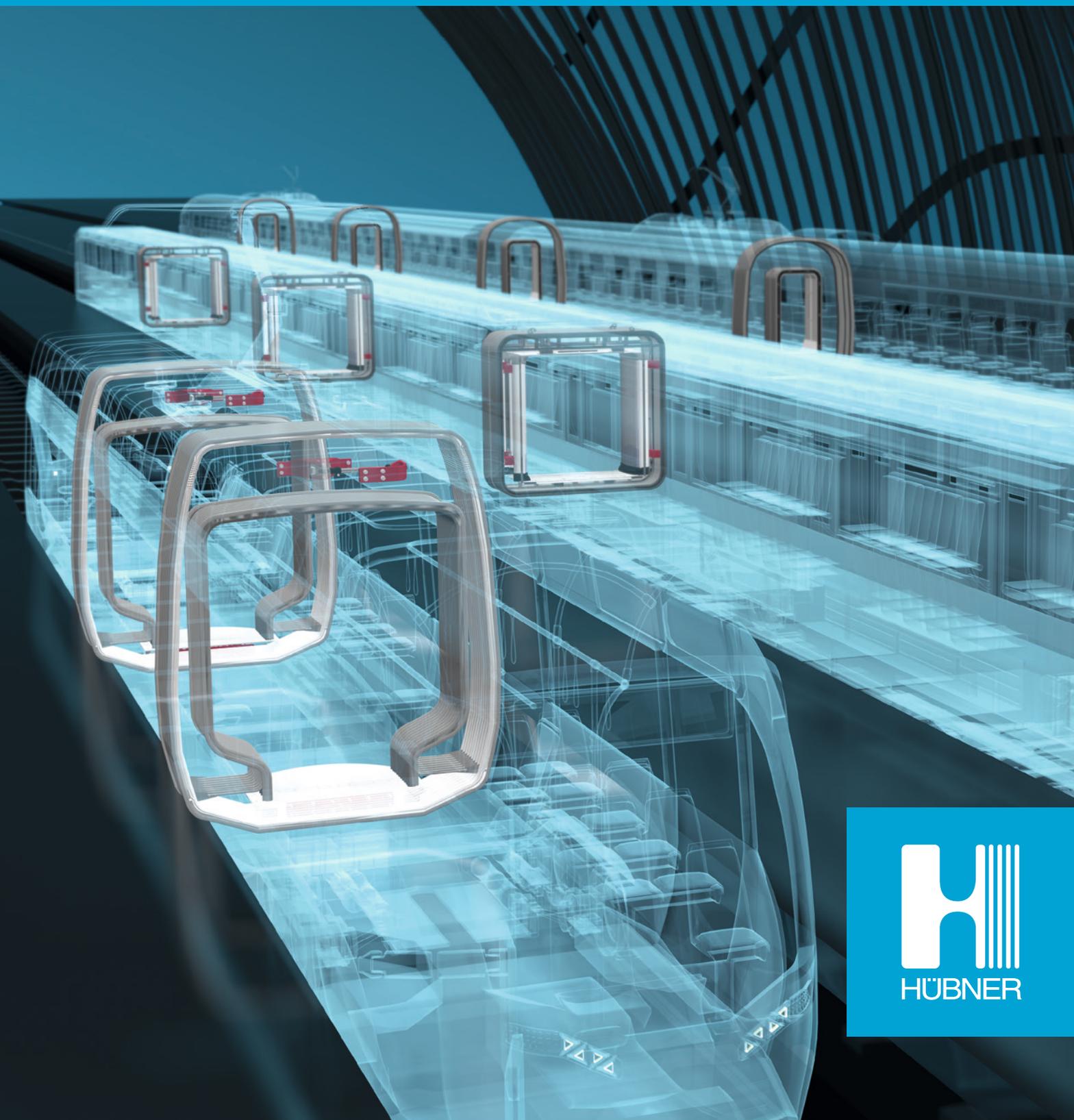


Products and Concepts for
Railway Vehicles

Mobility | Making mobility happen.



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HÜBNER Group
Mobility. Materials. Photonics.
united by passion.

Since the beginning in 1946 when Kurt Hübner founded the company, HÜBNER has been shaped by a spirit of enterprise, inventiveness and innovation. Today it continues to be this same passion for new solutions that drives the company and its employees. Again and again over the years, new concepts for new products and new markets have been developed and implemented.

It is on this basis that HÜBNER has become the company that it is today: A comprehensive system supplier for transportation technology and the worldwide leader for gangway systems (Mobility), a well-recognized specialist for sophisticated elastomer solutions and products, insulation and composite materials (Material Solutions), as well as an up-and-coming company in the field of laser, terahertz and high frequency technologies (Photonics).

Today the HÜBNER Group consists of more than 30 different companies and has more than 3,300 employees around the world. And HÜBNER products continue to stand out with their high-quality workmanship, their superior convenience and their distinctive durability. This high level of quality is to be found in all of the Group's business sectors and throughout the entire product range.

This all comes together in our company slogan:
Mobility. Materials. Photonics. | united by passion.





Mobility | Making mobility happen.

Hardly anything in today's globalized society shapes life as much as mobility. In addition to data and goods, it is people who are on the move more than ever before. Traveling and commuting between different locations, between workplace and home, between the suburbs and the city center has become essential to our standard of living in the 21st century.

As the global leader for gangway systems and a major supplier of bus, rail and airport technology solutions, the HÜBNER Group plays an integral part in this megatrend. For decades, the company has been delivering innovative products for the transport sector. The extensive portfolio ranges from customized gangway systems to chassis technology to driver displays in locomotives cabs and other vehicles to products for airport technology applications.

With increasing mobility, however, there is also growing demand for protection of the environment and resources. HÜBNER innovations such as lightweight articulation systems or aerodynamically streamlined corrugated bellows for railway vehicles are making significant contributions to greater energy efficiency in public transportation – while at the same time allowing for higher speeds.

And the materials used in HÜBNER products – many developed specifically for these applications – feature outstanding durability, thus reducing the consumption of resources over the whole product life cycle. HÜBNER has been developing innovative mobility concepts and solutions around the world for decades. These are making mobility happen today and are opening up new mobility horizons for the future.

On the move into the future

A great team: Railway vehicle technology and the name HÜBNER have been joined together for decades. Wherever people are traveling by rail, HÜBNER products will be found playing a connecting, sealing or absorbing role – in transportation systems around the world. And for mobility applications of the future, the company is also bringing intelligent solutions to the railway segment.

Dependability you can count on

First class: HÜBNER's transport industry products are distinguished by their precision and dependability. They have been demonstrating their quality in daily use for decades – on railway lines around the world. In addition to delivering the highest quality, it's HÜBNER's consistent customer focus that makes it a first choice worldwide.

Uniform manufacturing standards at all production locations in all countries guarantee consistently high standards – always with the aim of putting HÜBNER expertise to use so that the customer gets the best results. Ideas are made ready for serial production on the basis of customer specifications or products are customized to precisely fit customer needs. Examples include current innovations such as rollable side walls, extra heavy-duty tram articulation and bridgehead systems, aerodynamic wind fairing systems, or flame-resistant rubber profiles in accordance with fire safety standard EN 45545.

Excellent connections to the customer

With the establishment of a repair shop for rubber products in 1946, Kurt Hübner laid the cornerstone for today's international HÜBNER Group. Since this time, inventiveness and a drive to innovation have been part of the DNA of this family-owned company. Approximately 3,300 highly qualified employees around the world are at work every day developing new solutions and meeting diverse requirements. The close and effective cooperation between employees and customers is a key part of the company's success. HÜBNER reacts speedily and individually in response to customer wishes – one of a range of factors resulting in the many close and long-term partnerships HÜBNER has with producers and end customers.

A global network of knowledge

The know-how present in the company has been growing over decades. Through its involvement in many different industries and countries, it is possible for HÜBNER to make use of an exceedingly broad range of technological approaches. Customers place their trust in this knowledge and come to the company's engineers with challenges of many different sorts.

Close contacts are key. That's why the family-owned company follows its customers into diverse sales markets. It is represented on all five continents and in all the world's growth regions. In addition to the company headquarters in Kassel, Germany in the center of Europe, HÜBNER has also built up major locations in Hungary, Russia, China and the USA and has production sites in India, Malaysia and South Africa. These locations are supported by sales partners and trade representatives in more than 30 additional countries.

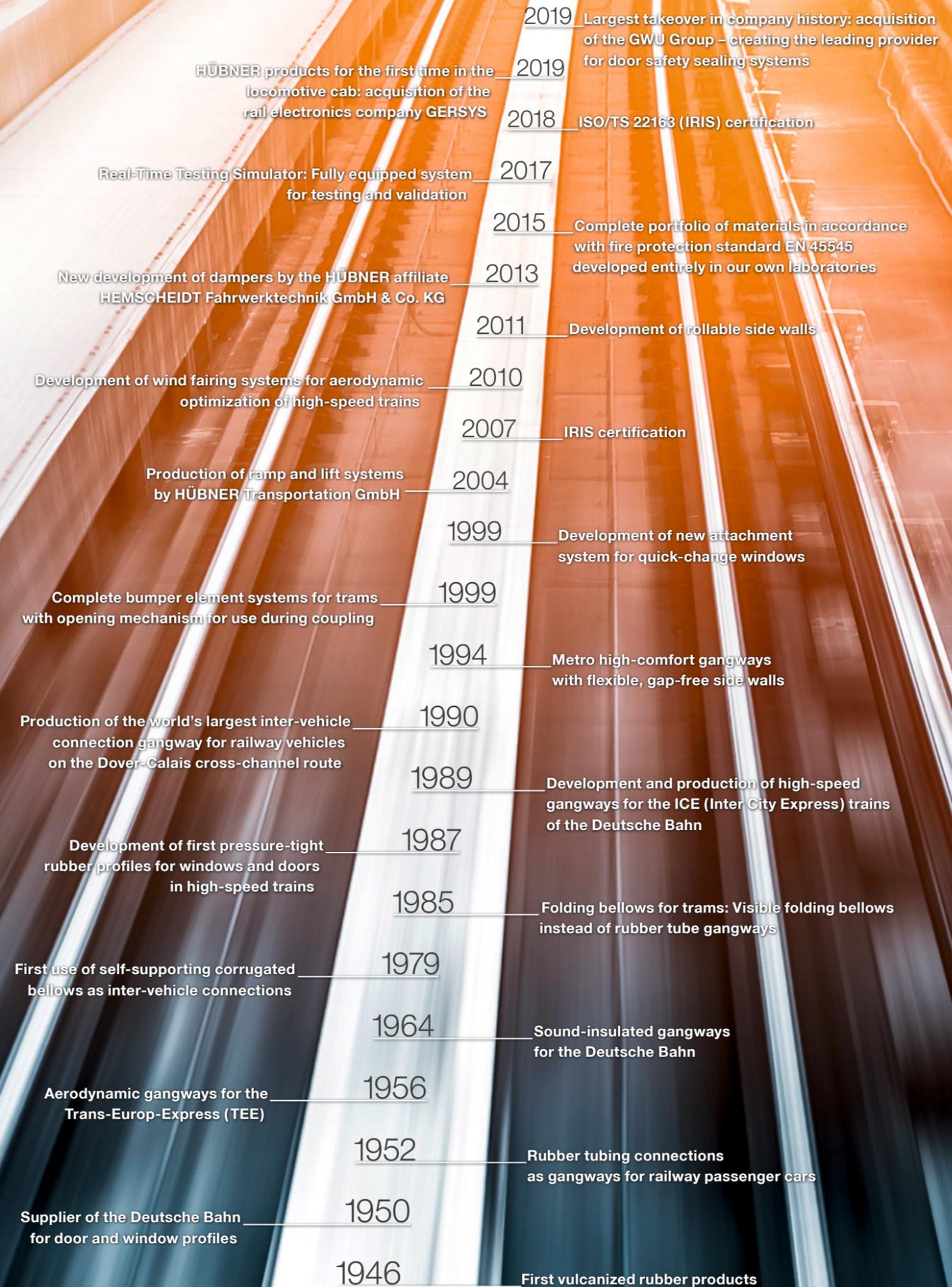
History
**Once an idea –
 Today, the standard**

Again and again, HÜBNER has been a driving force for technological progress – moving from an idea to a product ready for the market. From the beginning, the family-owned company has been committed to the innovative strength and outstanding quality in its products and concepts.

With the design and production of gangway systems for buses and railway vehicles, HÜBNER is the recognized global leader. Many other well-established railway vehicle products around the world can be traced back to HÜBNER developments – which today set the standard for the market. These include folding bellows made of rubber-coated fabric and corrugated bellows for large transverse movements – both made of highly flame-resistant materials. Or quick-release coupling systems, quick-change window systems and wind fairing systems for aerodynamic optimization. Or flexible, full-surface interior side walls and rollable walls. Or the Real-Time Testing Simulator for fully equipped testing and validation runs.

HÜBNER has further extended its product portfolio with the largest acquisition in the history of the company, the purchase of the GWU Group (Gummi Welz). Together with GWU, HÜBNER is now the leading supplier in the area of door sealing safety systems for the entire public transport area. In addition, with the 2019 acquisition of the rail electronics company GERSYS, HÜBNER products are now to be found for the first time in the cabs of railway locomotives and other vehicles.

The HÜBNER Group is active today around the world and is working continually to develop new products and solutions with its cross-industry know-how – always in close proximity to customers and their needs – so as to set new standards for the future.



From the starting line to the finish

Customized solutions

Components, complete systems or full series: HÜBNER delivers customized solutions for every sort of need. Customers benefit from HÜBNER employees' many years of experience – in development and production as well as in project management. Production standards that are uniform around the world guarantee precision and consistently high quality.

Always up to standard

HÜBNER products meet all established international standards and requirements – as numerous certifications attest. And often HÜBNER products exceed these standards in their functionality or safety aspects. That's the case, for example, with the requirements for preventive fire safety standards in materials and components (EN 45545) which are unique in the market.

Setting out on new paths

Innovation has a tradition at HÜBNER. That means to always be enhancing products, to be thinking ahead and setting out on new paths with unfamiliar ideas. The in-house departments for research and development are continually working on improvements, including on universal vehicle articulation systems. There is also ongoing testing for new materials with optimized fire safety standards and higher environmental compatibility. Partnerships with scientific institutes provide for further knowledge transfer and the inclusion of the latest technological developments. The innovations are always there to serve the customer – or the customer's customers. For example, with color design. Now it's possible to integrate the vehicle gangways into the overall optical design of the connected carriages. Another new trend is the use of translucent bellows materials. These let sunlight come into the carriage gangways creating a new and more friendly atmosphere.



Gangway systems for railway vehicles

A railway vehicle is only as safe as the gangways connecting the vehicle segments – an interface where extreme forces are at work. In the preceding decades, HÜBNER has made outstanding developments in the production of high-performance gangway systems. Thanks to this demonstrated expertise, the company is the global leader in this area.

HÜBNER gangway systems combine safety with comfort and durability and are being used in all parts of the world – in trams, metros, subways and suburban railways, as well as in mainline trains for regional, long-distance and high-speed transport. The company develops customized solutions for each customer with individual passageway widths and special designs. This is expertise that speaks for itself. Worldwide.



The best connection for trams

Cities are growing – and as they expand so too do the requirements for local public transport. Trams must manage every curve that comes – flexibly and safely. And even though safety is always the top priority, in times of tight financial budgets the durability of components also plays a critical role – because local public transport needs to remain affordable. Quality gangway systems from HÜBNER are great for our customers – and they also benefit passengers, too.

Safety, comfort & convenience

Tram transport has its own requirements. One of the biggest challenges are the tight curves found in cities. HÜBNER produces folding and corrugated bellows that are designed to meet just these needs. The bellows compensate for all of the extreme movements and provide sound insulation at the same time. For passengers that means that they can move from one part of the tram to the next safely and comfortably. And the gangway systems also get top marks during maintenance work. The floor elements can be easily removed, allowing access to the vehicle articulation.

Contours & colors

The special head covering of the gangway bellows fits perfectly with the contours of the tram. With this optical closure of the lateral vehicle contour, the whole appearance of the tram is upgraded. And an upgrade in appearance is also provided by innovative new folding bellows designs. They make it possible to give trams an individual and distinctive look. For example, HÜBNER can make the design and color of the bellows match the rest of the vehicle – giving trams a strong and unified look.



Components or complete systems

Designated contact persons

HÜBNER can deliver individual components or the gangway as a complete system as the customer wishes. A designated contact person is made available to the customer so that technical and mechanical errors in coordination processes are reduced to an absolute minimum.

Components of the gangway system:

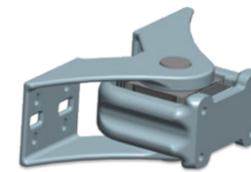
- Lower single and bi-articulation
- Upper articulation with pivoting, pitching and rolling freedom
- Folding bellows and single or double-corrugated bellows
- Articulated floor elements with turning plates and floor plates
- Portal frames made of aluminum profiles
- Connection systems for power supply or roof drainage
- Air-conditioning ducts for good ventilation
- Floor coverings that match the rest of the vehicle
- Integrated lighting

Versatile articulation technology

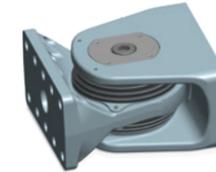
HÜBNER articulation systems can take on heavy loads – but at the same time are lightweight and long-lived. This is also true of the high performance universal articulation FX 1000 that can be adapted in numerous ways for the respective vehicle type. With an effective weight of approximately 40 kilograms, the FX 1000 makes it possible to transmit 1000 kilonewtons (kN) as tensile or compressive force. With additional adapters, customers' individual installation requirements can be readily handled.

Portfolio with latest technical requirements

The portfolio has been expanded to include soft-rolling articulation systems to meet new technical requirements. The extensive product range of upper articulations also includes models featuring pivoting articulation with wishbone connection as well as pitching articulation with Panhard rod.



Latest generation pitching articulation



Latest generation wishbone connection

FX 1000 – Compact, efficient and versatile

Due to the great diversity in vehicle types, it was necessary in the past to fit articulation systems individually for the respective vehicle. As a lower articulation, the FX 1000 is a top performing universal articulation that nonetheless provides plenty of room for modifications.

Pivoting articulation and pitching articulation – Lightweight and flexible

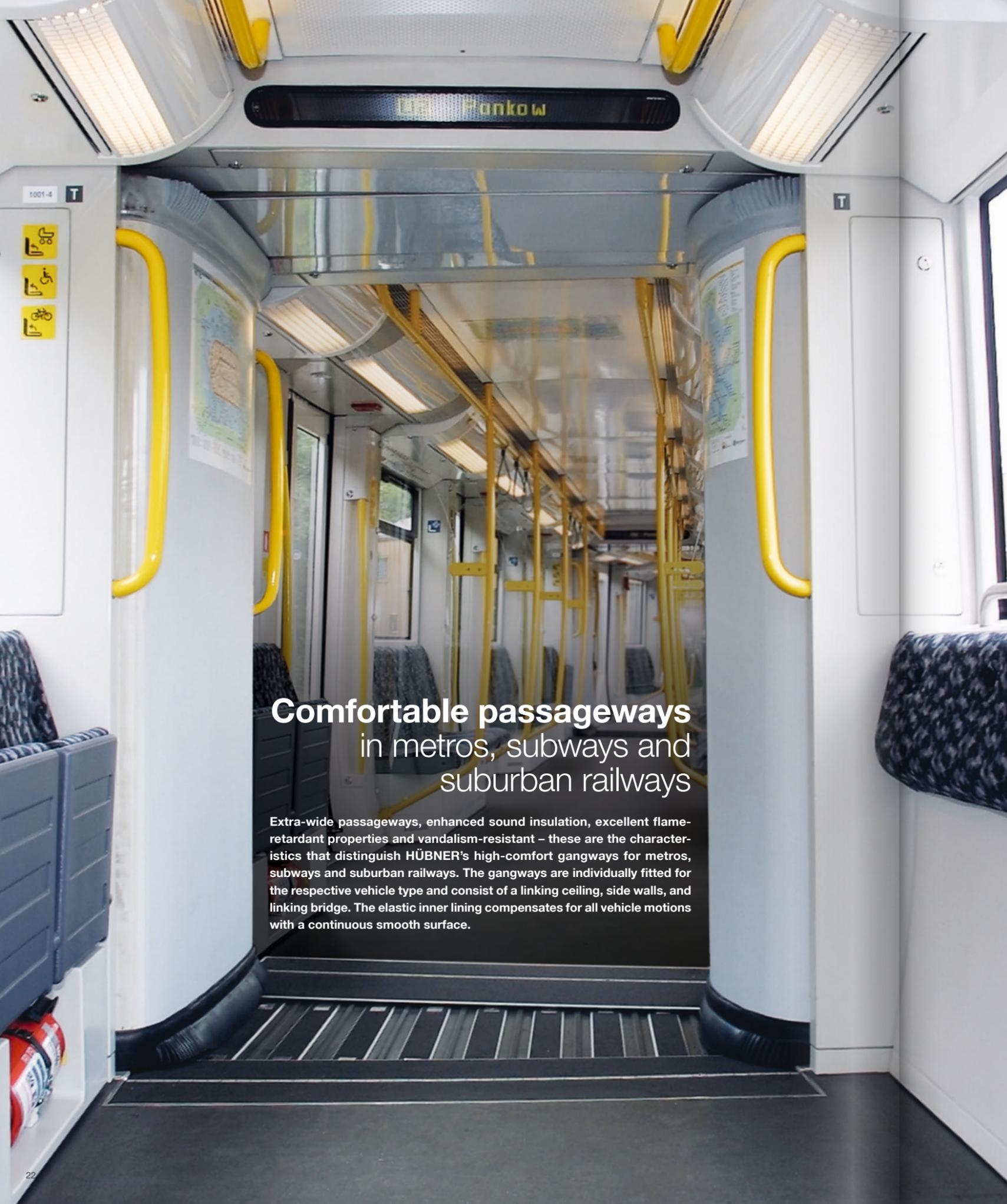
For many years upper vehicle articulation systems were mainly manufactured from cast iron parts. HÜBNER has now replaced these reliable but heavy components with a patented new design that uses sheet metal elements. This saves considerable weight. It is simple to integrate special customer wishes such as preloaded springs or damping elements when required.





Quality speaks for itself

Whether for express trains in Beijing, the Moscow Underground or the tram system in Melbourne – HÜBNER gangway systems are in use around the world. In the preceding decades, HÜBNER has made outstanding developments in the production of high-performance gangway systems. Thanks to this demonstrated expertise, the company is the global leader in this area. Nonetheless, each product is always individually and exactly customized to precisely fit the requirements of each customer. There's a reason why the HÜBNER name stands for quality and innovation – now for more than 70 years.



Comfortable passageways in metros, subways and suburban railways

Extra-wide passageways, enhanced sound insulation, excellent flame-retardant properties and vandalism-resistant – these are the characteristics that distinguish HÜBNER's high-comfort gangways for metros, subways and suburban railways. The gangways are individually fitted for the respective vehicle type and consist of a linking ceiling, side walls, and linking bridge. The elastic inner lining compensates for all vehicle motions with a continuous smooth surface.

Flexibility

HÜBNER high-comfort gangways can be customized perfectly for every vehicle type. Customers can select between various surface options. Special gap covers on the linking ceiling and floor connection system make for more safety and more effective sound insulation. The spacious, high-comfort gangways are available in one-piece or two-piece versions with single or double-corrugated bellows.

Design

Individually customized for the vehicle type, the gangway design can function as a single complete gangway element or in two connectible gangway halves. Two-piece gangways are advisable when cars are frequently separated from one another. This makes it possible to use them flexibly as dual-direction vehicles.

Coupling technology

The fastening of the vehicle gangways consists of a screw-on frame on the vehicle and a coupling frame as locking element. The material is either welded or curved, powder-coated aluminum profiles. A centering system on the coupling frame makes for simple, problem-free coupling which helps to shorten downtimes.

Corrugated bellows

Whether economical, lightweight single-corrugated bellows or double-corrugated bellows with increased noise insulation – this is for customers to decide on the basis of their particular requirements. Depending on the desired sound and thermal insulation characteristics, different thicknesses in the bellows material and corresponding design can be used.

For every model type, high-quality materials are implemented. These feature special characteristics that are indispensable in daily use: flame resistance, resistance to cold, heat and UV radiation as well as high tear and abrasion resistance. Highest quality and maximum material resistance are HÜBNER standards you can depend on.

Floor connection systems

HÜBNER linking bridges absorb all the movements occurring between railway carriages. This makes it so that passengers can pass through the gangway safely and comfortably. The newly developed combi-bridge features a simplified interface together with no-gap and no-step movement compensation. This makes it so that the bridge fits exactly between the end walls of the vehicle. In addition, it is self-supporting and handicapped accessible (TSI PRM). Specially coated bridge plates with low-wear sliding materials ensure a long service life.

Flexible & rollable side walls

In the 1990s, HÜBNER introduced a unique system of flexible gangway side walls to the market. These side walls continue to provide a flexible connection between carriages, increasing the available comfort zone in the gangways. The walls cover the bellows, providing a noise absorption effect and completely avoiding any exposure of moving edges in the train interior. In addition to these benefits, the highly vandalism-resistant inner lining is readily adaptable to nearly every vehicle type. The flexible side wall arches and extends to accommodate vehicle movements.

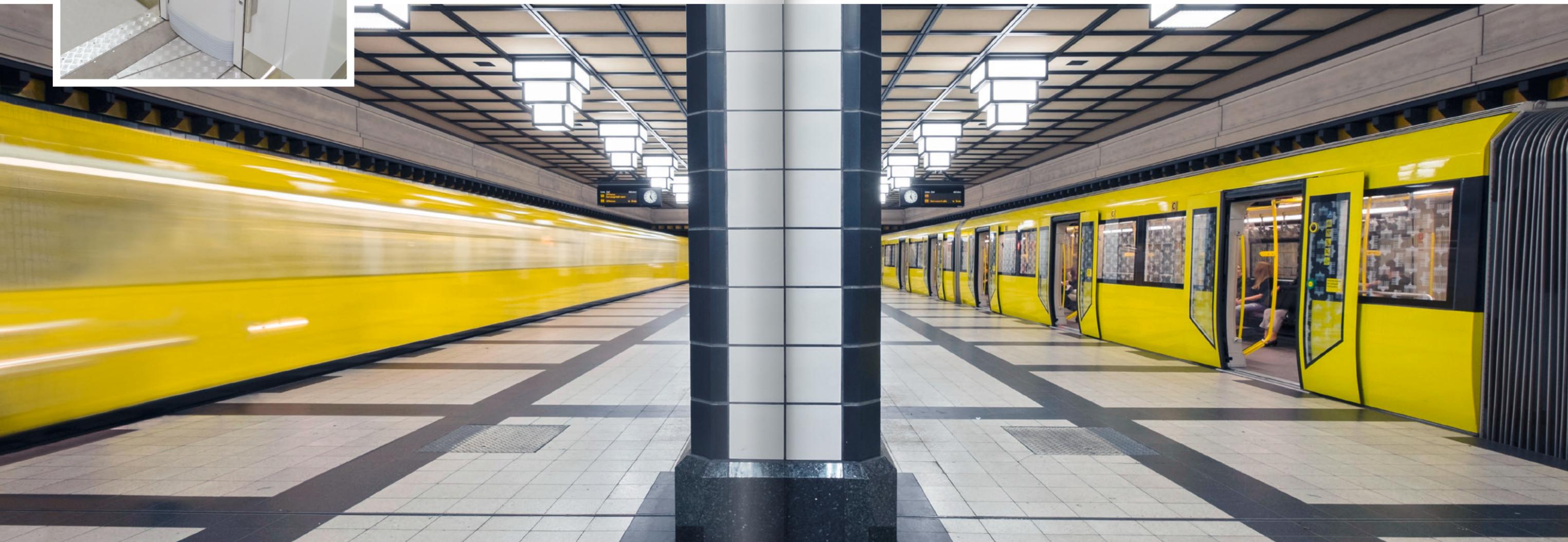
Flexible side walls – Folding bellows with inner lining

The inner lining – consisting of a linking ceiling, side walls and linking bridge or bridge plates – provides a flexible connection between the carriages and increases the available comfort zone in the gangway. In addition to the functional requirements fulfilled by these side walls, the highly vandalism-resistant inner lining can be customized to fit the interior design of all kinds of different vehicles through a wide selection of different surface options. Flexible side walls cover the corrugated bellows and are so pliable that they adjust to the different movements of the vehicle as it is in motion. Moving edges in the interior area are avoided completely. The inner lining of the comfort gangway also has a positive effect on sound insulation.

Rollable side walls – Large passageways

With a new enhancement of the inner lining, it is possible to maintain all the advantages of the flexible side walls and to eliminate the arching in the gangway through the new rollability feature. This provides an entirely flat surface in the high-comfort gangway area.

This new rollable side wall does cause a slight reduction of the clear passage while providing more space and lower weight. The rollable model allows for individual color selection, the possibility of varnishing or the application of a decorative foil.





Systems for mainline trains and high-speed trains

Inter-vehicle connections for mainline trains that meet the highest standards. HÜBNER produces systems for regional, local and long-distance transport. Thanks to these gangways' carefully considered design and the exacting selection of in-house manufactured parts and materials, these systems have an exceptionally long service life. They are low maintenance and deliver all of the features necessary to ensure that passengers can move comfortably and safely between carriages.

Flexibility

Gangways for mainline trains are customized to fit individual customer needs. They can be constructed with a one-piece or two-piece design and equipped with single or double-corrugated bellows. A range of options is available for the floor connection system – linking bridge, combi-bridge or bridge plates.



The right gangway for every railway vehicle

Gangways for high-speed trains

With their great pressure stability, elasticity and high fire safety standards, HÜBNER double-corrugated bellows for high-speed trains stand up to the most extreme mechanical impacts.

Gangways for multi-unit trains and regional transport

Perfectly fitted to the train vehicle contours and exceedingly flexible, the gangways for multi-unit trains and regional transports provide excellent sound insulation and top safety features. Use in tilting trains with larger roll angles is also no problem for these floor connection systems.

Front-end gangways

Optimal for high fluctuations in passenger numbers: Front-end gangways are attached to the driver's cab and guarantee safe and convenient passage through the train. This makes it possible to combine carriages and extend train length as required. Multi-unit trains can also be connected with front-end gangways.

Double-decker car transport trains

With a lifting roof for double-decker car transport trains specially developed by HÜBNER, the roof area of the folding or corrugated bellows can be raised to let cars be loaded onto the carriages. Following this, the gangway roof is lowered again to conform with the overall contours of the train vehicle. The special corrugated bellows for car-transport carriages have been in use in the shuttle trains running between France and Great Britain since 1994. These are the largest gangways in the world with a width of 4 meters and a height of 5.3 meters.

Special gangways

For customers with particular needs and for special applications, HÜBNER develops customized solutions. HÜBNER engineers have extensive know-how for such projects and years of experience.

UIC high-comfort gangways

HÜBNER's UIC-561 compatible gangway systems fulfill all of the stipulations of the International Union of Railways (UIC) for railway passenger cars. Rubber spring elements and corrugated bellows compensate for any displacement between the railway carriages. The gangway is coupled in the same way and is thus protected against sudden pressure fluctuations, shielding the train interior from outside influences.

Real-Time Testing Simulator

HÜBNER experts are now making use of an innovative new testing system for the development of customized gangways. This simulates in real time all of the motions that a gangway system will undergo in the course of its product life cycle. For this purpose, the vehicle movements occurring on the railway lines where the gangways will be used can be recorded in advance and fed into the simulator. HÜBNER thus is not only in the position to precisely recreate the course of a respective rail line, but also to exactly depict the changes that will be occurring in gangways over time. This makes it possible to adapt testing to real conditions in a way that has never been achieved before. Together with in-house laboratory material testing, this intensive test procedure ensures that all demands are fulfilled. For all vehicle types.

Aerodynamic wind fairing systems

Efficiency in mobility

Thanks to another HÜBNER Group innovation, trains can now travel more economically on the rails. The novel wind fairing systems conform exactly with the contours of the train vehicle to create a continuous, closed surface for the gangway area.

From the wind tunnel onto the rails

The new bellows generation features a unique flat-surfaced construction. This provides an extremely smooth and thus aerodynamic outer shell.

With this wind fairing system, HÜBNER is setting new standards for energy economy. The new development fulfills both ecological and economical demands. Extensive aerodynamic testing in the wind tunnel and special pressure testing facilities at renowned technical institutes as well as innovative testing methods paved the way for the innovation.

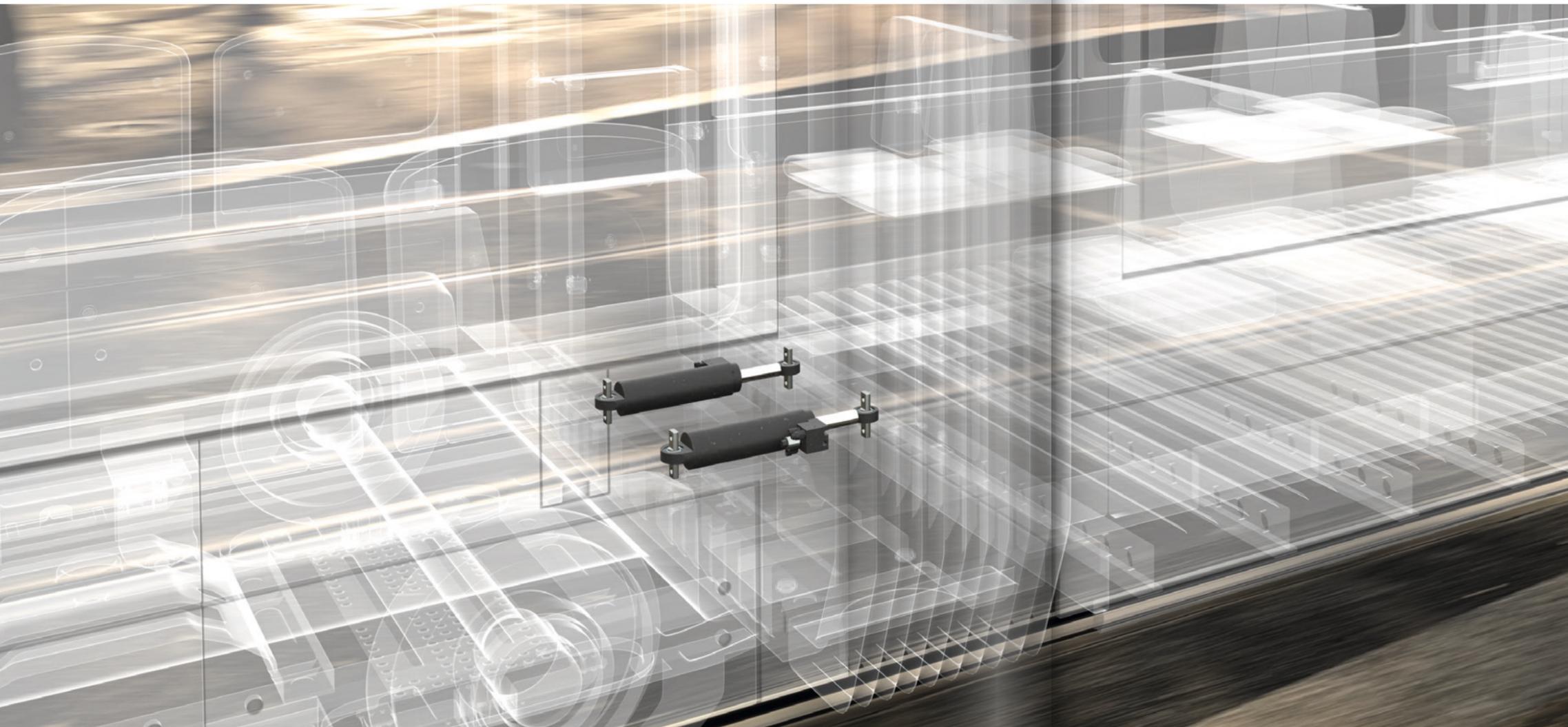
Energy efficiency is the future

Energy efficiency will be even more closely linked with high-speed transport in the future. With the help of the new fairings, energy and power savings of up to 10% can be achieved on high-speed trains. Aerodynamic optimization will become more and more significant. Analogous systems could also be implemented on regional trains allowing for similar improvements in efficiency and environmental impact. This would be an important contribution to securing the future of rail-based mobility from an energy standpoint.

Inter-carriage protective barriers

Inter-carriage protective barriers from HÜBNER combine passenger safety with well-balanced design. The flexible folding-wall side paneling closes the gap between the individual railway carriages of a train and covers the coupling. Passengers and passersby are thus provided optimal protection against falling between the carriages.





Vehicle stabilization systems
**Cushioning, damping,
 guiding**

As part of the HÜBNER Group, HEMSCHEIDT Fahrwerktechnik provides a range of stabilization components to enhance comfort and safety for use in trains and in commercial vehicles. The high-performance products are robustly designed, efficient and economical in daily use, and also are distinguished by their long and reliable product life cycles. For railway vehicles, the company manufactures dampers, springs, axle guides, and torsion bars as well as active and passive spring-damper cylinders. In addition, HEMSCHEIDT supplies customized test rigs for railway technology applications.

Vehicle stabilization systems: Individual and flexible

HEMSCHEIDT stabilization systems increase the running stability of vehicles and harmonize movements between the different railway cars. The systems can be individually adjusted. By facilitating optimal vehicle operating conditions, they reduce wear and tear which in turn reduces product life-cycle costs. And their modular construction is also advantageous for customers. A further benefit: With vehicle stabilization systems, it is possible to attain higher speeds on rail line segments with numerous curves which otherwise must be traveled at reduced speed.



HEMSCHEIDT torsion bar



HEMSCHEIDT yaw dampers



HEMSCHEIDT V-links

HEMSCHEIDT develops systems for customers' specific requirement profiles and customers can select the variants that best fit their needs. The portfolio for railway vehicles includes torsion bars, axle guides, springs and dampers as well as special pitch and roll turntables in the gangway area. With elastic bearing units these components increase riding comfort and contribute to acoustic decoupling. Their modular construction make it possible to install them in all vehicle constellations.

Offerings for railway vehicles are rounded out with the innovative passive and active spring-damping systems for vehicles and for gangway systems. These include the classic intercar dampers, roll dampers, yaw dampers, leveling systems and active steering cylinders. The cylinders can be modified for a wide spectrum of characteristics, facilitating more compact models for vehicles with demanding space requirements. A further significant benefit: These chassis components are entirely maintenance free.

www.hemscheidt.de

Locomotive instrumentation

Product expertise in the driver's cab: HÜBNER has extended its product offerings in the Mobility area with the acquisition of the rail electronics manufacturer GERSYS, a leading supplier for instrumentation in the cabs of railway locomotives and other vehicles.

IRIS-certified company

GERSYS serves a special category of companies in the worldwide market of rail manufacturers that is marked by very high technological entry barriers. GERSYS develops, designs and manufactures all products at its company headquarters in Wolfratshausen, Germany, close to Munich. GERSYS is certified in accordance with the International Railway Industry Standard ISO/TS 22163 (IRIS).

Highly durable products

With its various products and systems GERSYS fulfills the full spectrum of standards and certifications. The product range includes graphic displays, vehicle computers and engineer-assistant systems in accordance with railway standard EN50155. The needs and requirements that these systems fulfill are as different as the various customers. Therefore, GERSYS also develops and supplies individual customized devices adjusted for specific customer wishes in addition to its extensive line of standard products.

Tested quality

Highest quality is a top priority at GERSYS. The company runs its own in-house testing laboratory in which every device undergoes a full 24-hour test cycle before being delivered to the customer. This makes it possible to verify whether the products also will perform properly in extreme conditions such as the icy cold of Siberia, the desert heat of Australia or the tropical humidity of South America. From -40°C to $+85^{\circ}\text{C}$ – GERSYS devices guarantee full performance and exact display of data. They also are immune to electromagnetic disturbances. Not only do they fulfill the requirements of the European rail standard EN50155, they also meet much higher international requirements.

After Sales

Just as with other HÜBNER products, the instruments from GERSYS are distinguished by their outstanding durability. If, however, they happen to be damaged in some way, repairs are performed speedily and professionally. To ensure excellent repair and maintenance service, the company maintains a large supply of spare parts and supports customers with its own in-house service team.

www.gersys.de



Quick-change window systems

Damage caused by vandalism is a growing problem. Scratched window panes, broken glass or graffiti degrade the interior and exterior appearance of many vehicles. To facilitate quick reaction times and repair of such damages, HÜBNER offers quick-change window systems to its customers.

Increased profitability

Vehicle downtime in the workshop to replace windows causes annual losses running into millions. The repair of glue-based window systems is very time-intensive. Quick-change window systems, by contrast, shorten such downtimes substantially. This reduces maintenance costs and increases availability, thus increasing vehicle profitability.

Complete solutions from a single source

With complete system solutions from HÜBNER, damaged window panes can be exchanged quickly and simply whether in urban, regional or long-distance rail systems.

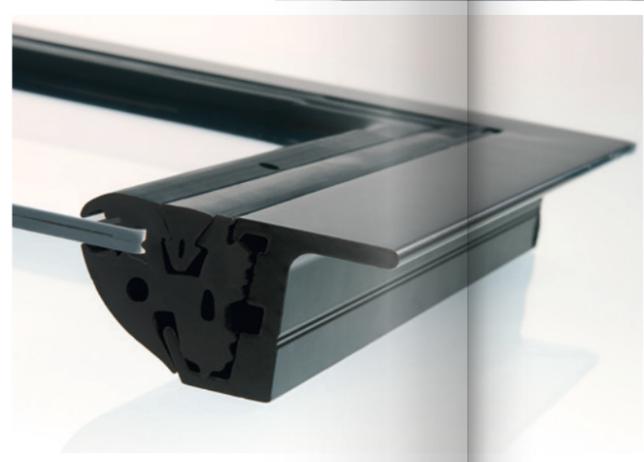
System solutions are available for:

- Windscreens
- Hopper windows
- Fixed windows
- Sliding windows
- Driver side windows
- Destination display windows
- Door glazing
- Side-hung windows
- Emergency exit windows

System benefits

HÜBNER quick-change window systems offer many benefits:

- No lengthy workshop downtimes
- Significant savings per window replacement
- High vehicle availability
- Minimized product life-cycle costs
- Simple replacement of panes from outside the vehicle
- No disassembly of interior fixtures necessary
- No cumbersome cutting out of glued seams
- Minimal replacement times
- Appealing design





Rubber systems in top form

More than 70 years of experience with rubber products: The engineers of HÜBNER are developing solutions for individual and special requirements and have a wealth of experience to rely on in handling any project. These many years of experience coupled with high-quality raw materials and perfect processing provide solutions for a long service life in railway applications.

Knowledge & experience

HÜBNER's unique know-how resides in its in-house development department for chemical engineering. More than 400 standard rubber compounding formulations are available to serve the specific requirements of the railway vehicle industry. All products comply with international fire safety standards and other applicable safety requirements. From the beginning of the development process, finite element method (FEM) calculations are used to simulate the loads exerted on profiles and molds. Depending on the particular material development, the rubber products feature high chemical and thermal resistance as well as outstanding mechanical stability and flame resistance.

Rubber profiles & frames

HÜBNER rubber profiles are produced using punched-out and cut-out sections, molded-on parts, shape-molded corners and preheated radial connections.

For windows, the rubber profiles are used as frames for holding the panes in place. For chassis, rubber suspension systems or elastic mountings absorb damaging or bothersome vibrations. For doors, HÜBNER offers single or multi-component seals consisting of finger protection profiles with electric safety edges and exterior-mounted portal frames.

Through the acquisition of the GWU Group in 2019, HÜBNER has now extended its expertise in the area of door safety sealing systems. For example, an innovative new rubber profile working with a light curtain operates on a touchless basis to detect when persons or objects are present in the closing area of the door. In addition, a newly developed door profile with LED light strips indicates when it is safe to enter or leave a vehicle.

For corners that are subject to especially hard wear (for example through shearing effects), HÜBNER produces rubber frames with injection-molded corners. With this special production technique it is also possible to connect hollow chamber profiles and profiles of differing diameters with each other.

Molded rubber parts

The company develops and manufactures molded rubber parts for virtually all applications, ranging in size from 10 to 5,000 grams. Our production facilities are well suited for the production of small to medium-sized lots for optimal handling of individual customer wishes.

Rubber-metal bonding

Whether steel, aluminum, brass or other metals – HÜBNER's high-performance metal pretreatment facilities guarantee perfect bonding of metal and rubber. These products can be used for end stops, tracks, buffers and discs.





Passive pedestrian protection

Decades of experience

As traffic volume increases, so too does the risk of accidents – particularly close to tram stops and crossings. The HÜBNER Group has more than 30 years of experience in the production of tram front ends made of polyurethane (PUR) foam. With this expertise it is possible to combine passive pedestrian protection with modern vehicle design to best effect.

PUR protection: 3P Front End Systems fulfill fire safety standards

The 3P (People Protection Products) Front End Systems for trams made of flexible polyurethane foam provide optimal protection for both pedestrians and the vehicle in the event of a collision. HÜBNER is also the first manufacturer worldwide to offer the tram vehicle front ends in a form that fulfills the specifications of the new fire safety standard EN 45545 that applies throughout Europe. This standard specifies the requirements for materials and components in rail vehicles in connection

with characteristics such as flammability and fire behavior. The front ends are distinguished by being at once highly robust and at the same time remarkably flexible. What does that mean in practice? In the event of a collision, HÜBNER's specially developed material deforms on impact and then in a short time returns to its original contour once again.

Outstanding test values, TÜV audit inspection

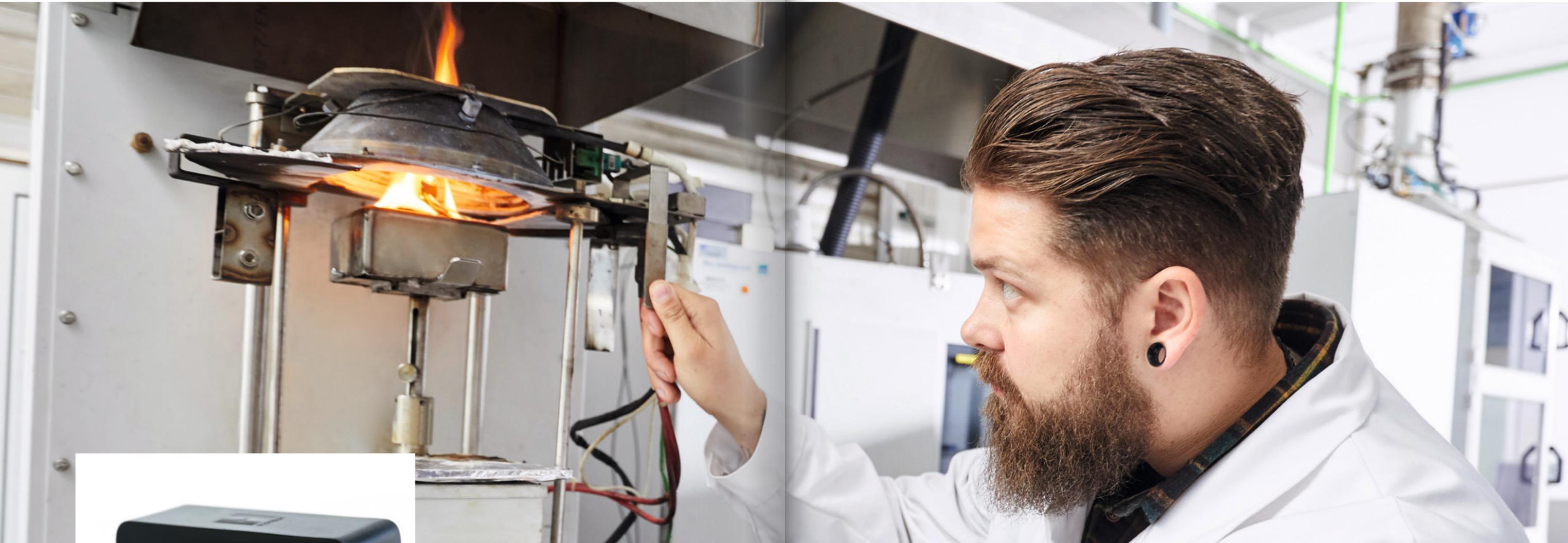
The Head Injury Criterion (HIC) test used in the automotive industry demonstrates the excellent protective effects of the HÜBNER components. The test shows that the special PUR bumper systems can reduce the degree of personal injury by absorbing the impact energy in a collision. The HIC value (Head Injury Criterion) measures the impact energy exerted on the human body. Values up to 850 typically result in good chances of survival with minimal or no injuries at all, while values over 1,300 typically result in serious injuries. In tests conducted by the

testing agency TÜV Süd, the current PUR front bumpers from HÜBNER recorded impressive results with a HIC value of 600 to 650. For comparison: Conventional tram paneling elements have a value well over 1,300.

Economical modernization

Long years of use also make themselves apparent in the look of tram vehicles. If trams are still delivering good service, however, and the technical features are only outdated in their appearance, then there is another possibility besides the cost-intensive procurement of new vehicles. An economical alternative developed by HÜBNER is the installation of new bumper elements with pedestrian protection – available also for older tram models. A practical side effect: Vehicles that have taken on an outdated appearance shine again with a fresh new design. In addition, the bumper elements can provide space for other technical upgrades such as modern headlight systems.





First-rate fire safety

Fire protection is essential for rail safety. Continually increasing passenger numbers and new regulations that prescribe enhanced fire safety standards for railway vehicles are increasing the need for modern safety features for railway vehicles. Protection of passengers and train personnel in the event of a fire is always the top priority.

Fire-retardant functional components

Under the brand name HFP, HÜBNER provides fire-retardant functional components to the railway industry made of its own polyurethane compounds. In addition to their fire-retardant characteristics,

the flexibility of these materials is particularly noteworthy. These components can be engineered and molded for all requirements.

Flexible for individual solutions

HÜBNER has more than 50 years of experience in handling polyurethane materials. This experience flows into each new product design project we undertake. Even atypical design ideas can be realized in accordance with the desired requirements.



Fiber reinforced plastic for railway vehicles When **quality counts**

The company Kunststofftechnik Hennigsdorf (KTH) – part of the GWU Group that HÜBNER has recently acquired – handles multiple aspects of the business with fiber reinforced plastic (FRP). These include product development, prototype and sample construction, mold and model making as well as the production and assembly of ready-to-install components. Additional business areas involve the production of prefabricated insulation units for railway car insulation and for the chemical industry. Comprehensive service for the production of spare parts as well as the repair of defective products of other manufacturers is also offered by KTH. The company can sometimes perform such repairs directly in the affected trains.

KTH supplies both German and international railway vehicle manufacturers with high quality paneling systems made of fiber reinforced plastic. As a comparatively economical fiber composite material, FRP can be used for many applications. It is distinguished by its high-grade stability as well as its good resistance to temperature, ultraviolet light and chemical influences. Its good weather resistance is also a significant benefit for use in the mobility sector. KTH can produce complex component configurations and shapes in accordance with specific customer requirements. Multiple-element molds also enable the production of indented parts.

ICE 4: Interior paneling produced by KTH

Interior paneling made by KTH is to be found, for example, in the locomotive cabs of the Deutsche Bahn's ICE 4 trains. For this new prestige order, the FRP blanks are initially produced in a manual laminating process. In the completion of the units, various other metal parts, rubber profiles and insulation elements are added together with connecting pieces made of metal, rubber or insulation material. During the subsequent assembly of the components, heating elements, passenger counting sensors and light sensors are premounted. For quality and process control, all of the production steps as well as all of the basic materials used are fully documented. For its customer Bombardier Transportation also located in Hennigsdorf, Germany, KTH not only delivers just-in-time but also directly to the point of use on the assembly line.

Parallel series production with individual configurations

KTH provides numerous product variants during simultaneous regular series production. In addition to supplying parts for the ICE 4, the company also delivers FRP components for various train series such as the new Hamburg suburban rail trains and the so-called platform train Bombardier Talent 3. With the Talent 3, Bombardier produces a standard train type that can be individually modified to fit the different needs and wishes of various customers. This makes it possible to undertake different configurations for additional components, the number of cars per train, the color design and the heating elements.

Certified and safe

The KTH company works with a fully integrated quality management system that is certified in accordance with ISO 9001:2015. In addition, the company is certified in accordance with the environmental management system standard ISO 14001:2015 which specifies further measures for ecological and sustainable practices. The changeover from the existing fire safety standard DIN 5510 to the EN 45545 standard has raised the requirements for fire safety characteristics enormously throughout Europe. The raw materials used by KTH fulfill these standards up to the designated Hazard Level 3, which meets the highest safety requirements.



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Insulating materials and sound absorption

Noise reduction for rail transport

Reducing noise emissions for greater travel comfort: Plastrocell offers innovative products for insulation and sound absorption in trains. For more than 30 years, the company – now part of the HÜBNER Group – has developed solutions across many industries for sound insulation and thermal protection. With this wide experience, Plastrocell brings distinctive expertise to the production and processing of various materials. For rail transport, the company's special products are mainly used for train interiors.

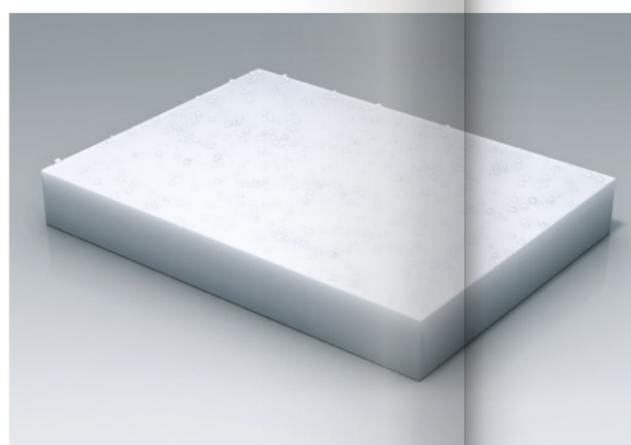
Optimal protection

Plastrocell products give rail passengers excellent protection against the noise emissions generated by the train chassis and wind resistance, which at the same time helps to provide comfortable interior temperatures. The thermo-plastic sound insulation film Plastroform is used in the floor and wall areas of trains and serves to insulate against airborne noise while also absorbing structure-borne noise. Vibrations and oscillations are thus effectively diminished. The high-density of the material allows for a particularly efficient reduction of train-related noise, giving passengers peace and quiet for a stress-free travel experience.

Plastotect is used throughout the train as a flexible foam – with or without hydrophobic characteristics – that provides excellent heat insulation as well as absorption of airborne noise. Through a special melamin resin-based modification, the foam can be made to be moisture repellent, and it also serves as a reliable diffusion barrier in connection with high temperature differences. In its water-repellent form, Plastotect resists the absorption of condensation so that moisture is not absorbed by the insulation material. The benefits for passengers are clear: pleasantly regulated temperatures in the train interior that make for comfortable traveling conditions.

In addition to its wide range of standard solutions, Plastrocell also provides customized products to meet special customer needs and requirements. Highest quality and safety standards are always a top priority. With their advantageous fire behavior characteristics, the complete range of Plastrocell materials are ideal for fulfilling all relevant fire protection regulations in the passenger areas of rail vehicles. In addition, they are tested in accordance with all required standards and are subject to ongoing official quality control certification (TÜV).

www.plastrocell.de



Ramps: Perfect access for every vehicle type

Full wheelchair accessibility: Manual folding ramps for trams manufactured by HÜBNER Transportation GmbH fulfill the highest safety and quality standards and enable easy, step-free entry. And work is also underway on electric ramps for rail applications.

Excellent accessibility

Manual folding ramps can be built for almost any vehicle type as a customized solution. Design and color can be made to match the corresponding vehicle. HÜBNER Transportation GmbH also is experienced with ramp systems for buses. This expertise contributes to the product solutions for railway vehicles.

The manual ramps are available in different sizes. They are particularly impact and scratch-resistant and can be quickly and simply integrated into any vehicle concept. All of the products get top reviews for their low weight. The plastic ramp has the additional feature of being electrically insulated. The folding ramp is well-suited for retrofitting purposes as it can be conveniently stowed in a wall mount that requires little space.

HK modular

Weight of the complete module: 28.5 kg
Load capacity: 350 kg
Tread plate size:
Length in accordance with ECE R107 and DDA
W ≥ 800 mm

HK light, the manual folding ramp

Weight of the complete module: 12.5 kg
Load capacity: 350 kg (can vary according to model)
Tread plate size: Length 905/1105 mm, width 930 mm

Folding ramp, the retrofitting solution

Weight of the complete module: Approx. 11kg
Load capacity: 300 kg
Length: 800 mm

www.hubner-transportation.com



Manual folding ramp HK light



Manual folding ramp HK modular



Service

After Sales & Service

HÜBNER is a company you can count on: The company's railway vehicle experts are always there, ready to provide practical assistance and technical expertise – from the start to the finish of the product life cycle. That begins with comprehensive consultation during the tender phase, continues after delivery with maintenance support and quick delivery of spare parts and refurbishment solutions, and finds a further form with the provision of individual training as requested. One significant advantage of working with the HÜBNER Group: Over the preceding years, the company has built up a close-knit network of locations and service points around the globe so that contact to customers is always quick and direct. HÜBNER has its own branches in more than 25 different countries and is represented by sales partners and trade representatives in more than 30 additional countries.



Service from A - Z

Top services for top products: What customers receive does not end with the delivery of the product. Years after the sale of a product, HÜBNER ensures continuing operating safety and performance – with know-how and a wide range of services for railway vehicles.

Refurbishment & product support

Buyers receive advice and support during the whole product life cycle. This also includes obsolescence management so as to ensure long operation for railway vehicles. When maintenance, overhaul or refurbishment become necessary, HÜBNER is ready to work with customers to find special solutions. Our aim is to make the service life of vehicles as long as possible.

On-site technical planning & testing

HÜBNER makes use of innovative planning tools for customer-specific product modifications – for example, an in-house developed system for recording relative movements in a vehicle. This makes it possible to determine the requirements for the specific gangways and on this basis to then design the perfect system – also for refurbishment requirements.

Servicing & expertise

Preventive as well as corrective maintenance work is performed on the basis of the condition of the gangway systems and other parts. If repairs are necessary, they can be performed at the customer's location or in the HÜBNER plant. Safety inspections and status analyses are also part of our service portfolio. In addition, HÜBNER can provide documentations, analyses and expert reports. Instructions, descriptions, spare parts lists and training videos are available in various languages.

Technical service & technical training

HÜBNER aims to provide practical and pragmatic solutions in its customer service. Service work is performed flexibly and when possible on-site. In all these activities, the customer's needs are the most important thing. Good communication and short turnaround times are standard policies, just like multilingual service personnel and an international network of service partners. Customers can also make use of training from HÜBNER specialists – on-site at their own locations or at the HÜBNER Training Center at company headquarters in Kassel, Germany.

Spare parts management

If a component needs to be replaced, only the original is good enough. HÜBNER guarantees high availability of spare parts. Thanks to flexible production capacities, high vertical integration in our manufacturing and a worldwide staff of approximately 3,300 employees, all parts including special makes can be quickly delivered. And always in OEM quality.

Contact:

as&s-rail@hubner-germany.com



The company **HÜBNER** worldwide

Think globally, act locally: HÜBNER is there where its customers are – because close contact helps us to understand business partners better and to provide better support. Individual wishes and requirements can be determined quickly and then put into effect and implemented without delay. Customers thus have direct benefits from our strong local presence.

In addition to the company headquarters in Kassel, Germany in the heart of Europe, HÜBNER has built up more than 30 locations around the world in the preceding years and decades. The company now has major plants in Hungary, Poland, the USA, China, Russia and Brazil. This network of company-owned locations is supported by sales partners and trade representatives in more than 30 additional countries.

And the company's offering to customers does not end with the delivery of the products. The HÜBNER Group is also continually expanding its service structures – in personnel and in the technical facilities that are provided. To be on hand ready to provide support as quickly as possible – in locations around the world.

www.hubner-group.com/en/worldwide

1 group with more than 30 locations	sales partners & representatives in more than 30 countries	approx. 3,300 employees
	founded in 1946	approx. 1,000 patents worldwide

www.hubner-group.com



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