

Products according  
DIN EN 45545-2



# RAIL COMPETENCE IN FLAME RETARDANT SYSTEMS

**BUILDING TRUST**



# TRENDS FOR PASSENGER RAIL VEHICLES

FASTER PROCESSES – SAFER VEHICLES – INCREASED COMFORT

Rail is an important service provider to the global society. It provides with its infrastructure the transportation backbone for a sustainable economy. The rail manufacturers must increasingly rely on innovative potential to deliver smart solutions in order to meet the numerous challenges like demographic development, climate change, increased demand for safety and at the same time cope with high cost pressure.

Manufacturers of passenger rail vehicles expect improvements in their processes, highly efficient and easy to use repair solutions and support for innovation in vehicle design. Rail operators have to meet higher safety levels, increased reliability

and at the same time reduced operating cost including provisions for comfortable passenger experience. Sika provides technological solutions that assist rail vehicle manufacturers and operators in meeting their targets.



## FASTER PROCESSES



Quality plays a key role in the rail market place but cost is of equal importance to rail vehicle manufacturers. Both factors need to be taken into consideration in order to maintain competitiveness and success. Therefore, focus is on process simplifications that reduce the risks for mistakes. Shorter cycle times increase capacity and can eliminate bottlenecks. Sika provides advice and solutions how to achieve these goals with accelerated or two-component systems, which do not require heat for curing or simply technologies and which do not need many pretreatment steps.

## INCREASED COMFORT



Passengers and fleet operators demand for high capacity vehicles providing fast, efficient and comfortable urban transport. Sika solution block out noise and damp vibrations that can create discomfort for rail vehicle passengers. Performance combined with excellent application properties make those products the perfect solution to improve the travelling experience for the occupants.





## ENVIRONMENTAL HEALTH & SAFETY



The market is constantly evolving and technology is playing a greater role helping companies ensure compliance, drive profitability, reduce risks, and improve environmental and social concerns. At the same time the new legislations, harsher classification and higher demands on worker safety are challenging topics for everyone in touch with chemical substances. Sika is dedicated to sustainable developments and provides innovative solutions like water based pretreatments, phthalate and tin free sealants and adhesives as well as products that allow reduced consumption and considerable weight savings.

## INCREASED LEGISLATION AND SAFETY DEMANDS



Legislation and community demands are increasing year by year. The use of adhesives and sealants in the rail sector has become a genuine alternative to traditional joining techniques such as riveting and welding. The growing material mix led to reduction in vehicle weight, improved space usage, new design opportunities, less corrosion and easier repairs. More than half a ton of adhesive is used for a modern passenger carriage nowadays. However, this positive development showed impact on legislation side. Harsher fire safety requirements, quality control demands and well-educated personnel lead to a significant increased workload for certification, and audit trails.

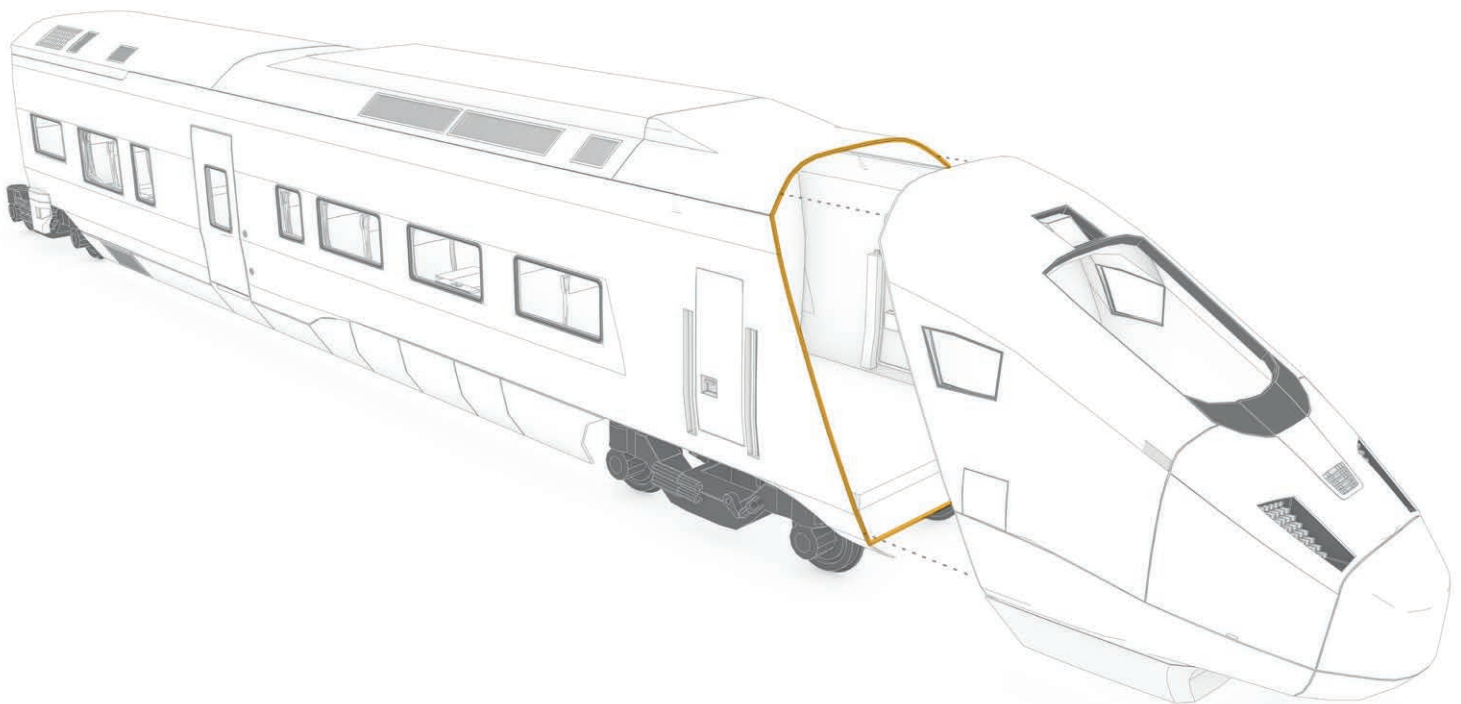


# SETTING NEW STANDARDS

## SikaPower®-1200 SERIES

The longevity and integrity of a rail vehicle is crucial to its long-term durability. A robust bonding system with exceptional impact resistance to withstand the dynamic stresses occurring during operations is important. The new Sika epoxy toughening technology SmartCore enables a new generation of epoxy adhesives which fulfil these requirements. It utilizes a core ingredient dispersed in the epoxy matrix during the curing process of the adhesive to create a uniquely high level of toughness.

Over the course of modern epoxy history, the improvement of the toughness has been aspired by many manufacturers. So far, the toughening performance strongly correlated with E-modulus displaying mechanical strength. By increasing the impact resistance usually, compromises in mechanical strength had to be made resulting in so called optimized epoxy adhesives. This is no longer the case with SmartCore toughening technology. SikaPower® epoxy adhesive toughened by SmartCore display superior toughness by retaining extremely high mechanical strength.



**Unmatched impact resistance of SikaPower®-1277**

Solely comparing the impact resistance of the available SikaPower®-1277 with competitive products mostly used in the market, Sika clearly provides a significant added performance to its customers. Crack propagation becomes a secondary issue as SmartCore increases the durability and load bearing capacity.

**BENEFITS**

- Exceptional energy absorption capacity
- Excellent crack resistance
- Exceptional fatigue performance
- Improved elongation at break
- Unmatched impact resistance



**PRODUCT SOLUTIONS – SikaPower®-1200 / SikaPower®-1277**

Description	High strength epoxy systems with excellent impact resistance, suitable for metal and composite bonding
Properties	<ul style="list-style-type: none"> <li>■ Superior fatigue properties</li> <li>■ High resistance against crack initiation and propagation</li> <li>■ Excellent non-sag properties</li> <li>■ Accelerated curing and higher mechanical strength with heat</li> <li>■ Good adhesion to FRP (Fiber Reinforced Plastic)</li> </ul>
Fire and Smoke properties DIN EN 45545-2	<ul style="list-style-type: none"> <li>■ R1 / HL 3</li> <li>■ R7 / HL 3</li> </ul>

# FLAME RETARDANT SEALANTS

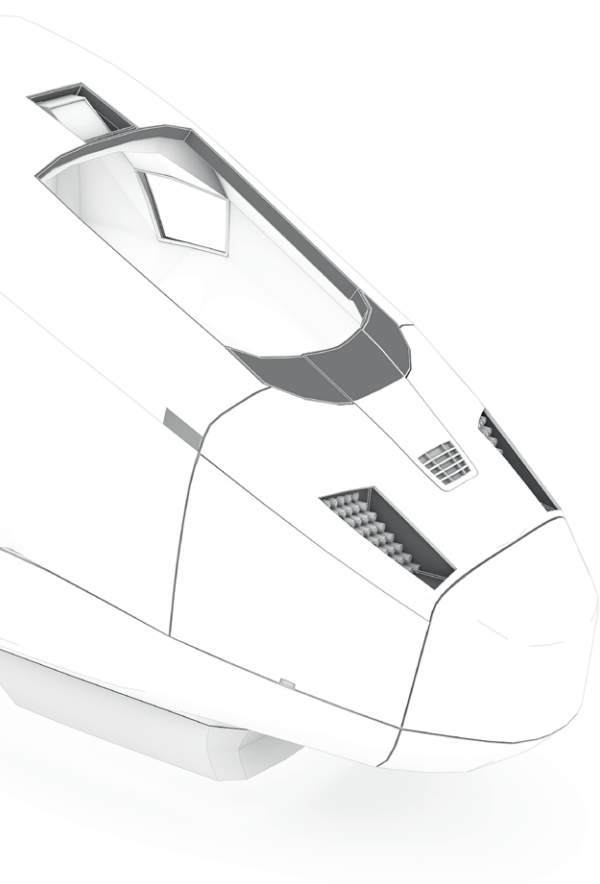
## Sikaflex®-821 FR



With their easy to use one-component formulation, Sikaflex® polyurethane adhesives finish interior components with a high performance elastic seal. Sikaflex® hybrid technology combines the performance of traditional Sikaflex® polyurethane systems, but shows additional characteristics such as reduced substrate surface preparation.

### WHY USE INTERIOR SEALING AND FIRE RESISTANCE PRODUCTS?

- Improved acoustic environment
- Compliance with international fire standards
- Watertight seals ensure protection of vital electronic and safety equipment
- More efficient air conditioning and heating



## Sikaflex®-821 FR

Sikaflex®-821 FR is a fire retardant sealant designed for applications in the rail (OEM and OES) market. This one-component PUR adhesive is curing by humidity and has very good mechanical properties as well as very good application properties.

### BENEFITS

- Resistance to ageing and an excellent hydrolysis stability makes this adhesive a high-class product for interior sealing applications in rail, where high requirements to fire protection are requested.
- High levels of aesthetic finish achievable.
- Permanent elastic seals maintain the integrity of a rail vehicle interior.
- High levels of fire resistance can be achieved.
- Easy to handle because the Sikaflex®-821 FR bonds very well to a wide variety of substrates and it has very good non-sagging properties.

### FIRE AND SMOKE PROPERTIES ACCORDING DIN EN 45545-2

- R1 / HL 2
- R22 / HL 2
- R23 / HL 2

#### PHYSICAL DATA – Sikaflex®-821 FR (approx. values)

Colour	grey, black
Skin Time	min. 60
Shore hardness	- A 45
Tensile strength	2 MPa
Elongation at break	250%
Tear propagation resistance	9 N/mm
Tensile shear-strength	1.8 MPa
Service Temperature	-50 to 70°C

# FLAME RETARDANT DIELECTRIC SYSTEMS RE 12531, RE 12461

Our high tech resin formulations satisfy the requirements of potting, encapsulation and casting applications in numerous industries, especially in the railway sector. Resins for capacitors, relays, transformers, sensors, electronic boards, coils, electronic devices and filters are part of the high tech encapsulation and potting resins of SikaAxson. They offer also high chemical and mechanical properties. Within the railway industry the potting resins are used for applications with high temperature requirements as well as for thermal shock resistant and flame retardant parts.



## RE 12531

RE 12531 is a semi-rigid, two component polyurethane resin with high temperature resistance, which is used for the potting and encapsulation of electrical applications with low and medium voltage like small transformers, electronic cards, relays as well as electronic filters.

### BENEFITS

- With an RTI of 150° C this material is the solution of choice, when high temperature requirements have to be fulfilled.
- Solvent free and RoHS compliant material improves handling properties.
- Low viscosity allows a good flowability and an easy processing.
- Further flame retardancy tests guarantee quality and safety: UL94 V0 on 3 mm thickness / HAI-HWI.

### FIRE AND SMOKE PROPERTIES ACCORDING DIN EN 45545-2

- R22 / HL 2
- R23 / HL 3
- R24 / HL 3

#### PHYSICAL DATA AND DIELECTRIC PROPERTIES - RE 12531 (APPROX. VALUES)\*

RE 12531 (A)		with hardener RE 1020 (B)
Colour		black
Shore hardness	ISO 868	D 53
Tensile strength	ISO 37	5 MPa
Elongation at break	ISO 37	50%
Tear strength	ISO 34	12 kN/m
Thermal conductivity	ISO 2582	0.73 W/m.K
Relative temperature index (RTI)	UL 746B	150°C
Dielectric strength (50 Hz- 1 mm)	CEI 60243-1 E2	22 kV/mm

\* average values obtained on standard specimens / Hardening 16 hours at 80°C



## RE 12461

RE 12461 is a semi-rigid, two component polyurethane resin, which is used for the potting of mechanical and numerous electrical applications especially for low or medium voltage when requiring self-extinguishing characteristics. Because of its self-extinguishing properties and high performance characteristics, RE 12461 is used for capacitors, transformers, electronic cards and components with UL 94 V0 qualification.

### BENEFITS

- Good chemical resistance against different engine fluids (e.g. oil, cooling medium).
- High performance characteristics increase the quality of the final product.
- Halogen and solvent free material improves handling properties.
- Low viscosity allows a good flowability and an easy processing.
- Several reactivities for more flexibility.
- Further flame retardancy tests guarantee quality and safety: UL94 V0 / HAI-HWI.

### FIRE AND SMOKE PROPERTIES ACCORDING DIN EN 45545-2

- R22 / HL 1
- R23 / HL 2
- R24 / HL 3



#### PHYSICAL DATA AND DIELECTRIC PROPERTIES - RE 12461 (APPROX. VALUES)\*

RE 12461 (A)		with hardener RE 1010 (B)
Colour		white, red, grey, black
Shore hardness	ISO 868	D 46
Tensile strength	ISO 37	7 MPa
Elongation at break	ISO 37	110%
Thermal conductivity	ISO 2582	0.7 W/m.K
Dielectric strength (50 Hz- 1 mm)	CEI 60243-1 E2	25 kV/mm

\* average values obtained on standard specimens / Hardening 16 hours at 80°C

# FLAME RETARDANT RAPID PRODUCTION SYSTEMS Biresin® RG57 FR

In the railway industry particularly lightweight design as well as product differentiation and equipment variation has been increasing for years. The result is an increasing variety of models and decreasing quantities of components and parts required.

The RIM (reaction injection moulding) technology is predestinated to produce parts from small to medium series. Therefore, this process fits perfectly to achieve the required numbers in the railway industry instead of thermoplastic injection moulding processes, which are mainly suitable for large series production.

The PUR resins, which are used for the RIM process, can simulate and substitute materials like rubber, polyethylene, polypropylene, ABS, PVC and others. Additionally the PUR resins have also better flowing properties compared to thermoplastic resins due to their lower viscosity and can achieve greater flow paths at the same wall thickness.



Handlamp housing made of Biresin® RG57 FR

## RIM PROCESS CHARACTERISTICS

- For production of single parts until serial production
- For small parts (< 100 cm<sup>3</sup>) to large volume parts (appr. 20 dm<sup>3</sup>)
- Low cost short run production
- Very low tooling costs compared to a thermoplastic injection moulding process
- Can be suitable for low or high volume production
- Flexibility of engineering design and styling
- Inserts and metal reinforcement may be moulded into a component

## BENEFITS

- Fast curing with good flowability and a short demoulding time allow a fast realization of cost effective prototypes up to small series with defined material properties.
- More safety due to a high dimensional stability and a resulting reproduction accuracy.
- High durability due to a high impact strength.
- Introduction of innovative railway parts due to certified products with outstanding performances.
- Further flame retardancy tests guarantee quality and safety: DIN 75200, ISO 3795 - Vehicle Safety; UL94 V-0 - Flame resistance.



## Biresin® RG57 FR

Biresin® RG57 FR is a rigid, two component polyurethane system to produce stiff housings and coverings, thin walled mouldings with complex structure and flame retardant parts.

## FIRE AND SMOKE PROPERTIES ACCORDING DIN EN 45545-2

- R3 / HL 3
- R22 / HL 2
- R23 / HL 3

### PHYSICAL DATA - Biresin® RG57 FR (APPROX. VALUES)\*

Biresin® RG57 FR (A)		with hardener Biresin® U5 (B)
Colour		black, beige
Potlife, RT		~ 55 s
Demoulding time RT, dep. on thickness		> 10 min
Curing time, RT		~ 1 d
Shore hardness	ISO 868	D 80
E-Modulus	ISO 178	2.350 MPa
Flexural strength	ISO 178	70 MPa
Tensile strength	ISO 527	38 MPa
Elongation at break	ISO 527	4%
Impact resistance	ISO 179	20 kJ/m <sup>2</sup>
Heat distortion temperature	ISO 75B	90°C

\* processing in AL tool at 60°C

# FLAME RETARDANT EDGE CASTING SYSTEMS Biresin<sup>®</sup> KL-100 FR

SikaAxson provides a high-class PUR casting technology, which enables to create various edge profiles (e.g. table edges) and detailed structures of vehicle components. Those edge casting systems offer a high wear resistance, impact resistance as well as a very good compressive strength. Depending on the mould the construction of small profiles of only a few millimeters wall thickness or tough profiles for supporting functional elements are possible to realize.

## BENEFITS

- High durability due to a high UV stability, a high chemical resistance and a high impact resistance which protects against vandalism.
- Easy application and optimal processing times due to a good flowability and a good balance between potlife and demoulding time.
- More freedom and flexibility due to the opportunity of an additional pigmentation with PUR colour pastes.
- Realisation of new applications in the railway industry.





Table in railway made of Biresin® KL-100 FR

## Biresin® KL-100 FR

Biresin® KL-100 FR is a flame retardant polyurethane casting compound for the manufacturing of lightfast decorative elements and safety edges in the furniture industry.

## FIRE AND SMOKE PROPERTIES ACCORDING DIN EN 45545-2

- R3 / HL 2

### PHYSICAL DATA - Biresin® KL-100 FR (APPROX. VALUES)

Biresin® KL-100 FR (A)		with hardener Biresin® KL-100 (B)
Colour		light beige
Viscosity, 25°C (A-component)	DIN 53019	6,500 ± 700 mPas
Viscosity, 25°C (B-component)	DIN 53019	1,100 ± 200 mPas
Potlife, 20°C		140 ± 15 s
Curing time, 20°C		2 - 3 s
Shore hardness	ISO 868	D 75
E-Modulus	ISO 178	750 MPa
Flexural strength	ISO 178	18 MPa
Tensile strength	ISO 527	15 MPa
Elongation at break	ISO 527	15%

# COATINGS FOR FIRE PROTECTION

## Sikagard<sup>®</sup>-6682 FR

PASSENGER COMFORT AND SAFETY for rail vehicles is of highest importance. Passengers demand a smooth and calm journey. The fleet operators request longevity of the rail vehicles and therefore robust and long lasting underbody protection is a must. In order to comply with fire regulation the coatings must fulfil those norms accordingly.

Sikagard<sup>®</sup>-6682 FR does not only show excellent stone chip protection, it also can be used to improve the acoustic performance to damp interior or exterior noise. It not only shows excellent sound deadening behavior but as well best in class stone chip resistance together with phenomenal working characteristics. Last but not least, it exhibits excellent adhesion on many coatings and primers used in the transportation industry.



## BENEFITS

- Underbody coating with sound-deadening properties
- Interior and exterior application on vehicles in transportation
- Highly filled dispersion based on Styrene-Acrylics
- Tough-elastic coating for good anti-chip performance
- Drying at ambient conditions
- Good adhesion on aluminum, galvanized steel, phenolic coated wood and E-coat
- Airless spray application



### PRODUCT SOLUTIONS – Sikagard®-6682 FR

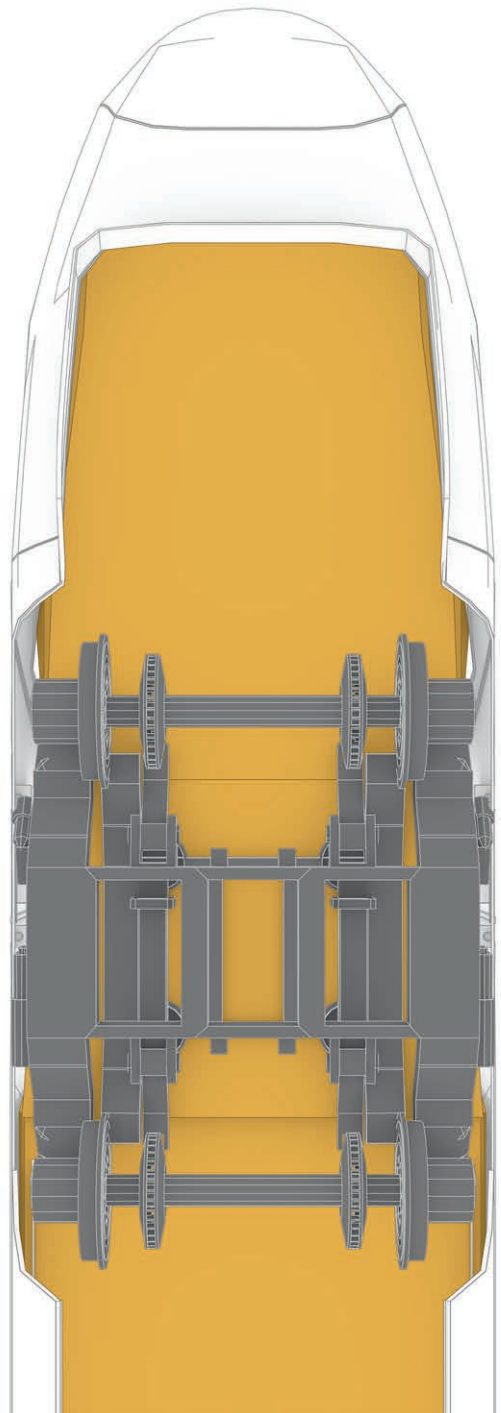
Description	Water-based spreadable and sprayable sound deadening and anti-chip coating, based on an acrylic dispersion.
Properties	<ul style="list-style-type: none"> <li>■ Excellent acoustic properties</li> <li>■ High resistance to abrasion</li> <li>■ Good sag resistance, no dripping</li> <li>■ Adhesion to e-coats, various primers and paints, metallic and wooden substrates</li> <li>■ Low water take-up</li> <li>■ Easy to apply by spray or spatula</li> </ul>
Fire and Smoke properties DIN EN 45545-2	<ul style="list-style-type: none"> <li>■ R1 / HL 2</li> <li>■ R7 / HL 2</li> </ul>

# COATINGS FOR FIRE PROTECTION

## Sikagard®-831

Rail manufacturers and operators as well as governmental bodies treat safety concerns as an absolute number one. Passenger must be transported with a minimal risk and it is not without reason that the rail sector is one of the safest mode of transportation. Many active and passive safety features are built into a train. Sika offers solution to improve the safety of rail vehicles, so once an accident happens passenger can be evacuated with sufficient time.

Sikagard®-831 is a 2-component epoxy system with excellent weather-resistance and handles substantial mechanical and chemical strains, which promises major benefits for the production process and the fabricator applying it. This intumescent fire protection coating is mainly used on metal substrates. The system prevents the fire spreading and builds an insulation layer by foaming and forming a carbonic char. In addition to its intumescent function, it provides excellent abrasion resistance and corrosion protection.







## BENEFITS

- 100% total solid state, wet film thickness = dry film thickness
- Solvent free, maximum build two pack modified epoxy fire protection coating for metal components in interior and exterior areas
- Increases the fire resistance rating for interior and exterior parts
- In case of a fire an isolating layer is formed which reduces heat transfer and the spread of fire

### PRODUCT SOLUTIONS - Sikagard®-831

Description	Solvent-free, modified epoxy based intumescent fire protection coating for internally or externally exposed aluminum or steel surfaces.
Properties	<ul style="list-style-type: none"> <li>■ High mechanical impact, shock and abrasion resistance</li> <li>■ Shortest application and drying time</li> <li>■ Excellent corrosion protection performance</li> <li>■ Applicable with or without primer</li> <li>■ Applicable without top coat in interior and exterior areas</li> </ul>
Fire and Smoke properties DIN EN 45545-2	<ul style="list-style-type: none"> <li>■ R1 / HL 3</li> <li>■ R7 / HL 3</li> <li>■ ASTM E 662</li> <li>■ ASTM E 162</li> </ul>

# SERVICE AND SUPPORT

Sika is dedicated to providing and maintaining the highest quality standards with its products and services. Therefore, local presence with global reach and dedicated sales teams supported by world class technical service and engineering support is of very high importance to Sika.



The global and local organizations are dedicated to provide customers with innovative solutions, experience and knowledge. Our teams help from the idea through to the design stage and until completion of projects with:

- Organization and project-specific material and durability tests performed by qualified laboratories
- Supplying technical documentation to support design, simulation and manufacturing processes in order to achieve high quality
- Helping determine the best fit for production setups by building up similar production processes in-house
- Supporting customers independently with evaluation and setup of equipment such as pumps and dosing units, all the way up to fully automated cells
- Providing tailored customer application trainings, audits and seminars

## **RESEARCH AND DEVELOPMENT (R&D)**

With about 70 patent applications every year, Sika is one of the most innovative companies in Switzerland. 20 global technology centers are the backbone of product development. This footprint offers access to a worldwide network of partners, suppliers and scientist to guarantee customer oriented solutions.

## **SUSTAINABILITY IMPACT ON TRANSPORTATION BUSINESS**

- Energy-saving products
- Reduced material consumption
- Considerable weight savings
- Durable and long lasting systems
- EH&S friendlier solutions

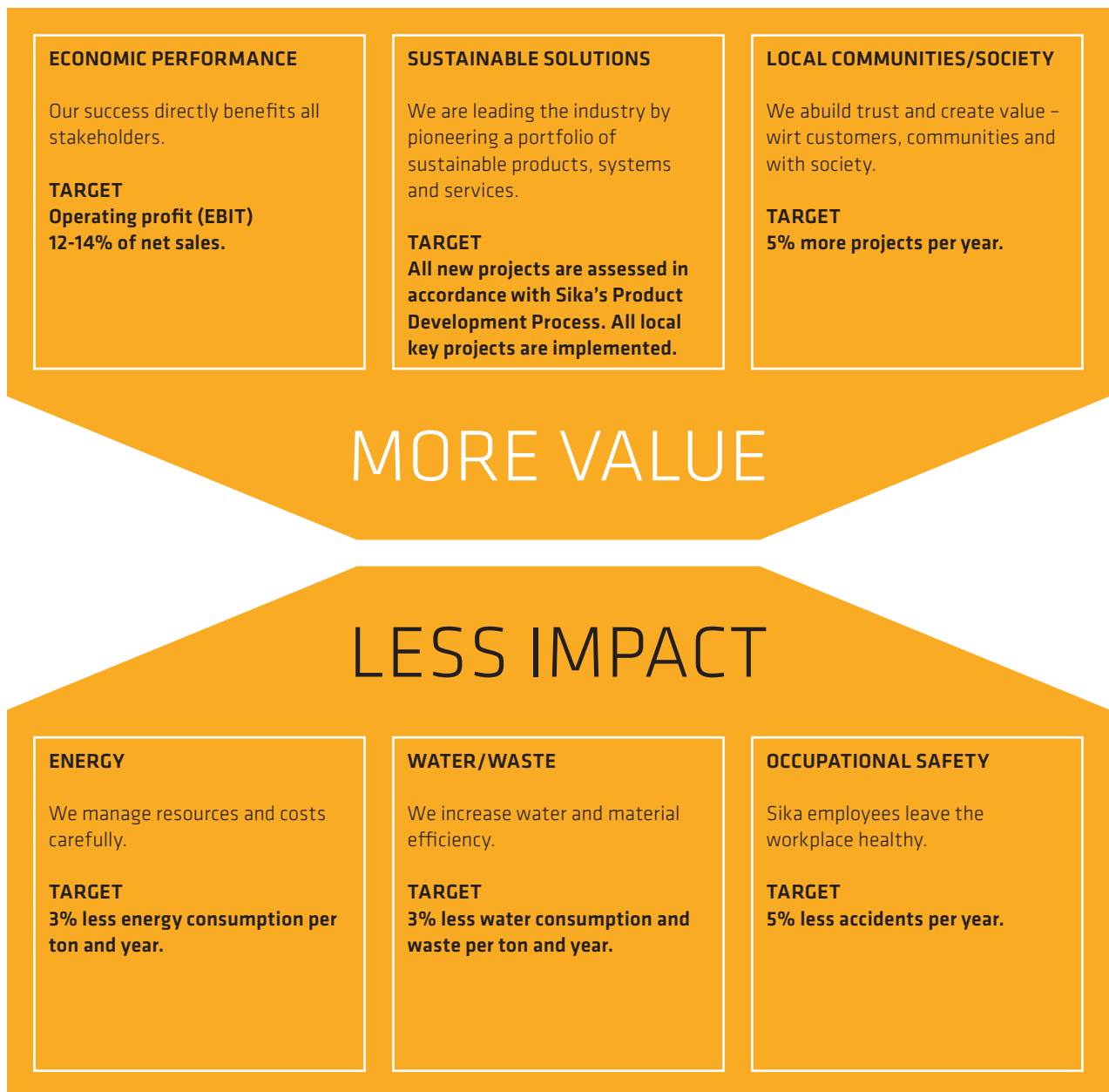
# SUSTAINABILITY AT SIKA

## Why we do what we do

Sika is dedicated to sustainable development, assuming responsibility to provide sustainable solutions in order to improve material, water and energy efficiency in construction and transportation. Sika strives to create value for all its stakeholders with its products, systems and solutions along the whole supply chain and throughout the life span of its products.

## Sika Sustainability Targets

Sika defines six target indicators with the largest potential effect. They cover the economic, environmental and social dimensions of Sika's business.



# GLOBAL BUT LOCAL PARTNERSHIP



## FOR MORE INFORMATION:



[www.sika.com/transportation](http://www.sika.com/transportation)

### WHO WE ARE

Sika AG, Switzerland, is a globally active specialty chemicals company. Sika supplies the building and construction industry as well as manufacturing industries (automotive, bus, truck, rail, solar and wind power plants, facades). Sika is a leader in processing materials used in sealing, bonding, damping, reinforcing and protecting loadbearing structures. Sika's product lines feature high quality concrete admixtures, specialty mortars, sealants and adhesives, damping and reinforcing materials, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.

Our most current General Sales Conditions shall apply.  
Please consult the Data Sheet prior to any use and processing.



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