INNOVATIVE RAIL FASTENING SYSTEMS
MODERN TECHNOLOGY FOR THE TRACK

The rail fastenings supplied by SCHWIHAG are based on systems which have been put to the test in practice for decades. SCHWIHAG has technically and economically optimised these systems.

SCHWIHAG provides consulting, development, design, production, delivery and service for rail fastenings and the following applications:

- Standard railway lines
- High-speed lines
- Heavy freight transport
- Underground railways
- Commuter railways
- Tramways
- Industrial railways

and in the following types of track construction:

- Ballast track with concrete sleepers
- Ballast track with wooden sleepers
- Ballast track with steel sleepers
- Slab track
- Bridge beams (beams on steel bridges)
- Transition areas

with regard to:

- Rail profile and cant
- Sleeper geometry
- Line layout (e.g. tight radii, large gradients)

SCHWIHAG rail fastening systems are:

- Proven standard systems (standard KS-track or W-track)
- New developments to customer requirements
- Adaptations with optimised components, e.g. new tension clamps for existing sleepers for retrofitting or conversion
- Special designs for difficult installation situations
- Systems with special surface protection for the RFS components to customer requirements for critical environmental conditions
- Systems with highly effective sound insulation (structure-borne sound/vibrations)
- Systems for transition areas, e.g. at tunnel/bridge with large relative movements between the rail and support

SCHWIHAG rail fastening systems offer many advantages for assembly and installation:

- Can be completely preassembled in the sleeper factory
- Due to sorted delivery, completely automated preassembly is also possible in the sleeper factory
- Quick, automated, mechanical final assembly on the construction site possible with assembly speed of > 400 m/h track

Other advantages:

- Tension clamps are produced free of surface decarburisation (see page 13 of the brochure) • maximum dynamic fatigue strength
- High-quality long-term corrosion protection available (see page 14 of the brochure) • The dynamic properties are maintained for the complete life
- High elasticity • Results in improved load distribution (deflection curve) along the rail, therefore, associated significant reduction in point loading on all track components such as the rail, rail fastening system, sleeper and ballast
- Integral anti-tilt protection • prevents overloading of the tension clamp in extreme load situations
- Integral electrical insulation • is achieved by using the insulating plastic fastening components: angle guide plate, rail pad and dowels
- Modularity • enables universal usability for all railway applications from the tramway, underground railway, and heavy load through to high speed traffic
- Precise batch marking • Lettering is made using laser technology and enables exact dating of the production date of each batch (see page 14 of the brochure)
- Heavy-duty dowels • Special design of the dowel geometry in conjunction with optimised material selection enables high pull-out forces and safety against excessive torques (see page 14/15 of the brochure)
RAIL FASTENINGS FOR CONCRETE SLEEPERS AND SLAB TRACK

Tension clamp Skl 14 on concrete sleeper (W-fastening)

Tension clamp Skl 15 for System 300-1 for slab track

Tension clamp Skl 12 on elastically supported baseplate as single support point for slab track

Tension clamp Skl SL 1 for heavy-haul systems on concrete sleeper

RAIL FASTENINGS FOR WOODEN SLEEPERS

Tension clamp Skl 12 on wooden sleeper (KS-fastening)

RAIL FASTENINGS FOR SWITCHES

System BSP-FF-B1 with Skl SL1, concrete

System BSP-FF-B2 with Skl SL1, steel

RAIL FASTENINGS FOR TRANSITION AREAS

System BSP-FF-B1 with Skl SL1, concrete

System BSP-FF-B2 with Skl SL1, steel

Tension clamp Skl 14 and Skl 12 as well as spring clip SSb2 for slide baseplate UfG 57 on W switch bearer
Targeted research and product development play an important role in SCHWIHAG. The requirements for forward-looking track components are determined through continuous dialogue with the railway engineers of the railway companies.

The 3D CAD system Pro Engineer is used to develop new products and to adapt or optimise products that have already proven their worth. The necessary FEM analyses are then performed on the basis of this CAD data. Prototypes are examined in our own test laboratory to determine their general technical properties and their suitability for use in railway operations. Continuous load (endurance) tests can be performed according to the test conditions of international standards and/or the specifications of the railway companies.

In addition to the static and dynamic load tests, the following material tests can also be performed:

- Hardness test
- Tensile/compressive strength test
- Grinding preparation and microstructural analyses (optical microscopy)
- Polymer tests (melting point, heat of fusion, glass transition point)
- Optical 3D measurement of components

SCHWIHAG AG’s jig construction department enables the production of customer-specific adapters and test apparatus, which ensures optimum position adjustment and clamping of the components to be tested during the tests.

Based on this development concept, our customers’ specific requirements can be implemented in new products or new product variants.

Following successful testing in the SCHWIHAG laboratory, the components and systems are subjected to further testing by an independent test institute as part of the approval procedure. Here SCHWIHAG works closely with renowned test and research facilities, e.g. the University of Technology of Munich or Dresden.
FROM THE WIRE TO THE FINISHED TENSION CLAMP:
SCHWIHAG PRODUCES IN A FULLY AUTOMATED PRODUCTION PROCESS

1. Wire roll made of spring steel
2. Bending line
3. Sorted transport to quenching and hardening
4. Quenching and hardening line
5. Sorted packaging of the finished product
6. Automatic transport into the warehouse
7. Indoor stores - warehouse
8. Outdoor stores products are ready for dispatch
We guarantee our customers that SCHWIHAG products are produced according to the following criteria:

- Careful selection of suitable heavy-duty materials
- Selection of the optimum production method under the aspects of product quality, flexibility and use of resources (manpower, material, energy consumption)
- Continuous monitoring of the production processes and the product data through material and dimensional checks according to national, international standards or those specified by our customers.

SCHWIHAG has a quality management system certified to ISO 9001-2008 and for many years has been a Q1 supplier of Deutsche Bahn AG and a certified supplier of numerous other railway companies (including SNCF, Network Rail, RFI).

The SCHWIHAG production concept in conjunction with the SCHWIHAG logistics concept enables us to respond to customers’ special wishes at short notice and to deliver standard products or special designs worldwide and on-schedule.

SCHWIHAG tension clamps can be produced free of surface decarburisation thanks to a special heat treatment method in closed chambers.

Following the heat treatment of the spring steel the fine acicular, martensitic microstructure forms. If classical heat treatment methods are used with open processes, surface decarburisation forms all around the perimeter of a wire with circular cross-section: these are the starting points for cracking. In the area of this surface decarburisation the material is brittle and tends to form cracks, especially under dynamic loading. These cracks or incipient cracks produce a notch effect and propagate in the quenched and hardened material and can cause a component to break. This process is also accelerated by increased formation of rust, which can occur especially in the area of the surface decarburisation.

The tension clamps produced using the SCHWIHAG method do not have any surface decarburisation zones and therefore achieve high dynamic fatigue strength.
**TECHNICAL INNOVATIONS**

**LONG-TERM CORROSION PROTECTION**

SCHWIHAG offers new, high-quality long-term corrosion protection for tension clamps made from spring steel. With this new type of corrosion protection, rusting can be verifiably and significantly reduced over the entire life under operative conditions. In this way, the fatigue strength properties of the tension clamps remain virtually constant over very long use cycles.

**PRECISE BATCH LABELLING**

In future, each batch of SCHWIHAG tension clamps will be marked precisely. The labelling is carried out using highly modern laser technology and enables exact dating of the production date of each batch.

**HEAVY-DUTY DOWELS**

The dowel is an essential component for rail fastening systems on concrete sleepers. The dowel, as a component cast in the concrete, is therefore very important for the function of the rail fastening. The loading capacity of dowel constructions can mainly be determined by its design failure. This can not only be loss of the connection or keying of the dowel with the sleeper body, e.g. pulling out of the dowel from the sleeper or damage to the surrounding concrete, but also failure of the internal plug construction, e.g. pulling out of the screw or bolt from the plug.

The objective of the development of the new SCHWIHAG plastic anchor dowel SDu S3 was to reduce the tensile stresses in the concrete body resulting from the screw-dowel combination. In critical loading situations, which occur especially during laying of the track and the tightening of the rail fastening, this should ensure a reserve against failure of the dowel construction and the bonding with the sleeper concrete.

The development objective was achieved in design terms by the geometrical formation of the dowel’s external (male) thread and the allocation of the corresponding dowel internal (female) thread. In addition, different wall thicknesses were implemented in the design of the dowel’s thread area. This material distribution causes any stress peaks occurring due to elastic and plastic deformation of the dowel material to be absorbed and therefore prevents damage to the surrounding concrete contour.

The newly developed plastic anchor dowel SDu S3 can be used not only with the sleeper screw Ss 25 but also with the sleeper screw Ss 35. Damage to the internal thread of the dowel caused by incorrect positioning of the sleeper screw Ss 25 with pointed thread is prevented by special design of the internal thread runout.

Within the scope of qualification tests it was established that the new SCHWIHAG plastic anchor dowel SDu S3 has a factor of safety of up to 4 for the pull-out force. The SCHWIHAG design also has a 3-fold factor of safety for the tightening torque, which is introduced into the dowel when tightening the sleeper screw. Apart from laboratory tests, this was also verified by practical tests on the track panel. When the sleeper screw was tightened and undone 10 times, no movement in the dowel crown was found and the bonding between the sleeper concrete and the dowel was completely intact.