



adhesives & sealants

Sabatack® MS Polymer adhesives & sealants for the rail industry

Values for construction and
verification according to DIN 6701-3



a strong bond



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SABA

The name SABA has stood for high-quality products for bonding, sealing and coating for more than 85 years. We are a Dutch manufacturer that unites Research & Development with manufacturing and marketing, all under a single roof.

Our tightly organised international network supports us, helping us to rapidly recognise our customers' requirements and allowing them to influence new product development.

What is Sabatack®?

The Sabatack® range consists of one-component and boosted, moisture-curing, elastic adhesives and sealants. These are used for production and repair in the metalworking and plastics industries.

Sabatack® has a MS Polymer base and as a result demonstrates many advantages over other products commonly found on the market. Sabatack® adheres superbly to metals and plastics, is UV-stable, does not blister and can be overpainted wet-on-wet. Without forgetting that Sabatack® does not contain solvents or isocyanates.

Laboratory and production

Our laboratory is where our high-tech products are invented and then developed. Tests on adhesion, strength and compatibility are carried out regularly. This can also be done on request from the customer. Our production department is certified to a high standard of quality and is involved in the manufacture of all SABA products.

Service

Service is a key component of our market approach. Our Application Team provides on-site support for our customers in the form of training courses, processing hints and demonstrations of the latest application techniques.

Visit our website
www.saba-adhesives.com

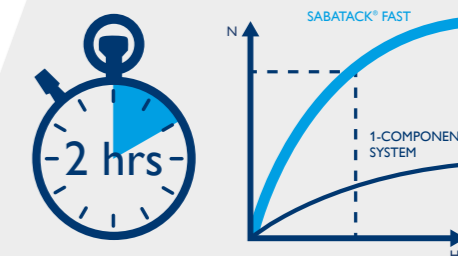


Sabatack® products for a broad range of applications



EN 45545-2,
R22 + R23
HAZARD
LEVEL 1,2+3

Sabatack® products for a broad range of applications



Sabatack® 750 & Sabatack® 750 XL

Bonding & sealing
XL: extended skin time

Principal application

Bonding with easy application and high tensile strength

Secondary application

Sealing seams, overlaps and joints

Characteristics

Medium viscosity and high modulus of elasticity

Data

Tensile strength	3,6 N/mm ²
Hardness Shore A	55
Elasticity	240%



Sabatack® 755 HL3

Bonding and sealing with
EN 45545-2, R22 + R23
Hazard Level 1, 2 + 3

Principal application

Bonding with easy application and high tensile strength

Secondary application

Sealing seams, overlaps and joints

Characteristics

Medium viscosity and high modulus of elasticity

Data

Tensile strength	3,0 N/mm ²
Hardness Shore A	60
Elasticity	180%



Sabatack® 760 XXL & Sabatack® 760 XL^{HT}

Window adhesive
XXL: extra extended skin time
XL^{HT}: extended skin time, high tack

Principal application

Bonding windows with high green strength (stability) and longer open time

Secondary application

Sealing windows

Characteristics

Very high viscosity and high modulus of elasticity, extended skin time

Data

Tensile strength	3,7 N/mm ²
Hardness Shore A	60
Elasticity	280%



Sabatack® Fast

Super fast bonding

Application

Bonding with rapid hardening, handling already after 2 hours

Ideal for series production, cycles can be reduced from 10 hours (one-component system) to 2 hours

Characteristics

Two components, medium viscosity and high modulus of elasticity

Data

Tensile strength	2,8 N/mm ²
Hardness Shore A	50
Elasticity	140%



Overview selection criteria adhesive according to DIN 6701-3¹

The following tables briefly summarise the main parameters of the Sabatack® range. These will be useful for making the right choice of adhesive or sealant according to DIN 6701-3 appendix C.

More background information about the less common parameters is available on the following pages.

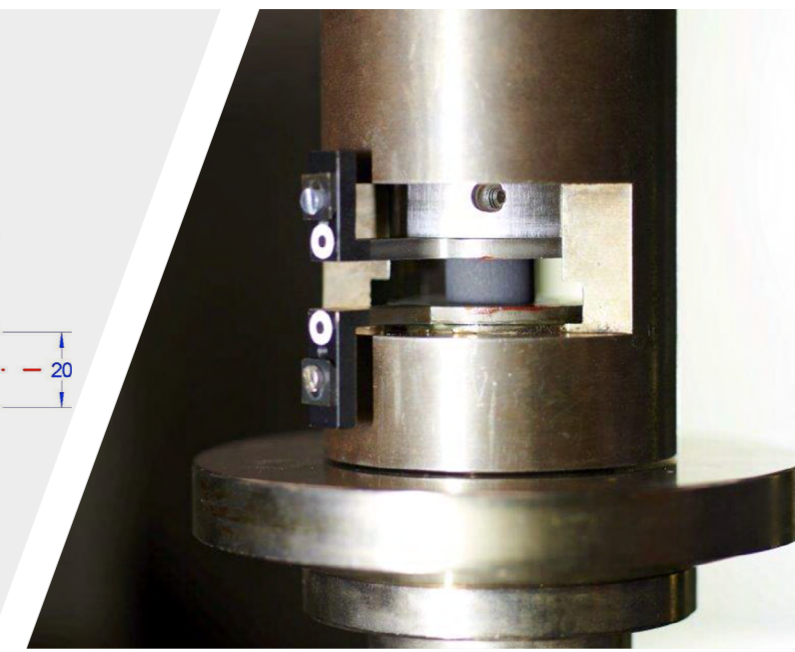
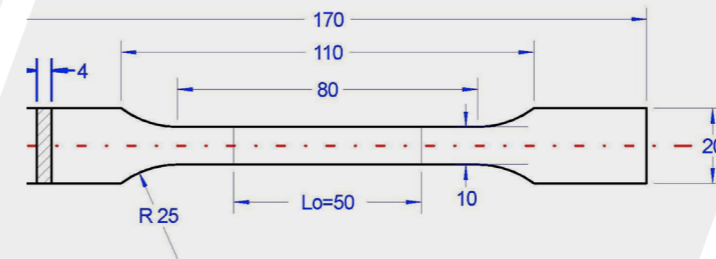
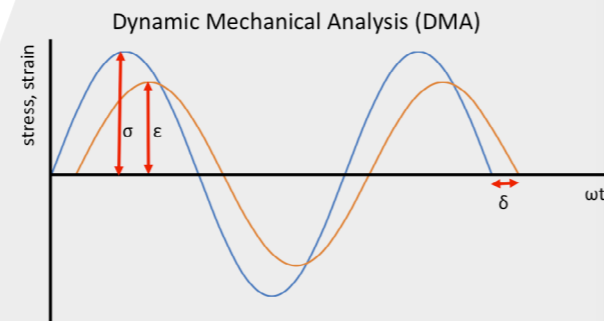
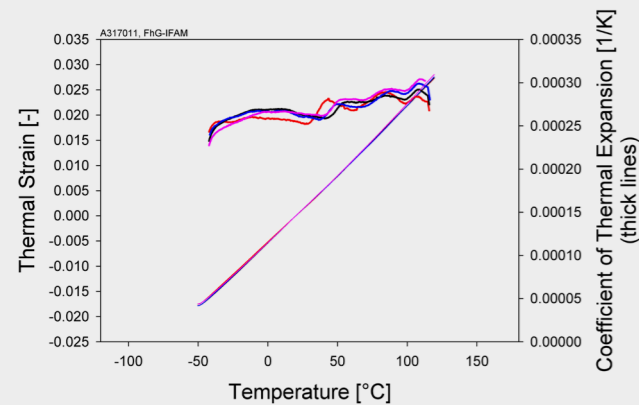
1.1. Kind of chemistry (C-series)		
No.	Description	Value
C-1	Chemical basis	MS polymer
C-2	Kind of curing	Condensation curing
C-3	Volatile Organic Compounds (VOC)	None in the Sabatack® range, except Sabatack® 710
C-4	Toxic properties	There are no warning or hazard labels on Sabatack®, because of its safe composition. For detailed information, see Safety Data Sheets (SDS).
C-5	pH value	Not applicable for non water-based products

1.2. Mechanical and physical properties (M-series)		
No.	Description	Value
M-1	Density in uncured state	See Product Data Sheet (PDS)
M-2	Density of cured material	Available on request
M-3	Colour and overpaintability	Very easy to overpaint using the commonly used paints in rolling stock and available in every desired colour
M-4	-	None in the norm
M-5	Volume change due to shrinkage	< 3%, see PDS
M-6	Thermal Expansion Coefficient	See page 08 for more detailed information
M-7	Glass Transition Temperature (T _g)	See page 08 for more detailed information
M-8	Shore-A hardness	See PDS
M-9	Tensile Tests, tensile strength, elongation, Poisson ratio, Young's modulus (σ , ϵ , μ , E)	See page 09 for more detailed information
M-10	Compression Test (σ , ϵ , E)	See page 09 for more detailed information
M-11	Lap-shear (T, γ , G), lap shear strength, G-modulus	See page 10 for more detailed information
M-12	Creep Deformation	See page 10 for more detailed information
M-13	Relaxation test	See page 11 for more detailed information
M-14	Fatigue	See page 11 for more detailed information
M-15	Mechanical properties at high speed (e.g. crash or impact)	Not determined

1.3. Physical properties (P-series)		
No.	Description	Value
P-1	Specific Electrical Resistivity	Available on request
P-2	Thermal conductivity	Available on request
P-3	Chemical-cleaning agents resistance	See page 12 for more detailed information
P-4	UV-weather resistance	See page 13 for more detailed information
P-5	Microbiological resistance	Not determined
P-6	Abrasion resistance	Not determined
P-7	Fire behaviour	See page 5 for products which meet the EN 45545

1.4. Technical Process parameters		
No.	Description	Value
T-1	Rheological parameters	Available on request
T-2	Packaging and Application tools	Available on request
T-3	Application parameters (P, T, etc.)	Available on request
T-4	Influence T, humidity, etc.	Available on request
T-5	Green strength, strength in time, etc.	Available on request
T-6	Process stability	Available on request
T-7	Repair capability	Available on request
T-8	Surface of the components	Customer responsibility
T-9	Dimensional stability of the components	Customer responsibility
T-10	Shelf life	See PDS
T-11	Required occupational safety measures	See SDS

¹ DIN 6701-3 Kleben von Schienenfahrzeugen und fahrzeugteilen – Teil 3: Leitfaden zur Konstruktion und Nachweis Führung von Klebverbindungen im Schienenfahrzeugbau; Anhang 3; Dezember 2015



M6: Coefficient of Thermal Expansion [CTE, α]²

Description:

Thermal expansion is the tendency of matter to change in shape, area and volume in response to a change in temperature³.

Some examples of materials which are frequently used in rolling stock:

- Steel: $\alpha = 12 \cdot 10^{-6}$ 1/K
- alu: $\alpha = 23 \cdot 10^{-6}$ 1/K
- GRP: $\alpha = 30 \cdot 10^{-6}$ 1/K
- PP: $\alpha = 150 \cdot 10^{-6}$ 1/K
- Silicon: $\alpha = 250 \cdot 10^{-6}$ 1/K

The CTE is determined by Thermal Mechanical Analysis (TMA): the dimensional change in a sample as a function of temperature from -50°C to +120°C.

Used for:

This provides an estimate of residual stress and can affect the dimensioning of the bonded joints⁴.

M7: Glass Transition Temperature [T_g]⁵

Description:

The glass transition is the reversible transition in amorphous materials from a hard and relatively brittle „glassy“ state into a viscous or rubbery state as the temperature increases⁶.

Hard plastics like polystyrene and poly(methyl methacrylate) are used well below their glass transition temperatures, i.e. in their glassy state. Their T_g values are well above room temperature, both at around 100°C.

Some examples of the T_g of commonly used plastics:

- Polypropylene (PP): $T_g = -20^\circ\text{C}$
- Polyvinylchloride (PVC): $T_g = 80^\circ\text{C}$
- Polystyrene: $T_g = 95^\circ\text{C}$
- Polycarbonate: $T_g = 145^\circ\text{C}$

Elastic MS based adhesives are used during their service life above their T_g , i.e. in the rubbery state, where they are soft and flexible.

Dynamic Mechanical Analysis (DMA) in tensile vibration are performed to determine the T_g over a temperature range from -100°C to +120°C.

Used for:

The T_g provides an estimation of the lowest operating temperature during service life and can affect the dimensioning of the bond.

M9: Tensile Tests [σ , ϵ , μ , E]⁷

Description:

Tensile testing is a fundamental materials science and engineering test in which a sample is subjected to controlled tension until failure.

Properties that are directly measured via a tensile test are ultimate tensile strength, breaking strength, maximum elongation, etc.

From these measurements, the following properties can also be determined: Young's modulus and Poisson's ratio.

The tensile test is performed over a temperature range from -35°C to +70°C.

Used for:

Dimensioning of the bonds.

M10: Compression Test [σ , ϵ , E]⁸

Description:

A compression test determines the behaviour of materials under a crushing load. The specimen is compressed and deformation at various loads is recorded. Compressive stress and strain are calculated.

Used for:

Basic mechanical data and parameters for hyperelastic material models of the adhesives. The data are necessary for the calculation and dimensioning and also allow the use of the finite element method. The compression test is performed over a temperature range from -35°C to +70°C.

² Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 3-4/88

³ https://en.wikipedia.org/wiki/Thermal_expansion

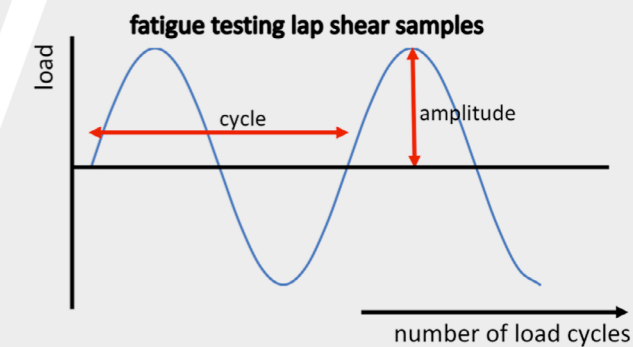
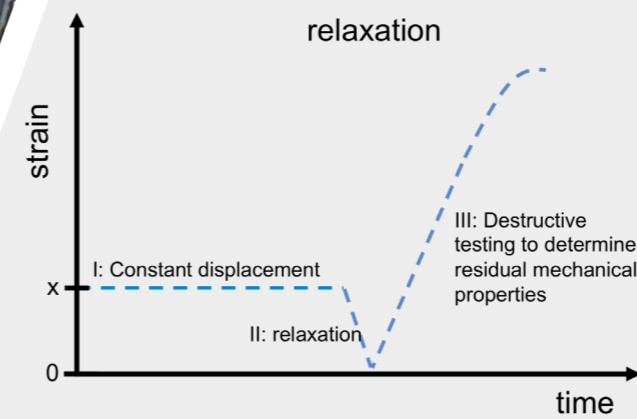
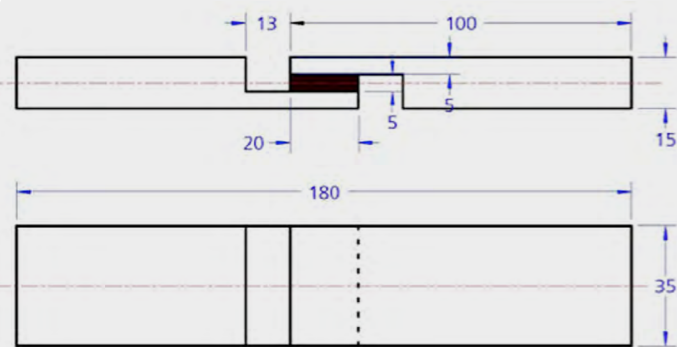
⁴ DIN 6701-3, December 2015

⁵ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 5-7/88

⁶ https://en.wikipedia.org/wiki/Glass_transition

⁷ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 8-27/88

⁸ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 28-35/88



M11: Lap-shear (τ , γ , G)⁹

Description:

Lap Shear determines the shear strength of adhesives for bonding materials when tested on a single-lap-joint specimen. The test is applicable for determining adhesive strengths, surface preparation parameters and adhesive environmental durability. This is determined over a temperature range from -35°C to +70°C.

Used for:

Basic data used for calculating bond strength.

M12: Creep Deformation (J, τ)¹⁰

Description:

Creep is the tendency of a solid material (polymer, metal, glass, etc.) to move slowly or deform permanently under the influence of mechanical stresses. It can occur as a result of long-term exposure to relatively low levels of stress.

In order to study the creep behaviour, lap shear were loaded with weights ($\sigma = \text{constant}$), the so-called retardant test. The applied load yields nominal shear stress acting on the samples for the duration (90 days) of measurement or until failure of samples.

Used for:

Basic data for measuring stress in relation with creep (constant load) and must be considered during the design and dimensioning of bonded components.

M13: Relaxation (γ , τ_{res})¹¹

Description:

Stress relaxation is the observed decrease in stress in response to the same amount of strain generated in the structure.

Relaxation tests were done with a constant displacement applied to lap shear samples over a certain time. It was evaluated whether cracks had been initiated in the positions of high stress concentration which can be found at the 90° edges between the adhesive and the aluminium.

Used for:

Stress in relation with creep (constant load) and relaxation behaviour (constant displacement) are basic requirements for accurate predictions.

M14: Fatigue (τ , n)

Page 77-85: IFAM report: WP-PB-MB-A317011-01-01, 2018-03-16

Description:

Fatigue is the effect of a material repeatedly exposed to applied loads. It is structural damage that occurs when a material is subjected to cyclic loading. The nominal maximum stress values that cause such damage may be much less than the ultimate lap shear strength limit.

The fatigue testing is performed with lap shear samples resulting in SN-Curve, which is a plot of the magnitude of alternating stress versus the number of cycles to failure, both displayed on logarithmic scales.

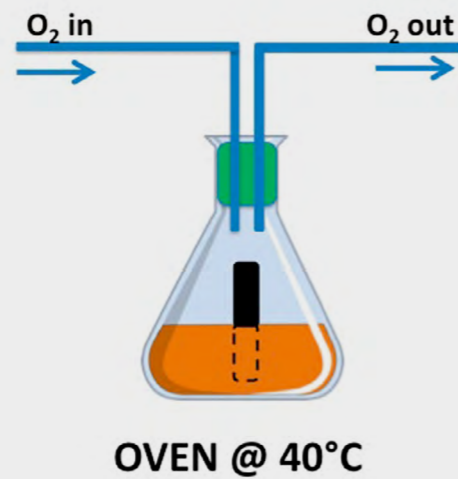
Used for:

Fatigue is a very important type of loading for many structural components that contain adhesive bonding systems and should fulfil a certain service life. Fatigue analysis and fatigue strength prediction are therefore very important, especially in the case of high (safety) demands of the bonded parts.

⁹ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 36-61/88

¹⁰ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 62-67/88

¹¹ Fraunhofer Institute report: WP-PB-MB-A317011-01-01, Bremen, Dr. M. Brede & Dr.-Ing. O. Hesebeck, 2018-03-16, Pages 68-76/88



P3: Chemical-cleaning agents resistance

Description:

During service life, a rolling stock railway vehicle is frequently cleaned to remove all kind of materials like: dust, iron stains, brake dust, grease, oil, insects, graffiti, etc.

To remove these numerous different contaminations, many different specific types of cleaners are available and used worldwide.

The nature of these cleaners may be in a range from very acidic to alkaline in combination with all kinds of surface active substances, solvents, etc.

When a sealant or adhesive is exposed to these cleaning agents, in combination with mechanical exposure of cleaning brushes, the properties should remain as unaffected as possible.

This means a limited decrease in strength, no black staining, no colour changes, no cracks, etc.

On a laboratory scale, we developed a new method using very heavy loads to perform accelerated testing with different cleaning agents in combination with our products.

Used for:

This laboratory method makes it possible to estimate the response to cleaning agents during the service life of a railway vehicle.



P4: UV-weather resistance

Description:

During its service life, a rolling stock railway vehicle is exposed to all kinds of weather like: high temperature, UV exposure by the sun, rain, dew, etc.

This can affect the quality of a material, resulting in cracks, discolouration, etc.

To simulate outdoor weathering, a QUV accelerated tester exposes materials to alternating cycles of UV light and moisture at controlled, elevated temperatures.

It simulates the effects of sunlight using special UV lamps and dew and rain with condensing humidity.

Used for:

QUV testing is used as an accelerated ageing test to simulate outdoor and indoor sun exposure to better understand the long-term effects.

No direct correlation can be made between accelerated weathering duration and actual outdoor exposure duration. However, performance comparisons under the controlled conditions of accelerated weathering can be compared.



Sabatack®

- ✓ No hazard labels
- ✓ No isocyanates
- ✓ No solvents

Environmental and health consciousness

Quality, working conditions and in particular environmental protection are integral aspects of SABA's business policy. SABA works continuously on improving its performance in these areas. SABA is certified in accordance with ISO 9001 and 14001 and is seeking future certification under ISO 26000 (Corporate Social Responsibility).

Production and development

When new products are developed, risks and improvements related to HSE (health, safety and the environment) throughout the entire lifecycle are considered. By choosing the right packaging materials, SABA reduces the environmental impact as far as possible.

We constantly continue to develop our products with the aim of minimising environmental impact. The Sabatack® product range is a particularly good example of this. Environmental considerations go still deeper at SABA, as the waste products created in the production process are recycled internally and externally as far as possible.



No hazard labels on packaging / no warnings

There are no warnings or hazard labels on Sabatack®, as a result of its safe composition.

No isocyanates

Sabatack® contains no isocyanates. Isocyanates are used as catalysts in a large number of common sealants and adhesives. Isocyanates are hazardous to health and the environment.

Products containing isocyanates have to be processed using breathing protection and special protective clothing.

Here too Sabatack® is once again setting new standards for protecting workers and the environment.

No solvents

Sabatack® does not contain solvents, which means that the product range is extremely safe for workers and kind to the environment overall. The products are virtually odourless.





adhesives & sealants

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