edilon)(sedra ERS
Embedded Rail System

(ERS-HR) Rail Fastening System for High-Speed and Heavy Rail

edilon)(sedra

edilon)(sedra bv
Nijverheidsweg 23
NL-2031 CN Haarlem

T +31 / (0)23 / 531 95 19
F +31 / (0)23 / 531 07 51

mail@edilonsedra.com
www.edilonsedra.com

edilon)(sedra GmbH
Kistlerhofstraße 168
D-81379 München

T +49 / (0)89 / 89 28 64-0
F +49 / (0)89 / 89 28 64-20

mail@edilonsedra.com
www.edilonsedra.com

edilon)(sedra GmbH
Schossbergstrasse 19
D-65201 Wiesbaden

T +49 / (0)611 / 928 01-0
F +49 / (0)611 / 928 01-15

mail@edilonsedra.com
www.edilonsedra.com

a member of the James Walker Group

edilon)(sedra
www.edilonsedra.com

edilon)(sedra ERS Embedded Rail System

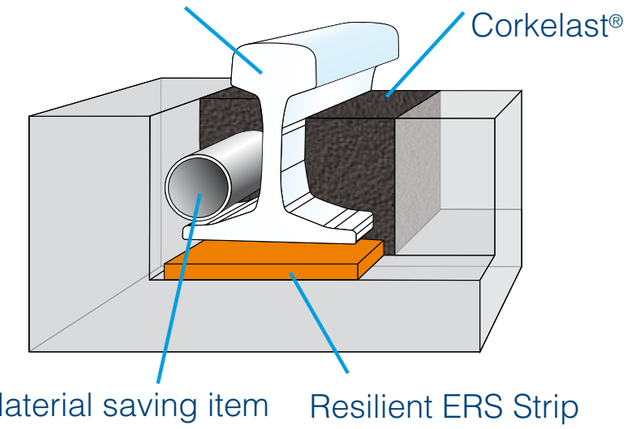
(ERS-HR) Rail Fastening System for High-Speed and Heavy Rail

For approximately 130 years, rail traffic was carried exclusively on traditional ballasted track. More demanding requirements – arising for example from high-speed trains, greater axle loads, increasing train frequencies, and enhanced environmental consciousness – have paved a new way: toward ballastless track systems.

In the best sense of this innovative technology, development has taken place of the edilon)(sedra ERS Embedded Rail System – as a high-performance and maintenance-free rail fastening system with special elastic characteristics.

The ERS rail fastening system is characterized by continuous support of the rails, as well as by the elimination of any and all forms of small hardware components. This also means avoidance of the support-point frequencies of traditional, discrete rail fastening systems – and it enables transfer of live traffic loads more uniformly and with reduced load peaks into the supporting track substructure.

The main product in the ERS rail fastening system results from enclosing and bonding the rails with the 2 component EDILON Corkelast® embedding compound in a concrete or steel channel. This unique, long-life material ensures that the rails have homogeneous support throughout, with specifically determined elasticity, in accordance with specified conditions. EDILON Corkelast® is a polymer embedding compound with hardness and quantities of filling material (e.g. cork) that depend on the product type. EDILON Resilient ERS Strip controls the rail deflection for ERS rail fastening systems, under the prevailing loads. Such strip mats are available with various thickness and hardness characteristics, according to requirements for system stiffness. The filling material used here primarily serves to reduce the use of embedding compound. Empty tubes employed for the same purpose can also be used to enclose cables for signals and other functions.



BENEFITS
Continuous elastic rail support
Life cycle over 30 years
Minimized life-cycle costs
Fast and efficient installation
Virtually no maintenance
Low track structural height
Flexible adjustment of support stiffness
Adaptable to all rail profiles
Selection of various track-covering material
Maximum chemical resistance
Maximum electrical insulation

The ERS rail fastening system was developed in the early 1970s, in collaboration with Netherlandsl Railways (NS). ERS has been used throughout Europe and the rest of the world for applications on bridges (since 1973), level railway crossings (since 1976), and for ballastless railway track (since 1976). The fields of application for ERS rail fastening systems in the heavy-rail (HR) version today include the following: high-speed rail traffic (with axle loads of 18 to 20 metric tonnes and $v_{max} \geq 300$ km/h), classic standard-gauge railways (with axle loads from 16 to 25 metric tonnes and $v_{max} \geq 200$ km/h), and the heaviest of industrial rail traffic with axle loads up to 35 or 45 metric tonnes.

Unique flexibility

BALLASTLESS TRACK

- Officially approved for $v_{max} \geq 300$ km/h
- Rescue and service vehicles can drive over
- Reduction of structure-borne noise
- Reduction of airborne noise possible
- Special applications for over 30 tonnes axle loads

TRAIN STATIONS AND STOPPING POINTS

- Appealing design of the track
- Simple cleaning of the track surface
- Accessibility for rescue and service vehicles
- Mass-spring system

TUNNELS

- Accessibility for rescue and service vehicles
- Reduction of track structural height
- Maximum stray current insulation
- Reduction of structure-borne noise
- Mass-spring system

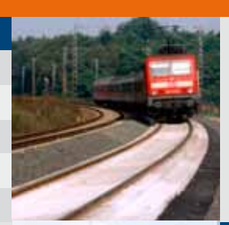
CIVIL STRUCTURES

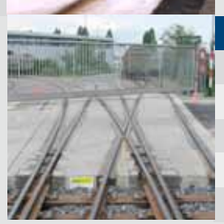
- Low weight
- Reduction of track structural height
- Reduction of structure-borne noise
- Reduction of secondary airborne noise

The special flexibility of the ERS rail fastening system is evident in all feasible types of track supporting structures. The ERS of course enables implementation with all track gauges and all types of track geometry, and all railway signalling systems can be effectively integrated.

CURVES

- Superelevation max. 180 mm
- Track gauge widening
- Installation of guard rails possible
- Reduction of rail corrugation





SWITCHES AND CROSSINGS

- In-situ or precast track supporting slabs
- Particularly suitable for heavy loads
- Durable track alignment
- No maintenance
- Adaptable to all types of switches and crossings

LEVEL CROSSINGS

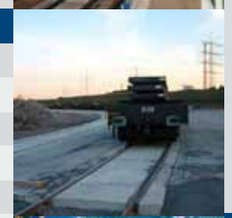
- Precast track supporting slabs
- Particularly suitable for heavy loads
- Durable track alignment
- No maintenance
- Life cycle over 20 years

BRIDGES

- Steel, concrete or hybrid
- Reduction of track structural height
- Significant weight reduction
- Spans up to 30m without rail expansion
- Reduction of structure-borne noise

PAVED SURFACES/TRANSSHIPMENT TERMINALS

- Particularly suitable for heavy loads
- Durable track alignment
- No maintenance
- Special applications for over 30 tonnes axle loads
- In-situ or precast track-supporting slabs



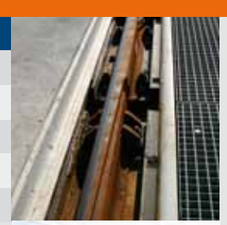
WORKSHOPS AND DEPOTS

- Washing and painting lines
- Chemical resistance to acidic and alkaline substances
- Flat and stable surfaces
- High quality joint sealing

In combination with the EDILON ERS rail fastening system, edilon)(sedra also offer standardized ballastless-track level-crossing and bridge systems. For more information, please visit **www.edilonsedra.com.**

RAIL EXPANSION JOINTS

- Combination with all expansion-joint designs
- Reduction of structure- and airborne noise
- Reduction in wear
- Reduced and simple maintenance



ERS system design

The flexible application possibilities of the rail fastening systems for edilon)(sedra ERS Embedded Rail System result from decades of development work and experience gained from employment of the systems.

The ERS rail fastening systems have been reorganized in application groups (see table at the right). These groups serve as point of starting point for customer- and project-specific implementation models, as well as for application in ballastless tracks, level-crossing, and bridge systems. These groups accordingly define the basic geometric conditions for channels made of concrete or steel.

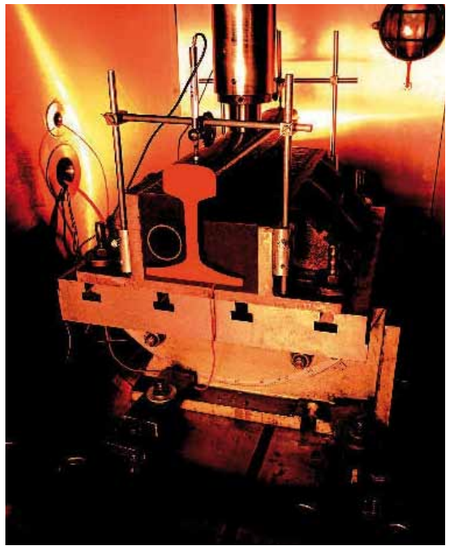
In addition, the ERS stiffness categories provide orientation for rail deflection under assumption of various load models.

It is possible in individual projects to modify the static and dynamic support stiffness, as well as sound-attenuation level, in order to comply with technical requirements for airborne and structure-borne noise.

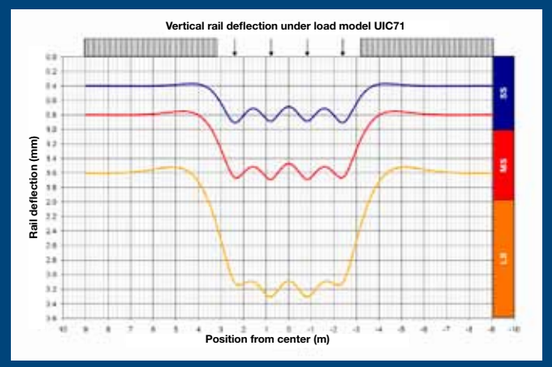
Each ERS system design undergoes extensive internal and external system testing (e.g. according to EN 13484-5 and EN 13146) as well as official approval tests. State-of-the-art computer supported test equipment enable simulation of all conditions acting on the rail fastening system. For example, performance between -20 and +50°C can be verified in our own climate-controlled testing chambers.

ERS-HR	Stiffness category	Typical static support stiffness (rail)	Max. static rail deflection (load pattern UIC71)
SS	Standard	100 kN/mm/m	< 1.0 mm
MS	Medium	50 kN/mm/m	1.0 - 2.0 mm
LS	Low	25 kN/mm/m	> 2.0 mm

ERS-HR APPLICATION GROUPS
Group “B“ - Basic
Group “L“ - Level crossing
Group “SB“ - Steel bridges

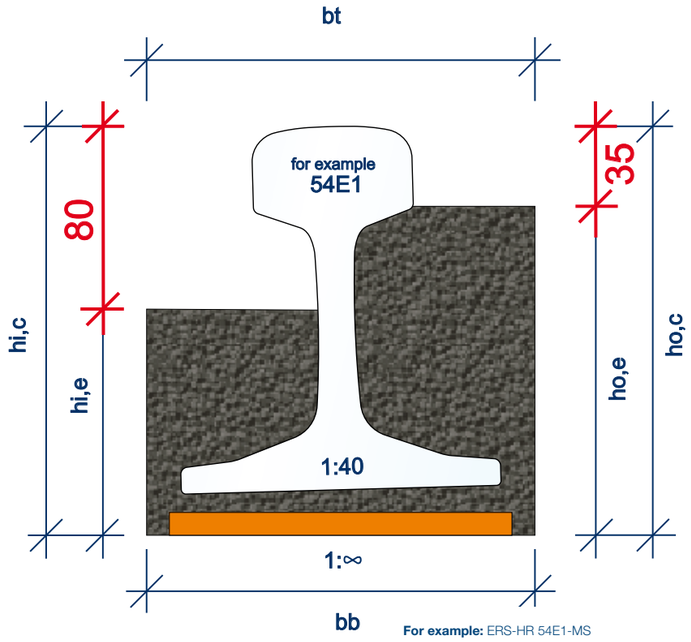


NOISE AND VIBRATIONS
Support stiffness can be adjusted
Rail deflection of 0.5 - 2.5 mm possible
Reduction of structure-borne noise
Reduction of airborne noise



The standard designs of the ERS-HR rail fastening system are based on the UIC71 load model.

Group “B” - Basic



For example: ERS-HR 54E1-MS

AREAS OF APPLICATION FOR GROUP “B”
Ballastless tracks
Bridges
Cut-and-cover or embankments
Tunnels
Civil structures

ERS rail fastening systems in Group B applications are designed for track areas that are not used by street vehicles driving along or across the tracks.

The heads of the rails are not embedded, which allows automatic drainage as well as grinding and re-profiling with high performance grinding machines.

In cases of tight curves (less than approx. 1,000 m), Corkelast® is poured at the outside of the rail heads up to e.g. 5 mm below top of rail.

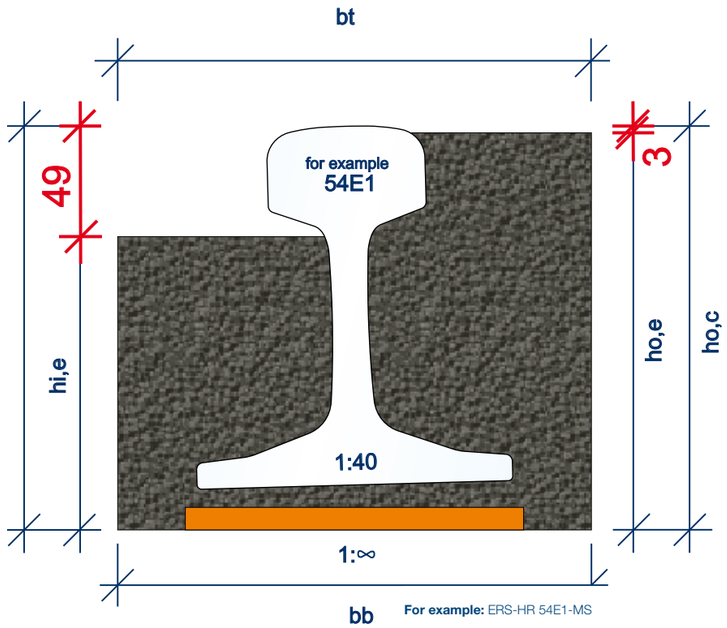
Group “L” Level crossing or roadway

AREAS OF APPLICATION FOR GROUP “L”

- Level crossings
- Transshipment terminals
- Paved track surfaces
- Workshops and depots
- Civil structures

STANDARD PROFILES IN GROUP “L”

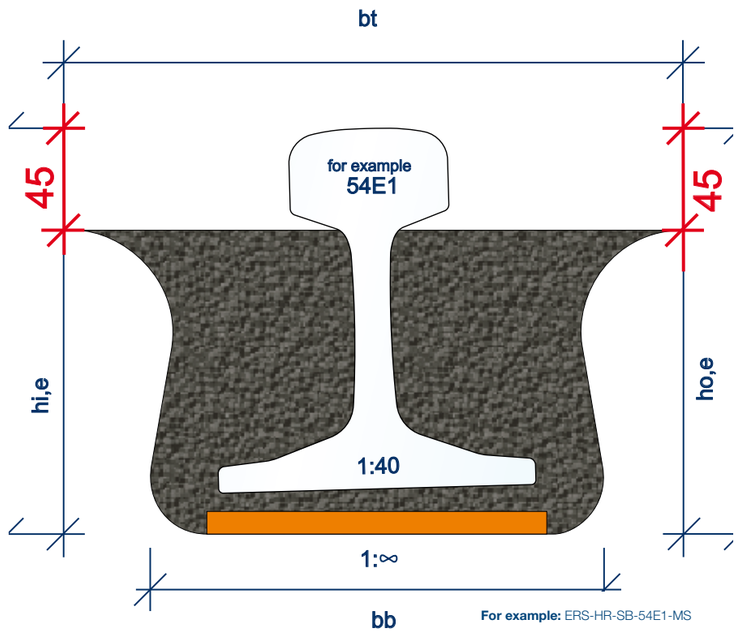
60E1 / 54E1 / 49E1 / etc.



For example: ERS-HR 54E1-MS

ERS rail fastening systems in Group L are designed for track areas that can also serve as level crossings or roadways for vehicles crossing the tracks, or moving along or over the tracks (e.g. for rescue and service vehicles).
Top of the is located e.g. 5 mm above the surface of the paved track. The depth of the flange groove is e.g. 55 mm. Flexibility in the width of the flange groove assures safety at level crossings, with low impact loads from lorries, fork-lift trucks, and the like.
The standard design for Group L of ERS rail fastening systems is for speeds up to 160 km/h with 25 tonnes axle loads, in accordance with load model UIC71. Special versions with grooved rails are available for industrial applications.

Group “SB” - Steel bridges



For example: ERS-HR-SB-54E1-MS

Group SB versions of ERS rail fastening systems are designed for applications in combination with steel module bridges (MB-S), or with modular steel deck plates.

The heads of the rails are not embedded, and Corkelast® is poured on the inner side up to e.g. 55 mm under top of rail, and on the outer side up to e.g. 20 mm below top of rail.

In cases of tight curves (less than approx. 1,000 m), Corkelast® is poured at the outside of the rail heads up to e.g. 5 mm below top of rail.

AREAS OF APPLICATION FOR GROUP “SB”

- Steel module bridges
- Modular steel deck plates

STANDARD PROFILES IN GROUP “SB”

60E1 / 54E1 / 49E1 / etc.

Installation

Installation and geometric alignment of the rails take place in accordance with the two techniques described below (Top-Down and Bottom-Up). For the embedding work, either project-dedicated machines pour the Corkelast®, or it is applied by manual pouring from buckets.

TOP-DOWN
Suspension of the rails by their heads
EDILON ERS portal every 3.0 m
Track positioning accuracy = ± 0.5 mm
Precise adjustment of the rail cant
Effective for high-speed requirements

BOTTOM-UP
Installation starts at vottom of channel
EDILON shims and wedges every 1.5 m
Track positioning accuracy = ± 1.0 mm
Simple handling
Traditional mode of construction

Preventive and corrective maintenance
Exchange of rails
Disposal of materials

Preventive and corrective maintenance
For over 35 years, experience has demonstrated the advantages of ERS rail fastening systems of significantly reduced maintenance in comparison to traditional track forms.
In addition, conventional maintenance work is of course also applicable to the ERS-HR system.

Exchange of rails
The ERS rail fastening systems enable to exchange individual rails without breaking the track surface. edilon)(sedra lease special asphalt-cutting wheels and other equipment to perform this work effivtively and efficiently.

ADVANTAGES
Virtually no maintenance
Optimal ride comfort over decades
Reduced rail corrugation
Reduced wear on the rail head

CONVENTIONAL MAINTENANCE WORK
Cleaning of flangeways (e.g. crossings)
Rail grinding (acoustic)
Rail re-profiling
Surface welding

Disposal of ERS rail fastening systems and packing materials

All EDILON materials are completely recyclable and are classified in accordance with the European Waste Catalogue. For more detailed information, please see the Product Information Sheets.. EDILON Corkelast® is classified in hardened condition as domestic waste.