

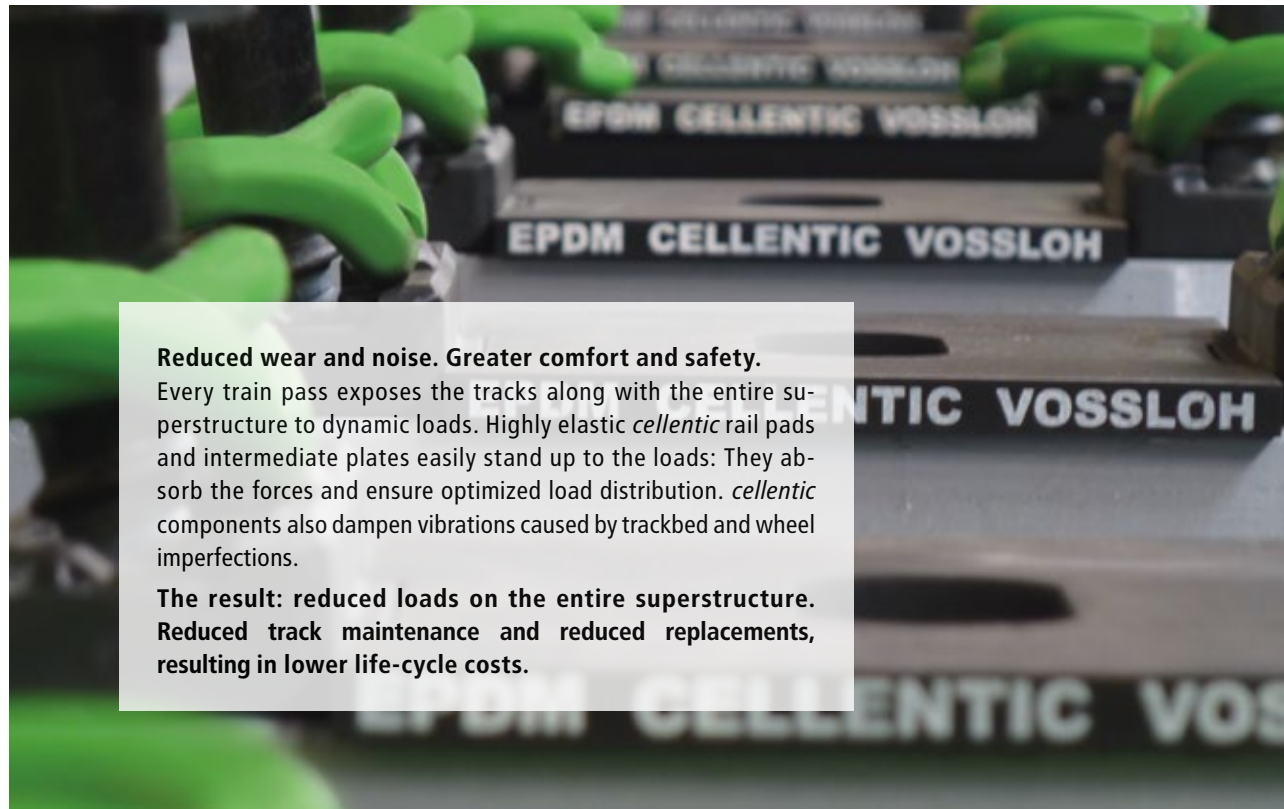
## Smooth travel with cellentic

Rail pads and intermediate plates for highly elastic rail fastening systems

# Maximized elasticity for Vossloh rail fastening systems

## **cellentic** – more elasticity for rail fastening systems

*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.



### Reduced wear and noise. Greater comfort and safety.

Every train pass exposes the tracks along with the entire superstructure to dynamic loads. Highly elastic *cellentic* rail pads and intermediate plates easily stand up to the loads: They absorb the forces and ensure optimized load distribution. *cellentic* components also dampen vibrations caused by trackbed and wheel imperfections.

**The result: reduced loads on the entire superstructure. Reduced track maintenance and reduced replacements, resulting in lower life-cycle costs.**

### Added value for the track and the environment:



#### Property

Reduced vibrations ...

Elastomers made from *cellentic* provide optimized force absorption ...

Vibration-damping ensures smooth wheel travel ...

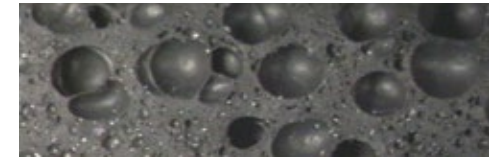
#### Benefit

... minimize structure-borne sound generated by rail vibrations.

... and conserve the superstructure – for reduced life-cycle costs.

... and increases passenger comfort and safety.

## **cellentic** – working principle



The key to success – the composition of the material: The micro-cellular EPDM-based elastomer has a saturated primary polymer chain as its chemical structure. The expanded, closed-cell structure ensures a particularly high elasticity. Its cell configuration absorbs the load into its own structure, therefore resulting in very little deformation.

### Engineering benefits

- highly resistant against chemical substances
- superior temperature, aging, and weather characteristics
- high durability under continuous loads
- low water absorption
- high UV and ozone resistance
- low frequency-dependence between 1 Hz and 40 Hz
- low dynamic loads on the support surface
- increased ride safety due to integrated track tipping protection
- high damping effect



### *cellentic* in the ballasted track

Rail pads made from *cellentic* dampen vibrations and optimize the elasticity of the ballast bed. This preserves the entire superstructure: wear on all track components including the ballast can be reduced. A configuration with different stiffnesses between 20–200 kN/mm allows *cellentic* rail pads to be used in nearly any application world-wide (conventional rail, urban transport, and high-speed rail).



### *cellentic* in slab tracks




















Slab track systems must meet special requirements to deflect forces into the ground as smoothly and with as little load on the material as possible. The highly elastic *cellentic* components of the rail fastening system ensure the required elasticity for all load profiles (conventional rail, urban rail, high-speed rail, and heavy haul). This involves the use of intermediate plates with elasticities  $\geq 8$  kN/mm.
















### Intermediate layers in endurance tests:



Different materials exhibit varying degrees of deformation under enormous loads, for instance during a train pass. **Left:** Based on its cell matrix, *cellentic* is able to absorb loads into its own structure and this exhibits very little deformation. **Right:** Solid rubber is non-compressible. Any deformation causes the rubber to expand in length and width, resulting in abrasion.

# Vossloh fastenings with cellentic

Fastening system	Vossloh DFF 300	Vossloh DFF 304	Vossloh DFF 21	Vossloh DFF 240	Vossloh DFF MC/CT	Vossloh DFF 336 NG	Vossloh DFF 300 UTS	Vossloh W-Tram	Vossloh 336
Railbed property	 SS	 SS	 SS	 SS	 SS	 SS	 SS	 SS	 SS
									
Application field	Conventional Rail	✓	✓	✓	✓	-	-	-	-
	High Speed	✓	-	-	-	-	-	-	-
	Heavy Haul	-	-	-	-	-	-	-	-
	Urban Transport	-	-	-	✓	✓	✓	✓	✓
 Component	Intermediate Plate	Intermediate Plate	Rail pad	Rail Pad	Rail Pad	Intermediate Plate	Intermediate Plate	Rail pad	Intermediate Plate
Stiffness of the material	≥ 17 kN/mm	≥ 22,5 kN/mm	≥ 30 kN/mm	≥ 30 kN/mm	≥ 30 kN/mm	≥ 8 kN/mm	≥ 16 kN/mm	≥ 30 kN/mm	≥ 8 kN/mm


















Fastening system	Vossloh 300 W	Vossloh 300 NG	Vossloh 300	Vossloh 300 HH	Vossloh 300 UTS
Railbed Property	 P	 P	 P	 P	 P
					
Application field	Conventional Rail	✓	✓	✓	-
	High Speed	✓	✓	✓	-
	Heavy Haul	-	-	-	✓
	Urban Transport	-	-	-	-
 Component	Intermediate Plate	Intermediate Plate	Intermediate Plate	Intermediate plate	Intermediate Plate
Stiffness of the material	≥ 17 kN/mm	≥ 17 kN/mm	≥ 17 kN	≥ 37,5 kN/m	≥ 16 kN/mm

 Gravel superstructure with concrete sleeper (CS)  
 Gravel superstructure with wooden sleeper (WS)

 Slab track with single support point (SS)  
 Slab track with profile (P)

### Remark

The contents, figures, and technical specifications in this brochure illustrate the performance of the fastener system; however, these also always depend on external influences. Please contact us so that we may develop a customized solution together with you that meets your specific needs. The presented information corresponds to the state of the art at the time of printing. The product may have evolved in the meantime in connection with the on-going research and development activities at Vossloh.

Fastener system	Vossloh W 14	Vossloh W 21 / W 21	Vossloh W 21 SH	Vossloh W 21 T	Vossloh W 25	Vossloh W 28	Vossloh W 30	Vossloh KS 24
Railbed property	 CS	 CS	 CS	 CS	 CS	 CS	 CS	 WS
								
Applications	Conventional Rail	✓	✓	-	✓	-	✓	✓
	High Speed	✓	✓	-	✓	-	-	-
	Heavy Haul	-	-	-	-	-	-	-
	Urban Transport	✓	-	✓	-	✓	-	-
 Component	Rail pad	Rail pad	Rail pad	Rail Pad	Rail pad	Rail Pad	Rail Pad	Rail Pad
Stiffness of the material	≥ 60 kN/mm	≥ 30 kN/mm	≥ 60 kN/mm	≥ 30 kN/mm	≥ 60 kN/mm	≥ 30 kN/mm	≥ 50 kN/mm	≥ 30 kN/mm



# cellentic – the right rail pad design for every installation requirement.



### Design in H-shape

(e. g. Zw 900a)

During the (pre-)assembly, the H-shape ensures that the rail pad is correctly placed under the rail and between the angled guide plates.



### Design in H-shape with pre-assembly lips

(e. g. Zw 900b)

The **pre-assembly lips** are important for transportation, especially for sleepers being pre-assembled in the sleeper factory: with their help, the angled guide plates hold the rail pad in place so it cannot get lost.



### Design in H-shape with anti tilting protection (AT)

The **reinforced edge** areas stabilize the rail position e. g. in narrow curves. The rail behavior is optimized by fitting angled guide plates. The **anti tilting protection** reduces abrasion and therefore extends the service life of the whole rail track. The AT-Version is also available with **pre-assembly lips**.



### All rail pads can be delivered with the innovative *fin*-design.

The ***fin*-design** was developed to optimize the H-shape's features – for applications where strong longitudinal movements of the rail can occur, e. g. due to high temperature fluctuations.

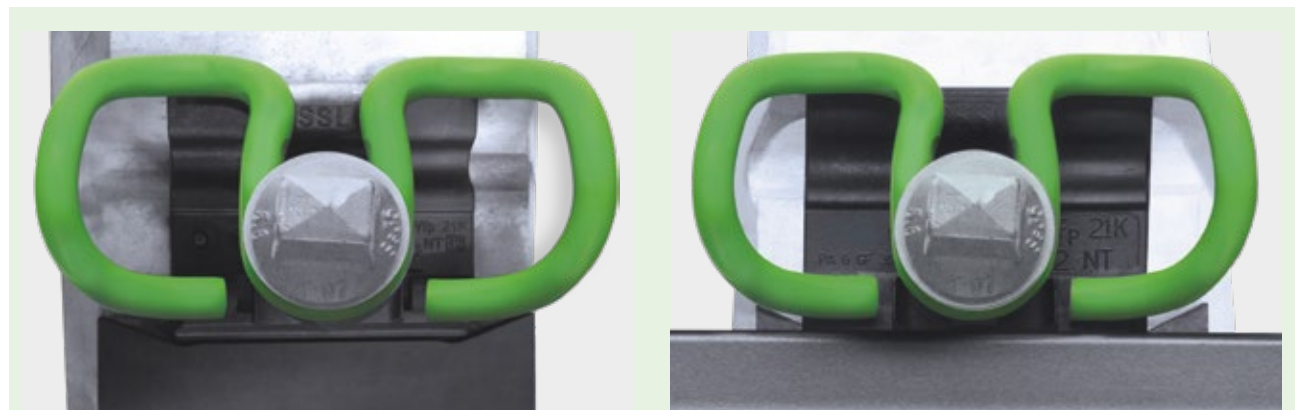
With the innovative ***fin*-design**, pre-assembly lips are also possible.

Cumulative total of all sold cellentic rail pads and intermediate plates:

Conventional rail  
**26.000.000**  
Units

High-speed rail  
**5.400.000**  
Units

Urban rail  
**3.300.000**  
Units



Pre-assembled fastening system before and after positioning of the rail



Rail pad after strong longitudinal movement of rail



Optimized distribution of forces: The „fin“ retracts.

### Smart shape: reminds of a dorsal fin

The streamlined ***fin*-design** offers a considerably improved flexibility **during track installation**:

- The rail pad optimally absorbs the forces: it recognizes automatically when the load becomes too heavy, caused by extraordinary longitudinal movements of the rail.
- The special shape reduces the resistance at the “fin” by retracting it.
- The design enables the rail pad to follow the longitudinal movements of the rail without resistance (it is virtually pulled out of the support point by the rail).
- Since the rail pad returns to its original shape after relaxing, it can be repositioned easily.

# **cellentic** – Ride comfort and safety across the globe



**„Olympic Route“ Beijing – Tianjin:** On China's very first high-speed rail line, a total of 750,000 *cellentic* intermediate plates were installed into the slab track over a track length of 230 km. While the track is designed for 300 km/h, the route will however also support speeds up to 350 km/h.

**Noise reduction for Metro Suzhou, China:** Suzhou was looking for a solution to address complaints from local residents about the noise and vibrations due to metro trains. The Suzhou subway installed 850 Vossloh support points. Those are compatible with the local track solutions and – because of its outstanding damping performance – are able to absorb 8 decibels more than conventional local systems.



**High-speed line Nuremberg – Ingolstadt:** Almost a third of the route (designed for 300 km/h) consists of nine tunnels. *cellentic* intermediate plates were installed here on a track length of 154 km. The route has gradients of up to 20 ‰, 55 % of the route is located along arcs with a minimum curve radius of 4.085 m.

**Taiwan TTY – Airport Line:** This project presented demanding engineering problems since the tracks travel along a topographically difficult route: the area is prone to earthquakes and the route has extreme grades, with 40 km of track installed on viaducts. As a result, approx. 330,000 *cellentic* intermediate plates were installed here along a track length of 102 km. At speeds of up to 100 km/h they provide a safe and comfortable ride for about 143,000 passengers daily.



**Metro Santo Domingo Line 2:** This route is completely located underground and was equipped in 2011 with *cellentic* intermediate plates along a track length of 22 km. Trains travel with speeds of 80 km/h at 3 minute intervals during rush hour, transporting up to 200,000 passengers daily.

**Source credit for the photograph:** Emmanuel Avargués; [www.art-e.org](http://www.art-e.org)

**Bangkok BTS Sky Train – Extension for Sukhumvit route:** Here as well, Vossloh is contributing to the overall solution: Approx. 45,000 *cellentic* intermediate plates were installed along the entire elevation along a 10.4 km track. Trains travel along the route at maximum speeds of 80 km/h.




**Metro Bangalore:** Essentially this entire Metroline – which travels below ground and also on viaducts – is equipped with rail fastening systems from Vossloh. A total of 240,000 *cellentic* intermediate plates were installed along 80 km – for trains move their passengers over the tracks with maximum speeds of up to 80 km/h.

 [www.vossloh.com](http://www.vossloh.com)

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