

From Standard Products to Customer-specific Solutions

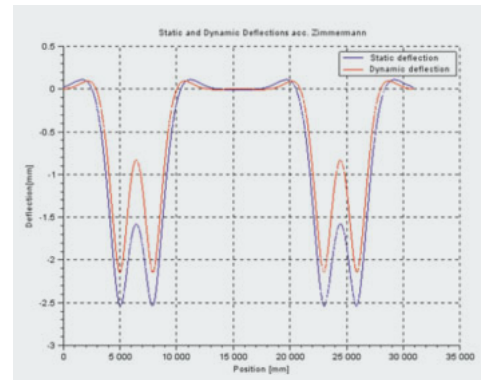


Over the years, Angst+Pfister has built up a comprehensive team of highly qualified application engineers who have amassed expertise across a broad range of industries. Under the APSO (Angst+Pfister Solutions) brand, our engineering specialists develop customized solutions for practically any application within our five core product areas. Let our railway application engineers serve you with tailor-made solutions in the areas of antivibration, fluid handling, sealing, engineering plastics and drive technologies.

Engineering services: Expertise all along the line

Technical industry expertise from around the globe that benefits our local customers:

- Design-in and development support (CAD, CAE)
- Experimental validation and virtual design
- Material and compound specification
- Industry approvals and certifications
- Technical seminars and training courses



Reliable logistics and customer focus worldwide

A comprehensive logistics infrastructure ensures that the right products are getting to their destination when and where they are required. Highly efficient processes, supported by an electronic order processing system, characterize the Angst+Pfister Logistics Center. Thanks to our extraordinary international network, a "just-in-time" delivery is supplied to all our customers, no matter the location.



Our customers include



Services from Angst+Pfister Group

Angst+Pfister – Your supply and solutions partner

The Angst+Pfister Group is a leading international technical manufacturer and service provider for high-end industrial components. As a supply and solutions partner for engineering plastics, sealing, fluid handling, drive, and antivibration technology as well as

sensors, Angst+Pfister combines efficient logistics concept with comprehensive product application engineering services. Besides providing customer-specific parts, the Group offers a product range consisting of approximately 100,000 standard items.

Our core product divisions



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APSOparts®
 the Online Shop of Angst+Pfister
 www.apsoparts.com

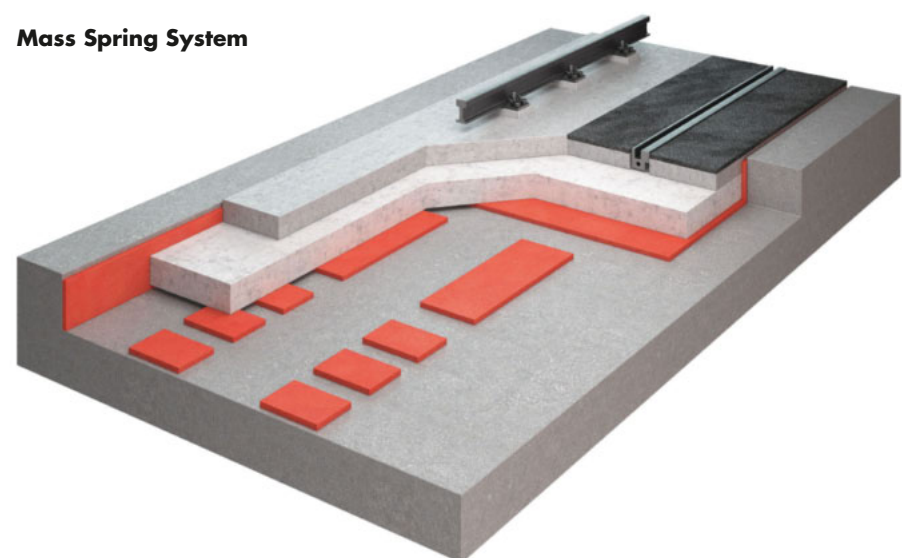


Angst + Pfister – Your Partner for Technical Solutions for Track Substructure

The best solutions for improving life cycle cost below the track

Angst + Pfister's track solutions increase effectiveness and efficiency in safety, performance and life cycle cost. Across Europe over the last 30 years, heavy tracks, high-speed rails as well as tramway tracks have all been equipped with Angst + Pfister solutions. We aim to preserve track design, reduce vibration and track life cycle cost. Our experts co-design and produce a vast array of products, to meet your exact specifications, from a wide range of materials. Under Sleeper Pads (USP), Mass Spring Systems (MSS) and Under Ballast Mats (UBM) are three of our expert solutions.

Mass Spring System



Angst + Pfister provides easy-to-apply, long lasting and highly economical solutions to effectively damp track vibrations. Our Mass Spring System is ideal for tramway, underground and other low-frequency vibration damping applications. The bearings are available in both mixed cellular polyurethane and high-quality recycled rubber granulates within three main forms:

- Full surface mats solutions can reduce by 25 dB the mechanical noise level for systems with a natural frequency between 14 to 25 Hz
- Strip solutions are a perfect fit with pre-manufactured tracks and on-site concrete track pouring. Efficiency starts for natural frequencies from 8 to 15 Hz
- Pads solutions are preferred for natural solutions between 5 to 12 Hz, and can also improve the noise reduction by 30 dB

Under Sleeper Pads



Under Sleeper Pads provide a layer with both elastic and plastic properties under the concrete sleeper and turnouts that are proven to protect both sleeper and ballast. Maintaining the ballast stones prevents concrete attrition and improves the load distribution. Under Sleeper Pads provide a significantly longer life cycle to the track. Angst + Pfister's Under Sleeper Pads are covered by patents, and fulfill the latest European standards, fully certified by both SNCF and DB. Material selection, surface area, concrete contact layer, shape and performance can fit virtually every axle load and track stiffness. Our technical railway engineers can adjust and adapt the components as required by the track manufacturer's specifications.

Under Ballast Mats



Under ballast mats influence both the track's stiffness and the load distribution within the substructure. They deliver an improvement in the track's isolation performance and significantly extend a track's life cycle by decreasing rail corrugation, wheels' false flanges, wear on the ballast and its possible stiffening due to infiltrations of subgrade sand. Angst + Pfister provides solutions in 10 to 50 mm thickness for 13 to 26 tons axle loads and up to 320 km/h – TC1 to TC5 (UCI) trains.

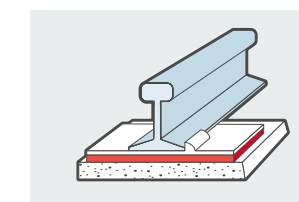
As a standard, we can deliver them with a bedding modulus from 0.15 to 0.38 N/mm³, other values are available upon request. Angst + Pfister's Under Sleeper Pads are widely used on every kind of track situation and reduce repair intervals and total life cycle costs. It is most advantageous to install our Angst+Pfister solution for the following critical track situations:

- High-speed rail
- Tunnels
- Ballast under 30 cm high
- Radius below 400 m
- Foundations deemed too hard
- Residential zones

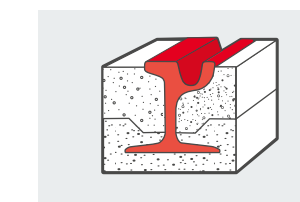
Our Under Ballast Mats are available in both mixed cellular polyurethane and high-quality recycled rubber granulates. Typical applications where sub-ballast mats are employed to reduce both acoustic emissions and mechanical vibrations include:

- High-speed rail
- Bridges and tunnels
- Transitions
- Residential zones

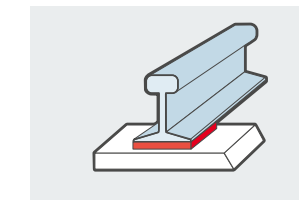
Other Common Applications



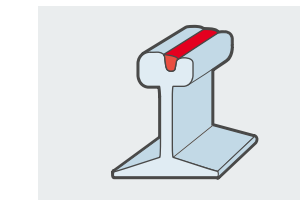
Base plate pads
For the elasticity of slab track systems, Angst + Pfister provides intermediate plates. They are installed between the rib plate and the concrete slab.



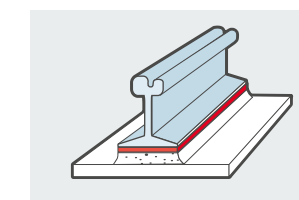
Embedded rail
The embedded rail system is used for electrical insulation of stray current. It ensures the interface between the rail and the platform surface.



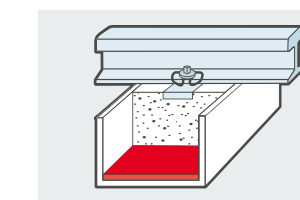
Rail pads
Flexible intermediate layers are installed directly under the rail foot. They have a defined stiffness and increase the elasticity of all ballast superstructures.



Rail groove filler
The rail groove filler is used to close the rail wheel groove of urban rails and tracks and thus eliminate danger points for both, pedestrians and bicycles.



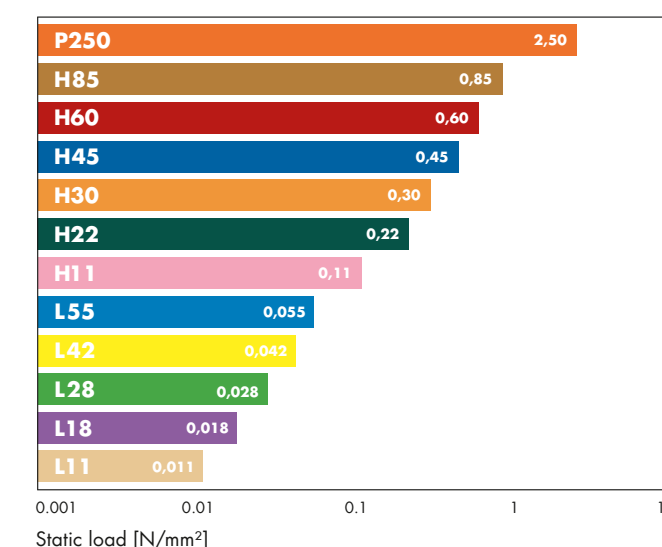
Continuous rail mounting
With the convenient solution of Angst + Pfister for continuous rail pads, different heights resulting from installation-related factors can be compensated.



Insert pads for sleeper bases
The Angst + Pfister insert pads are available in any desired stiffness that perfectly meet varied requirements. Preferred areas of application are tunnels of different categories.

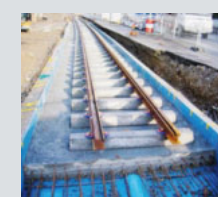
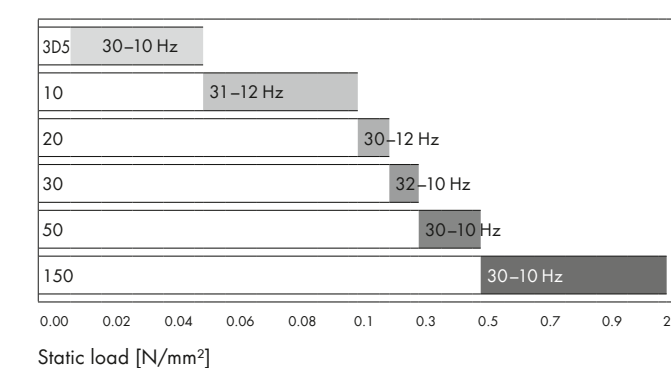
APSOPUR® range of high-performance polyurethane foams

Static range of use



ECOVIB® range of recycled rubber granulates

Static range of use



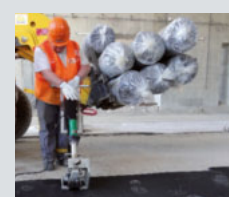
Tramway, Grenoble

1985



Tramway, Reims
Tramway, Saint-Denis/Boigny
Tramway, Nantes

1990



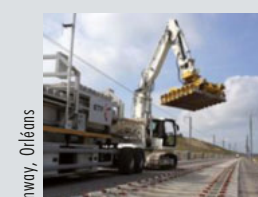
Tramway, Raven
Tramway, Strasbourg

Tramway, Lille



1995

Tramway, Montpellier



Tramway, Orléans

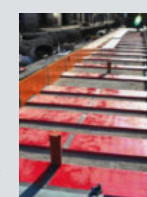
2000



Tramway, Saint-Etienne
Tramway, Nice
Tramway, Valenciennes
Tramway, Mulhouse

2005

Tramway, Bordeaux
Tramway, Marseille
Tramway, Paris – Les Mureaux sud
Tramway, Le Mans

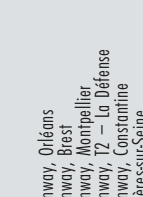


Tramway, Lyon
Tramway, Jerusalem

Tramway, Toulouse
AIM, Paris

Tramway, Reims
Tramway, Angers
Tramway, Rabat

2010



Tramway, Orléans
Tramway, Brest
Tramway, Montpellier
Tramway, T2 – La Défense
Tramway, Constanine
Arièze-sur-Seine

Tramway, Casablanca
Tramway, Iouis
Tramway, T1 – Genevilliers
Tramway, T2/T4 Lyon
Tramway, T3 – Bobigny
Tramway, T5 – Billiguis
Tramway, T6 – Paris/Saint-Denis

Tramway, Dubai
Tramway, Valenciennes
Tramway, Bordeaux Ligne A-B-C
Tramway, Iouis
Tramway, Toulouse Ligne G
Clichy, Paris

Tramway, Grenoble
Tramway, Lyon Ligne T1
Tramway, Montpellier –
Jeu de Paume



Tramway, Aubagne
LGV Est phase II, France

