MARINE MANUAL
WORK INSTRUCTIONS FOR YACHT AND BOAT CONSTRUCTION

BUILDING TRUST

FOREWORD

Since the middle of the 17th century, when the Industrial Revolution began, joining technology in boats and ships has changed enormously in terms of methods and materials. At that time, it was still customary to manufacture watercraft using traditional methods such as nails, screws and, in subsequent years, welding and riveting. Today, we know the limits of these conventional joining techniques. Reactive adhesive, sealing and damping systems can now have a significant positive effect on the key production factors of time, weight, costs and functional reliability. Historically, no other technology in shipbuilding has developed as much over the decades as the sealing of deck joints. Originally, wool or cotton yarns were used in combination with bitumen materials. Today, the use of elastomers is the standard worldwide.

BONDING, SEALING, DAMPING

Elastic adhesives have gained popularity for all types of bonding and sealing applications thanks to their easy handling and excellent properties. The basic functions of adhesives and sealants are largely identical: they serve not only to join, but also to create watertight seals, dampen noise, insulate and protect against galvanic corrosion. In this way, they help to overcome the daily challenges in the maritime industry.

ABOUT THE MARINE HANDBOOK

This marine handbook is based on our many years of experience with elastic bonding technology and the use of materials that are exposed to the tough climatic requirements and extreme mechanical stresses in the marine sector. It is intended to convey basic knowledge, work procedures and general rules for handling and applying adhesive and sealing systems. Careful implementation of the work instructions described in this manual will result in high quality results and avoid difficulties. The individual work steps are simple, but exact adherence to them is of fundamental importance. For this reason, the relevant work instructions in this manual should be consulted before starting work. Correct application can create long-lasting, highly resilient adhesive joints. Specially developed for yacht and boat construction and for repair and expansion, products from the Sika Marine range offer you individual, field-proven system solutions for your various needs.

PROCESSING INSTRUCTIONS

Sika products must be stored and used in accordance with the applicable regulations and provisions for the handling of chemical products. It is the responsibility of our customers to ensure that the hazards that may arise from the use of our products are appropriately and sufficiently evaluated. When using, observe the hazard warnings and safety instructions on the container. Further information on safety, protective and first aid measures as well as disposal can be found in the corresponding product and safety data sheets.

IMPORTANT REMARKS

Our verbal and written technical recommendations, which we give to support the buyer or processor based on our experience in accordance with the current state of knowledge in science and practice to the best of our knowledge, are non-binding and do not constitute any contractual legal relationship or ancillary obligations from the sales contract. They do not release the buyer from the responsibility to test our products regarding their suitability for the intended use and to observe the property rights of third parties. In all other respects, our general terms and conditions apply. For further technical information and project-related advice, please contact the Industry division of Sika.

In addition, the product data sheets and safety data sheets available on request from Sika must be taken into account. These are regularly revised, which is why we strongly recommend that our customers only use the latest editions.

The latest version of the Marine Manual is considered valid as well. It is available on request from the Industry division of Sika.

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CONTENTS

01 GENERAL INSTRUCTIONS FOR USE

1.1 ADHESIVE-CONDUCIVE DESIGN

PRINCIPLES

Before designing an adhesive joint, a few basic questions need to be answered:

- Which materials are being bonded?
- What are the mechanical properties of the connecting parts?
- Which surfaces (raw, painted, powder-coated, anodized, etc.) are to be bonded?
- What surface pre-treatment is required?
- Which forces (continuous and peak values) will be transferred?
- How will the bonding be finished (polished, painted over, etc.)?
- What resistances (chemical, UV, thermal) are needed?

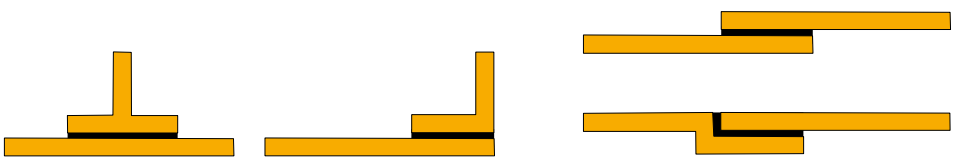
Sika Industry international subsidiaries support users of marine adhesive and sealant users, such as shipyards or shipbuilders, in designing adhesive joints.

Different forces can act on the adhesive joint:

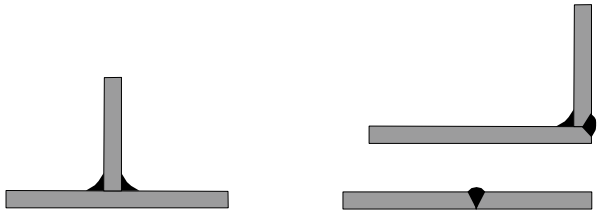
- Shear forces (displacement forces)
- Tensile forces
- Pressure (compressive forces)
- Torsion (torsional forces)
- Peeling forces

The strength of an adhesive joint depends on the strength and size of the surface, the internal strength of the adhesive and the stress distribution within the joint. A poorly designed joint can lead to stress peaks in the adhesive and the joining partners. This weakens the load-bearing capacity. A well-designed bond takes into account the practical application and the geometry of the joint. The correct design of the adhesive joint is a prerequisite for a durable connection. Peeling forces should always be avoided in the design, as these put an extremely high load on the bond.

ADHESIVE JOINTS using marine adhesives and sealants...



... represent a very effective alternative to mechanical joining methods:



CALCULATION OF BONDING SURFACE

The dimensioning of an adhesive layer mainly depends on the forces to be transferred and the mechanical strength of the substrates and adhesives.

A design based solely on the information in the product data sheets is not effective. Regardless of this, a number of other influencing factors must be taken into account for the practical design of the bonding: Temperature, type and frequency of stresses, ageing, etc.

For detailed calculation methods, please contact the Industry division of Sika. You can also find information on this in the current specialist literature (e.g. “Elastic Bonding: Technological Fundamentals and Guidelines for Economic Application”, Moderne Industrie Publishing).

In practice, an approximate rule of thumb applies: The tensile shear strength must be reduced to 3% of the value specified in the product data sheet.

EXAMPLE OF FORCE TRANSFER

To move a 200 kg body, you need **~ 2,000 N** (to be precise: 2,040 N). The value specified in the product data sheet for tensile shear strength is e.g. 2 MPa or **2 N/mm²**. The reduction factor is **3%**.

This means that only 3% of the strength value specified in the product data sheet is assumed for permanently secure adhesion of an object weighing 200 kg: **2 N/mm² × 0.03 = 0.06 N/mm²**.

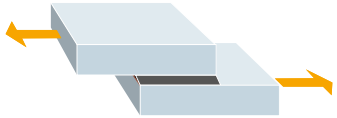
REQUIRED BONDING SURFACE:

2,000 N/0.06 N/MM²= 33,000 MM² = 330 CM²

Width of bonding surface: 15 mm or 1.5 cm
Length of bonding surface: 220 cm or 2.2 m

EXAMPLES OF ADHESIVE JOINTS

OVERLAPPING



Particularly preferred for low material thicknesses due to simple design and good strength. Good resistance to displacement.

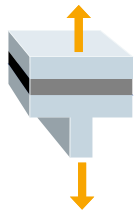
SCARFING

The inclined bonding surfaces increase the bonding surface, but are not well suited for elastic bonds.

BUTT JOINT

Good tensile or compressive strength, limited bonding surface.

T-PROFILE



Stiffening effect, reduces peeling forces.

BUTT JOINT, ENLARGED JOINT SURFACE

Enlargement of the joining surfaces to improve force transfer.

FLANGE

Reduces peeling forces, used during window installation.

1.2 SURFACE PRE-TREATMENT

INTRODUCTION

Correct pre-treatment is the most important prerequisite for the best possible adhesion between the adhesive and the substrate. The adhesive surfaces must always be free of dust and grease, dry and workable (free of non-stick parts such as paint residues, rust, scale, etc.). The correct pre-treatment results in a defined, adhesion-friendly surface with a high affinity for the adhesive. The correct pre-treatment steps always depend on the surface condition of the components to be bonded; often just one pre-treatment step is sufficient. Please refer to the Sika Marine pre-treatment table.

CLEANING

Dirty, non-porous surfaces can be cleaned with Sika® Remover-208. Depending on the type of soiling, Sika® Cleaner P or other suitable cleaning solutions can also be used. It is advisable to check surface compatibility.

Surfaces with oxide layers or other layers with low inherent strength must be sanded down to the base material.

HOW ACTIVATORS WORK AND HOW TO USE THEM

Activators are adhesive cleaners used for cleaning and activating bonding surfaces on non-porous materials. Activators leave adhesive adducts on the surfaces and thus ensure an adhesion-friendly bonding surface. Adhesive cleaners should only be used to activate the bonding surfaces, as the adhesive adducts leave visible traces. If the bonding surfaces are heavily soiled, cleaning agents such as Sika® Remover-208 or Sika® Cleaner P must be used before the activation step.

- Pre-treatment with the corresponding Sika® Aktivator simultaneously cleans and activates the surface. This can significantly improve adhesion on smooth, non-absorbent surfaces.
- Lint-free paper fleece must be used (no cloths or rags). Replace it regularly. To remove dirt properly, wipe in one direction rather than back and forth (wipe-on method).
- Do not use nitro thinners, silicone removers or spirits, as they will leave residues when drying.
- The activator must not be sprayed on or spread with a brush or roller; otherwise, it will not achieve its cleaning effect.
- Activators must not be used to remove adhesive residues. Sika® Remover-208, for example, is suitable for this.
- Transfer the required amount of activator into a separate container. Do not pour any leftover quantities back into the original can; dispose of them in accordance with the applicable regulations.
- The activator bottle must be closed immediately after use. This prevents the activator from reacting with moisture in the air. It also keeps dirt from getting into the can.
- If the activator looks cloudy or otherwise unusual, it is not suitable for use.
- Please observe the flash-off times specified in the product data sheet.

IMPORTANT: On absorbent substrates, do not use solvents or Sika® Aktivator for pre-treatment. Non-evaporated solvents interfere with the curing mechanism of adhesives and sealants. It must also be noted that alcohol prevents the adhesives and sealants from curing.

HOW PRIMERS WORK AND HOW TO USE THEM

Primers are undercoats or adhesive lacquers that must be used on some substrates to achieve good adhesion. Porous and rough surfaces often require the application of a primer. A primer is used to create an adhesion-friendly, well-defined bonding surface. Its film-forming properties firm and smooth the surface. The primer must be completely dry before bonding (minimum flash-off time). If too much time has elapsed between pre-treatment and application of the adhesive (maximum flash-off time), the surface must be reactivated. Our Sika® activators are suitable for this. The minimum and maximum flash-off times can be found in the product data sheets or in the notes in the Sika pre-treatment tables. The primed surfaces must be protected against all types of dust and dirt buildup until bonding finishes.

- Prime only the bonding surfaces of the materials to be bonded.
- Use the correct primer on the correct material surfaces.
- Some primers, such as black primer, must be shaken well before use.
- Pour the required amount of primer into a separate container. Do not pour any leftover quantities back into the original can; dispose of them in accordance with the applicable regulations.
- The primer can be applied with a brush, wool felt applicator or melamine foam, e.g. Sika® Cleaner PCA.
- The primer must be completely dry before bonding. Observe flash-off time.
- Close the primer can immediately after use to protect the primer from contamination and prevent it from reacting to the moisture in the air.

IMPORTANT: Make sure to store activators and primers at temperatures below 25°C. Once opened, they should be resealed immediately after use and used within three months of opening.

1. Outer and inner sealing cap
2. Close inner cap immediately after use
3. Shake
4. Outer and inner sealing cap
5. Close inner cap immediately after use

1.3 PREPARATION

PREPARATION AND PLANNING

Proper workflow preparation and planning ensures a smooth, efficient production process. Defining the materials and knowing the surface condition (raw, primed, painted, etc.) in advance will facilitate selection of suitable adhesive types and any necessary pre-treatment steps. Selecting adhesive-friendly materials/surfaces simplifies pre-treatment. When in doubt, preliminary adhesion and compatibility tests are advisable.

THE WORKPLACE

A clean, well-prepared workplace in a well-lit and well-ventilated location makes work easier and is essential for successful bonding. During use, ensure an ambient temperature not under +5°C and not over +35°C, ideally between +15°C and +25°C, and a relative humidity (RH) level of at least 30%. Separate the preparatory work area (general cleaning and sanding) from the primer application and bonding area. Have any necessary and appropriate tools and materials on hand for their associated work steps.

CHECKLIST FOR PREPARATION

- ☐ Clean workplace, stable worktop, marking pens and tape for marking the bonding surface
- ☐ Vacuum cleaner or oil-free compressed air
- ☐ Cleaning paper or lint-free, clean cloths
- ☐ A separate brush or felt applicator for each primer
- ☐ Tear-resistant, water-repellent, silicone-free smooth tape
- ☐ Protective gloves
- ☐ Adequate ventilation
- ☐ Observe ambient and substrate temperature restrictions
- ☐ Monitor the dew point. Make sure it is not too low, as this could lead to condensation forming on the bonding surfaces.

NOTES

EQUIPMENT AND MATERIAL CHECKLIST

- ☐ Proven handheld or air pressure gun or cordless gun (see Equipment technology and accessories)
- ☐ Cartridge opener or screwdriver for opening the cartridge
- ☐ Sharp knife for nozzle cutting
- ☐ Use elastic spacers to set the required adhesive layer thickness. The hardness should ideally correspond to the adhesive/sealant to be used (never apply spacers to the joining parts with instant adhesive)
- ☐ Tools for securing the parts to bemounted (clamps, weights, etc.)
- ☐ Spatula for removing larger quantities of residual adhesive
- ☐ Sika® Remover-208 for removing residual uncured adhesive from non-porous surfaces
- ☐ Sika® Tooling Agent N and levelling wood for smoothing Sikaflex® sealing joints
- ☐ Sika® HandWipes cleaning wipes

NOTES

1.4 Sikaflex® AND Sikasil® APPLICATION

INTRODUCTION

Sikaflex® and Sikasil® adhesives and sealants vary in viscosity from paintable, self-levelling liquids to highly viscous, resistant pastes and are selected according to the application and required functional properties. The products are available in cartridges, sausages, tubes, hobbocks and drums and can be used by hand or by means of commercially available manual pressure, air pressure or cordless guns. Pneumatically or hydraulically operated pump systems are used when working with hobbocks and drums.

The choice of container shape depends on the cycle frequency, the quantity to be processed and the ambient application conditions. Compressed air or cordless guns are particularly suitable for applying long continuous adhesive beads, such as for the deck-to-hull joint, as they enable continuous and jerk-free dispensing, for example when working with high-viscosity products such as Sikaflex®-292i or Sikaflex®-296.

DESIGN OF ADHESIVE/SEALANT BEAD

An elastic adhesive can only achieve its full performance, e.g. movement compensation, tolerance compensation or impact resistance, if the geometry of the adhesive bead has been selected correctly. First, a minimum layer thickness of approx. 2-3 mm should be maintained; thicker layers may be useful to compensate for correspondingly large movements or tolerances. Joints should not be deeper than 20 mm, as the hydrogen molecules required for curing can only penetrate to a depth of approx. 15 mm and thus the adhesive does not cure up to the joint bed. For sealing joints, the nozzle is cut at an angle according to the joint width. Deep joints should be filled from the bottom up to prevent air pockets. It may be advisable to mask the area around the joints with masking tape. After smoothing the joint with Sika®Tooling Agent N, the masking tape must be removed immediately before the sealant skin forms in order to obtain a clean, gap-free joint edge.

For bonding applications, the high viscosity Sikaflex® adhesive types are typically applied in a triangular bead that is at least twice as high as the pressed distance or varies based on component unevenness. This ensures sufficient wetting over the length of the joining partners, even in the case of significant unevenness.

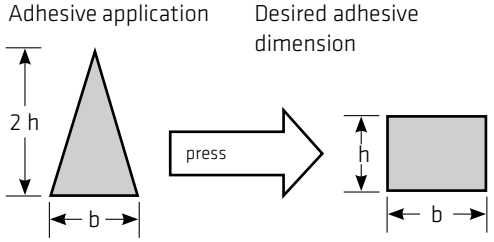
THE CORRESPONDING NOZZLE CUT DEPENDS ON THE SPECIFIC APPLICATION:

Original nozzle

Oblique-cut round nozzle for sealing joints in adhesive applications (diameter = bead width, V-height = approx. 2x required adhesive layer thickness)

V-section for triangular beads

THE REQUIRED NOZZLE GEOMETRY FOR THE DESIRED ADHESIVE DIMENSION:



Thickness = h
Use spacer if necessary

ADHESIVE AND SEALANT APPLICATION

The adhesive and sealant should be applied with a high-quality gun. Inexpensive guns may fail when trying to dispense high viscosity adhesives such as Sikaflex®-292i or Sikaflex®-296. Apply the adhesive in the form of a triangular bead with the correct geometry. To do this, place the gun vertically on the joining part.

After the spacers are placed next to the adhesive bead, the materials can be joined. A flat rod allows even pressing of movable workpieces to the desired dimension. For vertical bonding, spacer blocks or adhesive tapes are suitable for preliminary fixation of the workpiece until the adhesive bond is sufficiently strong. If subsequent sealing is planned, it is helpful to mask off the flanks. The sealant must fill the joints to prevent air pockets between the adhesive and sealant. The sealant can then be smoothed. Remove the adhesive tape after the smoothing step and before the sealant forms a skin.

ADHESIVE AND SEALANT REMOVAL

UNCURED ADHESIVES AND SEALANTS

- Use a spatula to loosen uncured adhesive and sealant on non-absorbent surfaces. Remaining residue can be removed with a cloth or rag using Sika Remover-208. Do not use other solvents, as they could react with Sikaflex® and form permanent sticky residues on the surface.

- On porous substrates, allow the adhesives to harden and then remove mechanically (e.g. by sanding).

CURED ADHESIVES AND SEALANTS

Cured adhesives and sealants can only be removed mechanically. Solvents will not help in such cases, though they may soften the material slightly, which might facilitate removal (please use acetone or isopropanol).

> **!** **IMPORTANT:** Never use Sika® Aktivator-205 or Sika® Aktivator-100 for cleaning.

CLEANING HANDS AND OTHER SKIN AREAS

Contact with fresh adhesive and sealant should be avoided in general, which is why suitable protective equipment should be used during use. Never use solvents to clean the skin. Special cleaning cloths such as Sika® HandWipes or water-based cleaning pastes are suitable for this purpose. For further information, please refer to the corresponding safety data sheet.

STORAGE

UNOPENED CARTRIDGES OR TUBULAR BAGS

- Store Sikaflex® and Sikasil® products at temperatures below 25°C and observe the expiry date printed on the container.

- Storing Sikaflex® at a higher temperature increases the viscosity, which makes it much harder to apply the adhesive. Moreover, it will result in decreased elasticity, such that sufficient wetting of the joining part can no longer be guaranteed.

OPENED CARTRIDGES

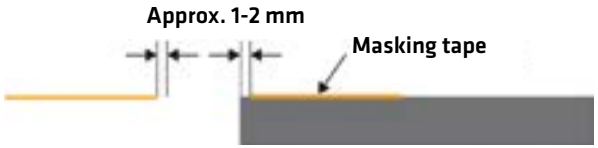
- If a cartridge sits unused for a few days after opening, leave the used nozzle tip screwed onto the cartridge. A new nozzle tip does not need to be fitted until the next time the cartridge is used.

- If the adhesive will not be used for a long period of time, the used nozzle tip can be removed and the cartridge opening covered tightly with aluminium foil. The required press-out force will increase briefly when the aluminium foil is first removed, but it will decrease to a normal level again as the adhesive is applied.

TOOLS

MASKING TAPE

Use masking tape to protect the substrate from contamination. The masking tape must be applied approx. 1 mm away from the adhesive joint (see Fig. below). Immediately after applying and smoothing the adhesive, remove the tape before a skin forms.



SPACER BLOCKS

Spacer blocks prevent components being bonded vertically from slipping. Ideally they should be made of wood or plastic; metal spacer blocks must not be used under any circumstances. After the adhesive has cured sufficiently, they can be removed and the remaining gap filled with adhesive.

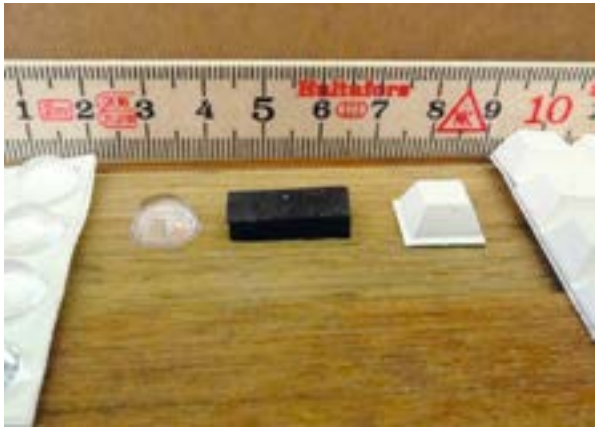
SPACERS

Spacers are used to maintain a defined adhesive layer thickness. They shouldbe as hard as the cured adhesive, but never harder.

Self-adhesive buffers, for example, are suitable as spacers. You can also make spacers yourself by drawing an adhesive bead, measuring it to the desired adhesive layer thickness and allowing it to cure. The adhesive bead can then be cut into short pieces.

The spacers should be placed on the substrate in such a way that they do not slip. If an adhesive is to be used for this purpose, do not use cyanacrylate (secondary adhesive) as it will affect Sikaflex® adhesion. As an alternative, we recommend a small blob of Sikaflex®.

The following figure shows a small selection of possible spacers:



CORROSION PROTECTION

The right paint systems provide the best protection against corrosion.

- Aluminium and ordinary steel must be protected with such systems (ISO 12499-3)
- Air pockets or air chambers (e.g. between adhesive and backfilled sealant) must be avoided.
- In cold outside temperatures, it is advisable to heat the adhesive to the recommended processing temperature before use.
- Interrupt the adhesive bead so that any occasional water (e.g. condensation) can drain off.
- Primers from Sika® do not help ensure adequate corrosion protection. They are to be used exclusively in relation to the bonding.

1.5 PROCESSING AND CURING TIMES

INTRODUCTION

Sikaflex® adhesives and sealants are high-quality single-component polyurethanes or silane terminated polymers (STPs) that react with moisture in the air to form a durable elastomer. Sikaflex® products have excellent adhesive properties and offer high mechanical strength. Temperature and humidity are the main factors influencing the curing process.

OPEN TIME

The open time determines the maximum time between adhesive application and joining of the parts to be bonded. The skin formation time is key. Only within the skin formation time is the adhesive tacky on the surface and able to form a connection with the joining parts. With single-component adhesives and sealants, the reaction begins with the ambient humidity on the outer skin and continues inwards to the adhesive core. The adhesive bond is established as the adhesive cures.

In general, the open time on single-component polyurethanes or STPs lasts until a skin forms. After that, adhesion to the bonding part is inhibited. In two-component systems, the open time is limited by the chemical reaction that increases the adhesive's viscosity. As a result, the joining part can no longer be properly wetted, which prevents successful bonding (adhesion fault). Depending on the type of adhesive and the climatic conditions (temperature and humidity), the open time can range from a few minutes to over an hour.

CURING TIME

The curing time is the time after which the adhesive is completely hardened and the bond is fully load-bearing. The bonded parts can be moved during the curing time after reaching the handling strength.

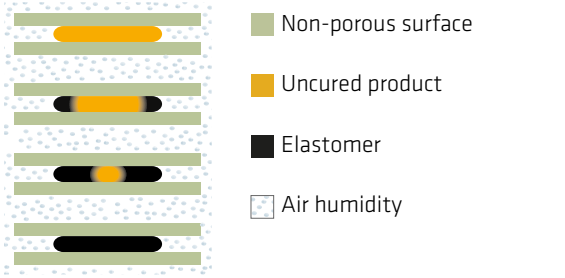
The necessary curing time is determined not only by the forces and loads acting directly upon the bond, but also by other factors that influence the speed of the chemical reaction. For single-component products such as Sikaflex® or Sikasil®, these may include:

- Adhesive exposure to moisture (depending on joint design)
- Water vapour permeability of the joining parts
- Ambient air humidity
- Ambient operating temperature
- Temperature of the material to be bonded.

Production processes can be optimised by applying the right adhesive or sealant and carefully selecting the joint design – for single-component products, for example, by allowing moisture to seep into the adhesive joint unhindered.

For further information, please contact the Industry division of Sika.

Curing process: Reaction with moisture in the air to form an elastomer



1.6 PRODUCT DOCUMENTATION

PRODUCT DATA SHEETS

Product data sheets describe the properties and benefits of each product and provide information on their scope of intended use. Before using Sika products, we recommend downloading the currently valid product data sheets from the Internet. The product data sheet specific to the country of purchase is always applicable.

SAFETY DATA SHEETS

The safety data sheet contains information about the safe handling of chemical products. This document must be available to all persons who come into direct or indirect contact with chemical products.

Safety data sheet contents

- Name of the substance/mixture and the company
- Potential hazards
- Composition/information on components
- First aid measures
- Fire-fighting measures
- Measures in the event of accidental release
- Handling and storage
- Limiting and monitoring of exposure
- Personal protective equipment
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Environmental data
- Notes on disposal
- Transport information
- Legislation
- Other information

The currently valid safety data sheet is available from local sales organisations or on the national website **www.sika.com/marine**.

1.7 PRODUCT SELECTOR

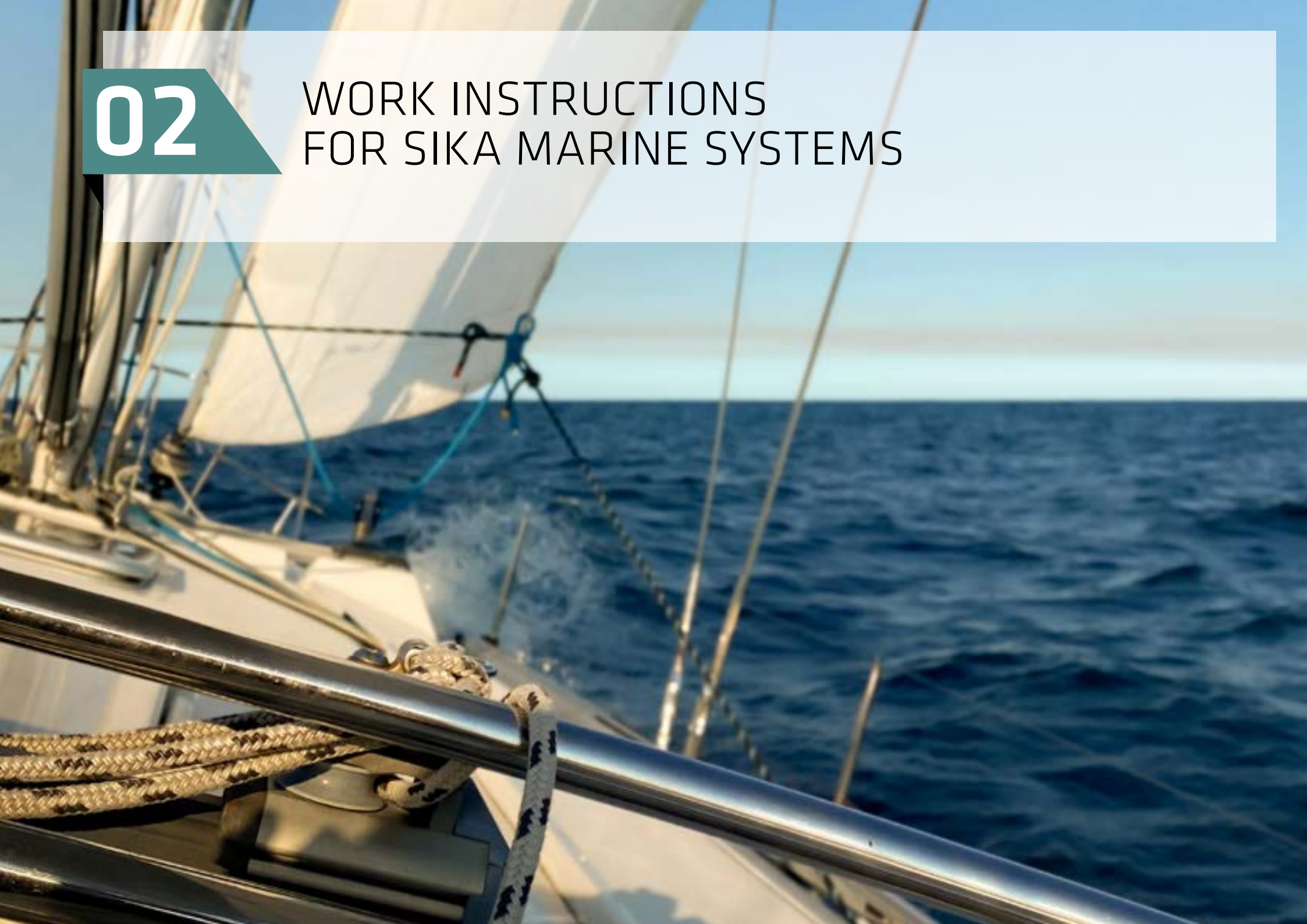
LEGEND	
Recommended solution	●●
Good solution	●
Possible solution	○

[1] 300 ml cartridge suitable for private users

[2] For professional users only

	Sikaflex®-290 DC PRO [1]	Sikaflex®-291i	Sikaflex®-292i	Sikaflex®-295 UV [2]	Sikaflex®-591	Sikaflex®-296 [2]	Sikaflex®-298 [2]	Sikasil® WS-605 S	Sikasil® SG-20	SikaFiresil® Marine N
ADHESIVE APPLICATIONS										
General adhesive applications		●	●●							
Assembly bonding (deck & keel hull, flybridge)			●●							
Bonding baseboards			●●							
Bonding floor coverings		●					●●			
DECKBOARD										
Laying deckboard		●					●●			
Deckboard caulking	●●									
DIRECT GLAZING										
Mineral glass						●●			●●	
Plastic glass				●●		○			●●	
SEALING APPLICATIONS										
Interior applications		●●			●				●●	
Exterior applications				●●	●●	●		●●	●●	
Paintable sealing joints*		○	○		●●					
Fire-retardant sealing joints										●●
Seals in sanitation					○					
Sealing non-ferrous metals					●●					

*** Paint compatibility must be verified by preliminary tests under production conditions.**



02 WORK INSTRUCTIONS FOR SIKA MARINE SYSTEMS

2.1 DECKBOARD

2.1.1 INTRODUCTION

APPLICATION DESCRIPTION

Every type of wood needs protection against the ingress of water in order to prevent possible damage such as staining, wood rot or corrosion of metal parts. In addition to static bracing, a wooden deck provides additional insulation in both hot and cold climates.

Teak has special properties that must be taken into account when laying the deck. Oil and rubber content, porosity and colouring vary depending on the origin and age of the teak.

Solid, professional work and strict adherence to the work instructions are prerequisites for perfect quality that can withstand harsh marine conditions.

GENERAL TERMS AND CONDITIONS OF PERFORMANCE

- Working temperatures should be constant or falling between +5°C and +35°C at max. 75% humidity;
- Protect the deck from sunlight and rain while working;
- Protect components from external influences for at least eight hours after the last work step with the Sika® Teakdeck system;
- Ensure good ventilation;
- Dirt, dust, water, oils and grease can lead to bond failure.

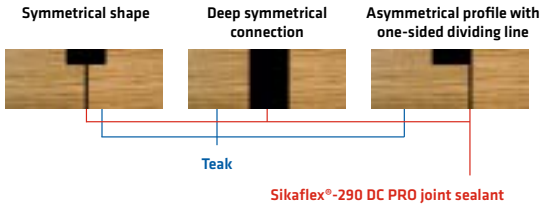
GENERAL REMARKS

- The wooden strips should have upright annual rings.
- Core wood moisture should ideally not exceed 12%. Higher levels increase the risk of excessive wood shrinkage, which can potentially lead to insufficient bonding and consequently to a leaking deck.

IMPORTANT: In general, we recommend the use of the "deep joint method". Joint-separating tape to prevent three-point adhesion is not necessary.

TEAK ROD TYPES

Teak strips up to 22 mm thick are available in different versions. Sika recommends the deep symmetrical joining system:



1. SYMMETRICAL OR ASYMMETRICAL JOINT

Advantage: Easy to use.

Disadvantages: Limited joint depth if subsequent grinding is required as part of restoration. Increased risk of water ingress between strips and deck (peeling after wood swells).

2. DEEP JOINT METHOD

Advantages: Repeated grinding possible; thinner strips can be used, which saves money. Wood expansion balanced more effectively.

Disadvantage: More complex processing with curved strips.

2.1.2 LAYING DECKBOARD

STEP 1: SURFACE PRE-TREATMENT

Deck boards are typically attached to steel, plywood, aluminium, polyester or wood decks. Both aluminium and steel need to be levelled before accurate pre-treatment, whereas wood and polyester are already naturally level.

ALUMINIUM AND STEEL DECKS

1. Sand or sandblast the surface to remove rust, loose particles, flaking paint, or other foreign matter. After that, vacuum away abrasive dust.
2. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
3. Flash-off time: Minimum 10 minutes to a maximum of 2 hours.
4. Avoid dirt, dust and other foreign bodies until the next work step.
5. Cover the ground deck with a two-component corrosion protection coating (e.g. SikaCor® ZP Primer) using a clean brush or roller and a consumption of 200 g/m² (observe the SikaCor® ZP Primer product data sheet).
6. SikaCor® ZP Primer flash-off times:
   at +10°C: 5 to 14 hours
   At +20°C: 3 to 14 hours
   At +30°C: 2 to 14 hours
7. Protect from dirt, dust or other foreign objects during the entire curing time. If necessary, clean the surface with water and allow it to dry completely.

GRP DECKS

1. Clean heavily soiled adhesive surfaces with a clean solvent (Sika® Remover-208) to remove the coarsest dirt.
2. Grind the adhesive surface with a non-woven abrasive pad.
3. Vacuum away abrasive dust.
4. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
5. Flash-off time: Minimum 10 minutes to a maximum of 2 hours.
6. Apply a thin but covering layer of Sika® MultiPrimer Marine to the bonding surface using a clean brush, melamine foam or felt applicator.
7. Flash-off time: Minimum 30 minutes to maximum 24 hours.

ALUMINIUM OR STEEL MATERIALS COATED WITH 2K PAINT - REFIT

1. Before use, make sure that the deck material is workable and compatible with Sikaflex®-298. Otherwise, the surface to be processed must be sanded down to the metal surface. After that, pre-treat following the procedure for pre-treatment of aluminium or steel decks (see left).
2. Treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
3. Flash-off time: Minimum 10 minutes to a maximum of 2 hours.

WOODEN DECK

1. Grind the adhesive surface on the deck with non-woven abrasive pad (80/100 grit).
2. Vacuum away abrasive dust.
3. Apply a thin but covering layer of Sika® Primer-290 DC or Sika® MultiPrimer Marine to the adhesive surface with a felt roller.
4. Flash-off time: Minimum 30 minutes to maximum 24 hours.

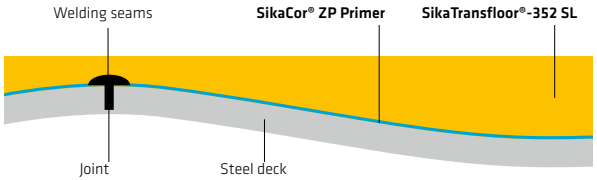
Application of SikaCor® ZP primer with a roller on a steel deck

Application of Sika® MultiPrimer Marine with a roller on a teak deck (reverse side)

STEP 2: COMPENSATE FOR SURFACE UNEVENNESS

Steel and aluminium decks often have production-related unevenness, protruding welds or indentations that must be levelled with SikaTransfloor®-352 SL before the teak deck is laid. SikaTransfloor®-352 SL is a lightweight 2K polyurethane system that cures into a soft, sound-absorbing layer.

It is not necessary to compensate for unevenness as long as the unevenness on the deck does not exceed 1.5 mm.



! **IMPORTANT:** Condensation and water droplets on the cured levelling layer lead to adhesion problems. As such, always be mindful of the dew point.

Pouring the mixed SikaTransfloor®-352 SL onto the deck

WORKING TEMPERATURE	10°C	20°C	30°C
Pot-life of SikaCor® ZP Primer	3 hrs	2 hrs	1 hr
Waiting time before applying SikaTransfloor®-352 SL	5-14 hrs	3-14 hrs	2-14 hrs
Processing time SikaTransfloor®-352 SL	approx. 45 min	approx. 35 min	approx. 25 min
Waiting time before embedding the teak strips with Sikaflex®-298	up to 14 days	up to 14 days	up to 14 days

Time specifications to apply SikaTransfloor®-352 SL

Spreading SikaTransfloor-352 SL with a spatula

GRP SURFACES

1. Stir component A of SikaTransfloor®-352 SL and add component B.
2. Mix mechanically at medium speed for three minutes. Avoid air pockets.
3. Immediately afterwards, transfer the mixture to another container, scraping off any remaining material from the inside and bottom of the container. Stir the mixture again in the container it has been transferred to for another minute. Please ensure that no material that has not been completely mixed gets onto the deck. Instead, pour unmixed residues into the next container to be processed. Repeat as often as necessary.
4. Pour SikaTransfloor®-352 SL onto the deck. Please note the processing times: 45 minutes at 10°C, 35 minutes at 20°C and 25 minutes at 30°C.
5. Evenly distribute SikaTransfloor®-352 SL with a level/levelling board at the height of the maximum unevenness point, ensuring a maximum layer thickness of 30 mm. For higher layer thicknesses, additional layers must be built up atop the bottom layer. Sand each layer and vacuum away the abrasive dust before applying the next one. Processing conditions: between 10°C and 35°C, max. 80% RH
6. Flash-off time: After 24 hours, SikaTransfloor®-352 SL can be walked on and is ready for additional processing.

IMPORTANT: The temperature of the substrates, the product to be processed and the air should be between 10°C and 35°C.

EMBEDDING THE TEAK STRIPS

Sikaflex®-298 is an elastic adhesive that is applied to the prepared surfaces with a toothed trowel (3–5 mm), using approximately 1200 ml per square meter. Cover profiles may only be laid on adhesive surfaces that have not yet formed a skin. It is therefore recommended to only apply the adhesive to a limited area. Do not exceed an ambient temperature of +35 °C. Secure the pre-treated profiles mechanically, such as using the vacuum pressure method or by distributing counterweights.

It is not necessary to compensate for unevenness as long as the gaps and indentations on the lower deck are not larger than 1.5 mm.

IMPORTANT: The teak strips must be inserted into the adhesive within the skin formation time. As such, do not prepare excessively large areas with adhesive.

AIR HUMIDITY

AMBIENT AIR TEMPERATURE	< 50%	50%	60%	70%	80%	90%
5°C	0	0	0	3	5	7
10°C	3	3	6	8	10	11
15°C	8	8	10	13	15	16
20°C	12	12	15	17	19	21
25°C	17	17	20	22	24	26
30°C	21	21	24	27	29	31/

Minimum substrate temperature to avoid condensation (calculated with dew point plus 3°C as safety)

Grey: non-permitted conditions
Blue: permitted conditions

EXAMPLE:

Air temperature 10°C/ relative humidity 60% = minimum temperature of the substrate 6°C. In this case, the permitted conditions are not reached (at least 10°C).

STEP 3: PREPARATION FOR EMBEDDING

Position the teak strips before processing and mark the position. Once all positions have been marked, the strips can be removed again for further pre-treatment.

PROCESSING ON LEVELLING COMPOUND

1. Sand SikaTransfloor®-352 SL with a suitable belt sander (80 grit) and vacuum away abrasive dust.
2. The surface must be protected against footprints, dirt, dust, oil, grease or other foreign bodies during curing of the levelling compound and before the adhesive bed is applied.

PRE-TREATING TEAK STRIPS

1. For all types of wood: Apply a thin but full-coverage layer of Sika® Primer-290 DC or Sika MultiPrimer Marine with a roller to the adhesive surface.
2. If the joints are to be sealed shortly after embedding, it is recommended to prime the joint faces of the teak strips in addition to the adhesive surface.
3. Flash-off time: Minimum 30 minutes to maximum 24 hours.

STEP 4: WORK INSTRUCTION FOR EMBEDDING TEAK STRIPS

WE RECOMMEND USING AS FOLLOWS: SIKAFLEX®-298

1. Apply approximately 1200 ml/m² of Sikaflex®-298 to the pre-treated deck surfaces using a toothed trowel (4 mm serration). The actual consumption depends on the surface condition. Sikaflex®-298 must be applied as a full-coverage, closed 2 mm film such that no air pockets form between the teak strip and the substrate. This additionally protects the deck substructure against water ingress.
2. Exact positioning of the teak profiles must take place within 20 or 30 minutes before a skin can form, which is why adhesive should only be applied to a limited area. Lightly press on the profiles.
3. During curing, teak profiles must be secured by means of clamping devices, weights, screws (can be removed again after curing) or vacuum pressure. After approximately 24 hours, the panels are fully load-bearing and the fasteners can be removed.
4. Residues of uncured Sika adhesives and sealants can be removed from non-porous surfaces with Sika® Remover-208. Under no circumstances should other cleaning agents or cleaners be used for this purpose. On visible wood surfaces, wait until Sika adhesives and sealants are fully cured. These can then be ground down.

Application of deck

Curing time

As a rule, with properly laid deck profiles and a temperature of over +18°C, only a 24-hour wait period will be needed before proceeding with the next step.

Teak strips embedded in Sikaflex®-298 and secured with weights

2.1.3 DECK CAULKING

INTRODUCTION

Depending on the design and construction of the deck, strong movements of the deck planks may occur. If the joints are correctly dimensioned, Sikaflex®-290 DC PRO will absorb up to 10% of the joint width in movement. The ratio of the movement to the joint width must be taken into account before making the teak deck. Raw wood swelling/shrinkage is less the result of temperature fluctuations than moisture absorption/release.

When designing the joint, the movement of the deck must also be considered. Significant difficulties can arise if the wood used in the deck construction is not sufficiently aged or dried.

! **IMPORTANT:** The recommended wood equalisation moisture content should be between 7% and 12%.

Ideally, the teak should be sawn radially/quartered to create upright annual rings (see Fig. 24). This minimises warping or shrinkage of the wood.

DIMENSIONING OF JOINTS

The width of the sealing joint depends on the width of the teak strips and the depth of the joint as well as on the moisture of the core wood during processing and boat use.

GUIDELINE FOR JOINT WIDTH AND DEPTH FOR TEAK

TEAK PROFILE WIDTH (IN MM)	35	45	50	75	100	125
JOINT WIDTH (IN MM)	4	4–5	5–6	8	10	12
JOINT WIDTH (IN MM)	4–5	6	6	7	8	10

Other types of wood may exhibit different shrinkage behaviour from teak (both more and less). For wood species with greater shrinkage behaviour, the joint dimensioning should be 10% larger for safety reasons.

Annual rings on the left (not recommended), annual rings on the right (recommended)

STEP 1: PREPARATION OF JOINTS

Priming the joint faces with Sika® Primer-290 DC is essential to creating a durable teak joint. After the wooden strips have been thoroughly cleaned, the primer can be applied.

EXPLANATION OF THE WORK STEPS	
1	The joint faces must be pre-treated with the utmost care to obtain a permanent bonding effect with Sikaflex®-290 DC PRO. Foreign bodies such as dirt, dust, grease and oil must be completely removed; the joints must be clean, dust-free and dry before applying the adhesive.
2	Prime the joint faces of the wooden profiles with Sika® Primer-290 DC or Sika MultiPrimer Marine. Apply a thin but full-coverage layer of primer with a brush or melamine foam. The primer will form a layer which, after priming, will continue to look wet and shiny even when dry. The processing temperature should be between +10°C and +35°C.
3	Flash-off time: Minimum 30 minutes to maximum 24 hours. The surfaces must be protected against dust and moisture. If the waiting time exceeds 24 hours, the joint faces will need to be primed again. Avoid puddles of primer to prevent bubbles from forming.

STEP 2: DECK CAULKING INSTRUCTIONS

EXPLANATION OF THE WORK STEPS	
1	Before starting work, make sure that the wood temperature is below +35°C.
2	Also, ensure that the outdoor temperature is constant or falling during use. It should ideally be between +5°C and +35 °C.
3	Cut the application nozzle to size and place it on the base of the joint. Hold the gun at an angle of approx. 60° and apply Sikaflex® -290 DC PRO into the joint without air pockets. Manual pressure guns, push rod operated compressed air guns or cordless guns can be used. Pull the nozzle along the joint in a constant motion, slightly overfilling the joint. Use an appropriately narrow nozzle tip on narrow joints.
4	After filling and before skin formation, draw a slightly flexible spatula, ideally with a convex recess, across the joints at an angle of approx. 60°. This gives the joint a rounded appearance and fills it completely. After smoothing, remove any material that seeped out the sides immediately so that less sanding will be necessary.
5	Filled joints must be protected from sun and rain for at least eight hours. Any removed material that has already formed a skin must not be re-introduced into the joints, as this will prevent proper bonding and could result in leaks.
6	The table at the top right shows the number of days after which Sikaflex®-290 DC PRO can be sanded under the specified climatic conditions.

SAFE TIME TO SAND SIKAFLEX®-290 DC PRO

RELATIVE AIR HUMIDITY	AMBIENT TEMPERATURE (°C) 10°C	20°C	30°C
25%	5.5 days	4.5 days	3.5 days
50%	4 days	3.5 days	3 days
75%	4 days	3 days	2 days

Draw off excess Sikaflex®-290 DC PRO with a spatula and press in

STEP 3: SANDING THE DECK

First sand with sandpaper grit 80, then sand with grit 120 or finer. Sanding should be done in the running direction of the joints. Belt grinders, disc grinders or elastically mounted grinding wheels are suitable.

The illustration on the left shows the sanding of the deck with an industrial belt sanding machine so that the processed wood can be finished afterwards.

STEP 4: FINISHING TREATMENT

Finishing the boat deck with clearcoat, for example, is not required and is not recommended. Paints are usually not as elastic as the joint filler, so there is a risk of movement causing the paint to crack. However, some boat owners prefer a deck finish. The choice of paint system should be considered carefully, as solvents and plasticizers can compromise the joint. Please note: Never apply care products to uncured Sikaflex®-290 DC PRO.

A waiting period of approx. <u>one month</u> must be observed.

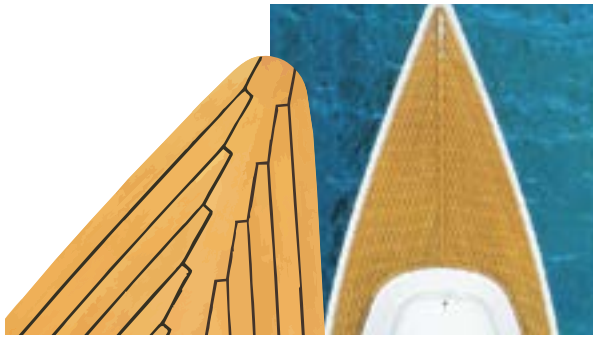
> **!** **IMPORTANT:** Consult the explanations in chapter 2.1.5 “Sika® Teak care system”!

2.1.4 BONDING PREFABRICATED DECK PANELS

ADVANTAGES OF PREFABRICATED DECK PANELS

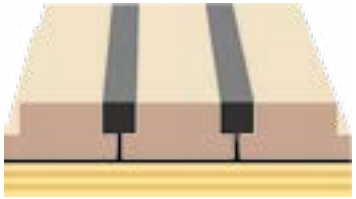
Many boat owners prefer to use prefabricated decking, since it is manufactured in a production facility without hindering other work on board. Deck panels are readily available in standard formats and can be customised to fit deck geometry precisely on request. In addition, deck panels are easy to work with and attach to the deck. The application of Sikaflex®-290 DC PRO before production outside the ship's deck enables economical production of the panels. This shortens production times and makes work processes more flexible.

Custom-manufactured teak decking

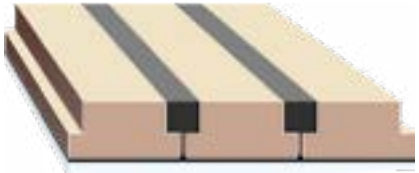


Custom-manufactured wood decking

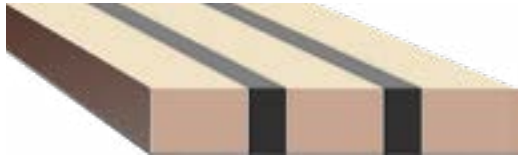
Variants of carrier plates for prefabricated deck panels:



Marine plywood or HPL



GRP



without carrier plate

TYPES OF PREFABRICATED DECK PANELS

The panels consist of deck segments that are either custom-manufactured using a template or punched out of single-direction panels. There are variants with and without carrier plates.

BONDING PREFABRICATED DECK PANELS

One-component polyurethane adhesives such as Sikaflex®-298 are particularly suitable for laying the panels on the deck. The permanently elastic adhesive compensates for tolerances and serves as an additional layer to seal the deck completely watertight. No additional mechanical connections are necessary. This keeps the deck from being damaged by drilled holes for the screws or bolts and prevents the ingress of water.

STEP 1: PRE-TREATING THE ADHESIVE SIDE OF THE PREFABRICATED DECK PANELS

Deck surface pre-treatment is described in detail in chapter 2.1.2 “Laying of decks”. Often, the visible sides of the decks are already finished on fibre-reinforced plastic carrier plates by the manufacturer. However, the backs will still need treatment.

FIBRE-REINFORCED PLASTIC CARRIER PLATE

1. Clean heavily soiled adhesive surfaces with a clean solvent (Sika® Remover-208) to remove the coarsest dirt.
2. Grind the adhesive surface with a non-woven abrasive pad.
3. Vacuum away abrasive dust.
4. Apply Sika® Primer-290 DC or Sika® MultiPrimer Marine with a clean brush or felt roller thinly but opaquely covering the adhesive surface.
5. Flash-off time: Minimum 30 minutes to maximum 24 hours.

DECKS, NOT REINFORCED OR REINFORCED WITH PLYWOOD

1. Marine plywood: Sand the adhesive surface with sandpaper 80/100 grit. HPL: Sand the adhesive surface with 60/80 grit sandpaper.
2. Extract dust and other particles.
3. Apply a thin but full-coverage layer of Sika® Primer-290 DC or Sika® MultiPrimer Marine with a clean brush, wool felt applicator or foam applicator.
4. Flash-off time: Minimum 30 minutes to maximum 24 hours.

STEP 2: BONDING THE PREFABRICATED PREFABRICATED DECK PANELS

In general, we recommend Sikaflex®-298. Connection joints, on the other hand, can be processed with the following products: Sikaflex®-290 DC PRO (horizontal), Sikaflex®-295 UV or Sikaflex®-591 (vertical or inclined surfaces).

EXPLANATION OF THE WORK STEPS

1. Apply Sikaflex®-298 to the pre-treated deck area and spread it over the application area with a triangular toothed spatula (4 mm). The layer thickness can vary depending on the empty spaces to be filled (usually 1 to 2 mm, which corresponds to 1 to 2 litres of adhesive per m^2).
2. The deck panel must be positioned and pressed down within the skin formation time of the adhesive to prevent air pockets.
3. Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208. If absorbent surfaces are soiled with adhesive, allow it to cure and remove it mechanically.
4. If necessary, secure the plates during curing with a clamp, weights or screws (removable after the adhesive has hardened). The vacuum press method is another option.
5. Full load-bearing capacity is reached after approx. 24 hours and the fixation aids can be removed.
6. Horizontal connecting joints can be grouted with Sikaflex®-290 DC PRO, on inclined and vertical surfaces with Sikaflex®-295 UV or Sikaflex®-591.

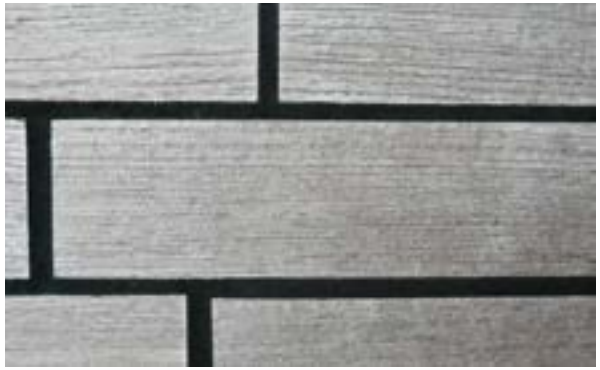
IMPORTANT: If masking tape is used, it must be removed before the Sikaflex® forms a skin.

Deck clamped for curing

2.1.5 SIKA® TEAK CARE SYSTEM

STEP 1: SURFACE PRE-TREATMENT

Sunlight and weather cause the teak deck to turn silver-grey. This effect is quite desirable, but some boat owners prefer to maintain the original colour with care products. The Sika® Teak care system is available for this purpose; it is designed for use on joints filled with Sikaflex®-290 DC PRO.



10-year-old teak deck

New teak deck

THE SIKA® TEAK CARE SYSTEM CONSISTS OF TWO PRODUCTS:

SIKA® TEAK OIL NEUTRAL

Spread Sika® Teak Oil Neutral on the dry, clean wood surface with a clean cloth, brush or roller. Leave on for 30 minutes and then remove the excess. Repeat the work step as soon as the first signs of weathering are visible.

IMPORTANT: Do not process the entire surface at once, but divide it into working areas to prevent drying or excessive contact time of the product before rinsing.

SIKA® TEAK C+B

This combination product cleans the deck of dirt, salt residues, oily contamination and algae; it also brightens teak decks that have been exposed to the elements.

Sika® Teak C+B is applied directly to wet or dry teak using a scouring brush or cloth. Always work in the direction of the grain. Leave on for 10 minutes, then rinse with fresh water.

WITH THE RIGHT CARE PRODUCTS, A TEAK DECK

WILL LOOK NEW FOR A LONG TIME.

2.1.6 REPAIR OF DECKING

INTRODUCTION

High-quality wooden decks are usually made of teak. Therefore, most of the procedures described in this manual focus on this material.

Deciding whether or not to repair a deck is not always easy. First, it is necessary to determine whether the joint or wood is damaged in such a way that it could cause problems.

- Each joint should be carefully examined. All areas where small gaps or cracks can be seen in the sealing material should be clearly marked with chalk.
- The wood surface must be carefully examined for excessive wear, nicks, cracks, or splinters and marked with chalk. Damaged strips should be replaced in whole or in part, depending on the degree of damage.
- If the joints are mostly in good condition and only damaged in one or two places, it is sufficient to replace the sealing material selectively.
- In the event of more extensive damage, it may be necessary to replace the complete joints.

> **!** **IMPORTANT:** Never repair a joint without knowing the sealant technology.

The ideal repair solution depends on the condition of the deck and the desired result. **The following table shows the recommendations in relation to the result of a deck analysis:**

	SERIOUS WOOD DAMAGE	MINOR WOOD DAMAGE	WOOD NOT DAMAGED
SEVERE JOINT DAMAGE	Replace deck completely (prefabricated deck or laying individual strips on board).	Renew all joints, then sand and repair the entire deck.	Replace all joints.
MINOR JOINT DAMAGE	Replace damaged joint areas, replace damaged wooden areas, then sand and repair entire deck.	Replace damaged joint areas, then sand and repair entire deck.	Only replace damaged joints.
UNDAMAGED JOINTS	Replace damaged wooden areas. Sand and repair entire deck.	Strip and repair entire deck.	Clean the deck. Repair the wood if necessary.

RESONANCE ON THE DECK ANALYSIS

Note that water seeping between the wood and the deck can lead to wood decay. It is advisable to check the deck regularly and repair any leaking areas proactively, before the entire deck is affected or any wooden components come loose due to swelling from constant water contact.

WHAT'S THE BEST WAY TO FIND IMPROPERLY SEALED AREAS?

Wood damaged by water ingress becomes more permeable than the surrounding wood. The colour of the damaged wood may change as a result. One effective method of identifying damage is to cover

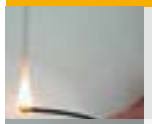
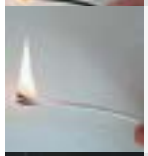
the entire deck with water, as damaged areas will remain damp even after the rest of the deck has already dried.

Teak deck damaged by water ingress

DETERMINE TYPE OF ADHESIVE TO BE REPLACED

To ensure successful repairs, determine the chemical composition of the joint material as well as the elastic surface adhesive for the deck strips, if this information is not already known.

A simple test for this is to observe the burning behaviour of the material. To do this, a small test piece is lit with a lighter or match. The type of flame, the burning behaviour and the smoke indicate the material used:

BURNING BEHAVIOUR OF A TEST PIECE	
	Flammable. A yellow flame with intense black smoke and black ash indicates a polyurethane.
	Flammable. A yellow flame without black smoke indicates a product based on silane-terminated polymers or MS polymers.
	A non-spreading, pale-yellow flame with white to grey smoke and white ash indicates silicone.

RECOMMENDED REPAIRS

If the old joint is soft and sticky, we recommend removing the old material completely from the edges of the planks with a milling cutter, creating an entirely bare wooden surface. After that, fresh sealant of any type can be applied (see chapter 2.1.2 Laying of decks).

STEP 1: REMOVE OLD SEALING MATERIAL

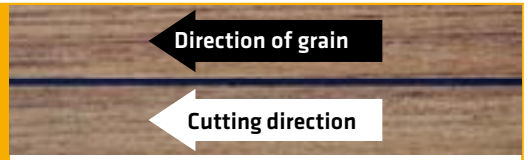
There are several ways to remove the old material:

- Cut out by hand with a sharp knife
- Using an oscillating knife (e.g. from Fein Power Tools) with a blade that has the same width as the joint
- Using an electrically heated rubber cutter (e.g. RUBBER-CUT by Rema Tip Top)
- Using a milling cutter. In particular, a milling cutter must be used if the old sealing material is not Sikaflex®-290 DC PRO. The milling knife is used to grind the edges of the strips to bare metal and remove the old material completely.

The appropriate repair method depends on the type and scope of work. For smaller, one-off jobs, the manual method is the easiest and most cost-effective. For larger repairs or in a professional repair shop, either an oscillating knife or a RUBBER CUT is recommended to save time and achieve a high-quality result.

The milling cutter is used when it is necessary to ensure that no remnants of the old sealing material are left behind. This is especially important when the chemical base of the old material is unknown, as it can lead to undesirable reactions with the new joint material or to poorer adhesion to the joint faces.

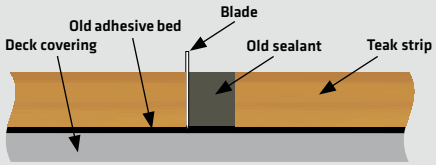
OLD JOINT \ NEW JOINT	PUR	MS/ STP	SILICONE
PUR	Cut out damaged joint, activate smoothly cut adhesive residue with Sika® Aktivator-205 (observe flash-off time) and then re-joint.	Not recommended	Not recommended
MS/ STP	Not recommended	Contact the manufacturer.	Not recommended
SILICONE	Not recommended	Not recommended	Contact the Manufacturer



IMPORTANT: It is essential to cut with the grain to prevent abrasions.

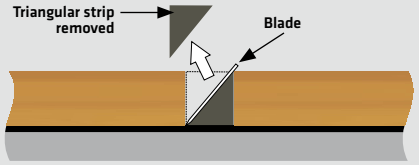
REMOVAL WITH A SHARP KNIFE

1 Position the blade of a utility knife perpendicular to the deck surface on one side of the joint.



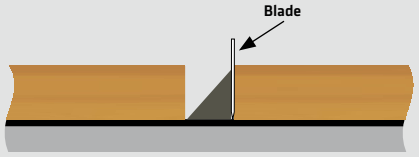
2 Cut along the joint, making sure to keep the blade straight; otherwise the wood may be damaged or the old sealing material might not be removed completely.

3 Insert the blade from the other side of the joint at an angle from above to the lower side of the joint material of the already cut side.

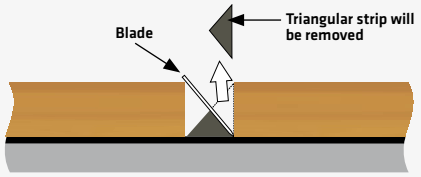


4 Cut along the joint, making sure to guide the blade at a constant angle. This creates a triangular bead of old sealant, which can then be pulled out of the joint.

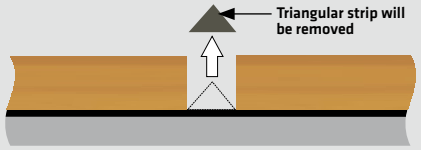
5 Place the blade vertically on the joint face that has not yet been cut and insert it to the bottom of the joint material. Again, make sure to hold the blade straight; otherwise, the wood could be damaged or the old sealing material may not be cut completely.



6 Position the blade at an angle to the first cut joint side and insert it to the opposite joint side up to the base of the joint.



7 Remove the remaining small triangular bead on the base of the joint with a scraper or chisel at the width of the joint.



REMOVAL WITH THE OSCILLATING KNIFE

1 Switch on the oscillation knife. Sharpen the blade with a grinding stone from the tool manufacturer.

2 Insert the knife into the joint and cut out the joint material. Thick joints may require a two-step process.

3 Remove the cut sealant material from the joint as a continuous strip.

STEP 2: REPLACING OLD JOINTS

Old, damaged or detached sealants should be replaced to prevent water from penetrating between the rods and the substrate. Ideally, the old sealing material should be completely removed with a milling cutter.

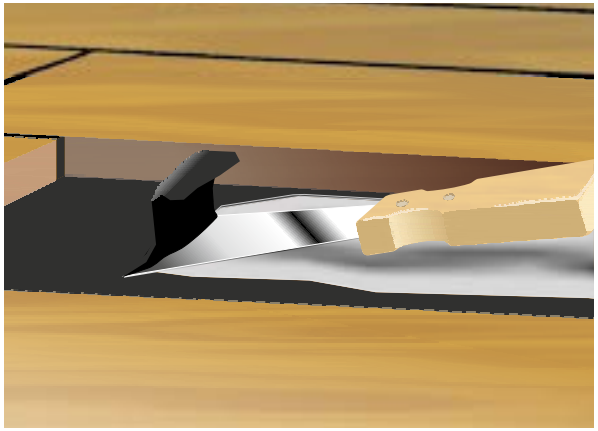
This prevents residues of the old sealant from causing adhesion problems if their chemical base is unknown. If the old sealant cannot be completely removed, an analysis of the old sealant should be carried out to rule out possible incompatibilities between the old and new sealant (see page 33). The cut-out triangular bead of old joint material is pulled out of the joint by hand.

REMOVING WITH THE ELECTRIC RUBBER CUT TOOL

1. Switch on RUBBER CUT.
2. Apply pressure to the cutting head in the cutting direction. The heat developing at the tip ensures that the old sealing material can be cut out.
3. Insert the tool and move it forward along the joint. Make sure that the strips on the joint faces are not damaged. If smoke develops, replace the cutting blade.
4. Remove the cut sealant material from the joint as a continuous strip.

RUBBER CUT tool with additional blades

Reference to Rema Tip Top



STEP 3: REPLACEMENT OF DEFECTIVE STRIPS

For proper processing, we recommend our product Sikaflex®-298. Alternatively, use Sikaflex®-291i.

REMOVAL OF CONVENTIONAL SEALANTS

1. Completely remove the sealing material from the joints around all strips to be removed (see "Removing the old sealing material" on page 33).
2. Mark the damaged strips with chalk.
3. Remove the damaged strips. Make sure not to damage the substrate. If a high-strength adhesive was used to embed the teak strips, the first strip in the row may need to be destroyed. Use the resulting gap to place a wedge so that the adjacent strips can be removed more easily.
4. If only some of the strips are to be replaced, cut out the damaged area with a vibration saw. Cut the new strip to size.
5. Remove old adhesives, embedding materials and other foreign substances from the substrate and clean all traces of joint sealant residue from the exposed joint faces using a cutter, scraper or sandpaper.
6. Sealant analysis (see page 33).

REMOVAL OF SILICONE AS SEALANT

1. If silicone was originally used as a sealant, the edges of the moulding should ideally be ground down with a milling machine to ensure complete removal of the silicone.
2. Fit the new strip for test purposes.
3. Clean the substrate and prime if necessary.
4. Prime all sides of the remaining strips and the new strip including the underside with Sika® Primer-290 DC or Sika® MultiPrimer Marine.
5. Flash-off time: Minimum 30 minutes to maximum 24 hours.
6. Apply and spread a sufficiently thick layer of Sikaflex®-298 surface adhesive to the deck.
7. Insert the replacement strip, embed it in the surface adhesive and carefully align and level it.
8. Hold the new strips in place with weights, screws or wedges.
9. Allow Sikaflex®-298 to cure for a minimum of 24 hours.
10. Caulk with Sikaflex®-290 DC PRO joint sealing compound. Ensure that no air is trapped in the joint and that the joint is slightly overfilled with the sealant.
11. The fresh sealant can be removed after 5 minutes with a spatula at an angle of 60° without pressure.
12. Allow Sikaflex®-290 DC PRO to cure.

IMPORTANT: If the deck is not being sanded, masking tape can be used for caulking.

Cutting the strips with a vibrating saw

Remove excess 290 DC PRO with an oscillating scraper

STEP 4: SANDING THE DECK

EXPLANATION OF THE WORK STEPS

1 To save sanding time, start by drawing off most of the uncured Sikaflex®-290 DC PRO with a spatula or by removing the cured material with an oscillating scraper.

2 An industrial wood sanding machine should be used for efficient sanding results. It is recommended to start with a medium-grit sandpaper (approx. 80). Suitable sanding machines are belt, flat or elastically mounted sanding machines.

3 One-handed sanders can be used for joins.

4 When the surface is evenly smooth, sand the entire area again with 120 grit sandpaper. If possible, the sanding machine should be guided in the direction of the wood grain.

5 Vacuum away abrasive dust.

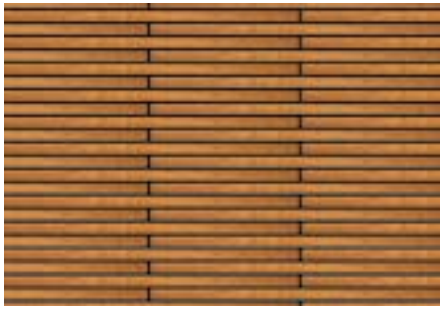
Belt sander

One-handed sander

Damaged area

Strips removed

Embedding the new strips



Repaired deck

2.1.7 ALTERNATIVES TO TEAK WOOD

INTRODUCTION

Teak has been used as a covering material for centuries because of its durability. Alternative wood species such as Iroko or Padouk usually require extensive protection to remain functional in the long term. These types of wood are usually used as thick protective floors on work ships.

New deck made of Kebony wood

Deck with aged Kebony wood

ALTERNATIVE WOOD SPECIES

ADVANTAGES:

- Not subject to any legal regulations (FSC label)
- Accepted price / durability of the deck

DISADVANTAGES

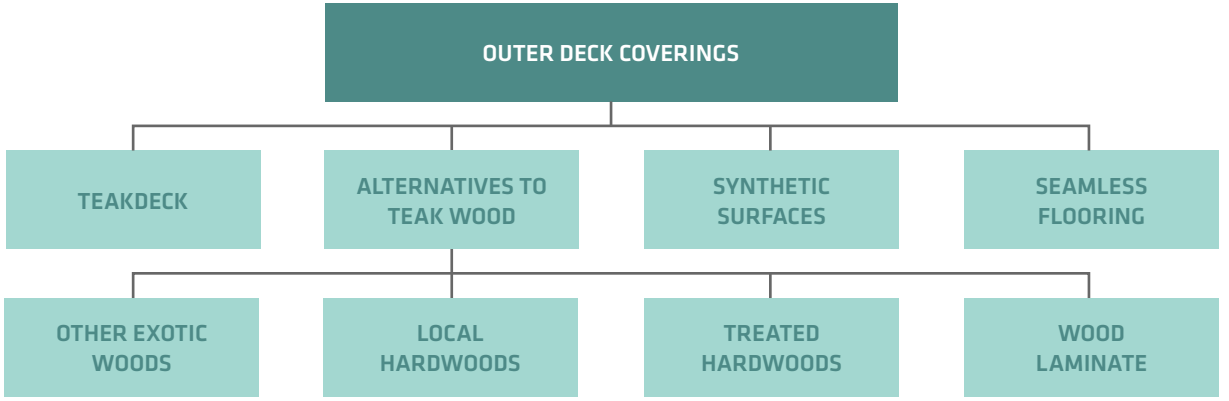
- Reduced durability
- Stronger shrinkage
- No long-term experience as deck coverings
- More irregular grain, e.g. due to alternating rotational growth etc.
- Regular deck inspection required

Surface pre-treatment is the same as for producing a teak deck (see chapter 2.1.2). Other alternative woods are Douglas fir, Afrormosia, Angélique, Cedro, Cordia, Khaya mahogany, Sipo mahogany, Diamond walnut, etc.

IMPORTANT: Alternative wood decks may exhibit irregular hygric movement. These wooden decks must be inspected regularly and any joint detachment must be repaired immediately.

Iroko (Kambala)

Padouk



TREATED HARDWOODS

Native deciduous trees are treated with natural or synthetic resins. One example of this is the maple wood Kebony treated with natural resins.

This achieves the following properties:

- Durability comparable to teak wood with the same colour change to grey-brown.
- Hardness and abrasion resistance higher than teak
- Expansion properties like teak

Surface pre-treatment and adhesives are identical to chapter 2.1.2.

WOOD LAMINATE

Synthetic teak consists of thin layers of teak wood bonded together. The advantage here is that all tree parts (heartwood and sapwood) can be used. Please contact the manufacturer for further information.

SYNTHETIC FLOOR COVERING

Synthetic Floor Coverings are made from various plastics. Quality and durability can differ, as can slip resistance and haptics.

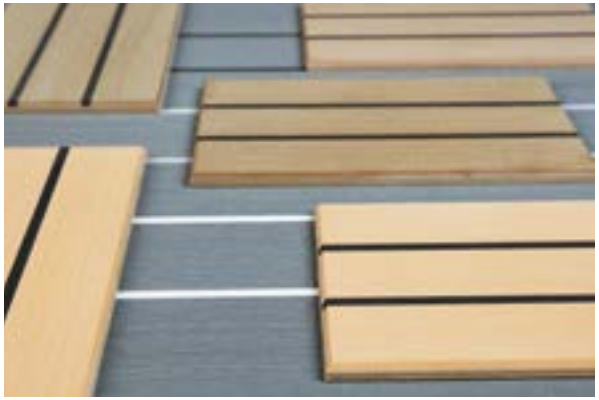
They are essentially divided into three types:

1. Polyurethane elastomers with carrier plate (e.g. Sikafloor® Marine-500 series)
2. Synthetic rubber compounds
3. PVC coverings

SPECIAL FEATURES OF PVC FLOOR COVERINGS

Most alternatives to teak decks are PVC-based; their exact composition varies from manufacturer to manufacturer. PVC coverings contain organic plasticisers, which can cause long-term interactions with the adhesive used.

> **!**
>
> **IMPORTANT:** Due to the wide variety of available deck coverings, we recommend contacting the manufacturer of the coverings or the Industry division of Sika.



Different designs

STEP 1: PRE-TREATMENT OF DECK COVERING

PRE-TREATMENT OF PUR-BASED DECK COVERING

1. The coating must not contain any release agents or other media used in the manufacturing process. Only remove them using a manufacturer-recommended solvent.
2. For non-absorbent deck coverings, the side to be bonded must be cleaned with Sika® Aktivator-100 using a clean, lint-free paper towel. The cloth must be replaced regularly.
3. Flash-off time: Minimum 10 minutes to maximum 2 hours.

STEP 2: SURFACE PRE-TREATMENT DECK

GRP DECKS

1. Pre-clean heavily soiled surfaces with a clean solvent such as Sika® Remover-208.
2. Lightly abrade the adhesive surface with a very fine non-woven abrasive pad.
3. Vacuum away abrasive dust.
4. Pre-treat the substrate with Sika® Aktivator-100 using a clean, lint-free paper towel. The cloth must be replaced regularly.
5. Flash-off time: Minimum 10 minutes to maximum 2 hours.

ALUMINIUM OR STEEL MATERIALS COATED WITH 2K PAINT - REFIT

1. Before use, make sure that the deck material is workable and compatible with Sikaflex®-298. Otherwise, the surface to be processed must be sanded down to the metal surface. Further pre-treatment is then carried out in accordance with the pre-treatment for aluminium or steel decks (see above).
2. Pre-treat the substrate with Sika® Aktivator-100 using a clean, lint-free paper towel. The cloth must be replaced regularly.
3. Flash-off time: Minimum 10 minutes to maximum 2 hours.

ALUMINIUM OR STEEL DECKS

1. Steel: Adhesive surface according to ISO 8501-1: Sand 1996 SA 2.5 with an abrasive paper (36 grit) or sandblast.

   Aluminium: Lightly sandblast adhesive surface.
2. Vacuum away abrasive dust thoroughly.
3. Clean contaminated surfaces with Sika® Aktivator-205 using a clean, lint-free paper towel. The cloth must be replaced regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. The adhesive surface must not be contaminated with dust or other dirt until the next work step.
6. Apply a continuous layer of a two-component corrosion protection coating (e.g. with SikaCor® ZP Primer) within 2 hours after pre-treatment with Sika® Aktivator-205 using a clean brush or roller with a consumption of approximately 200 g/m^2 or in a layer thickness of 80 µm.

WOODEN DECKS

1. Abrade adhesive surface with a non-woven abrasive pad (80/100 grit).
2. Vacuum away abrasive dust.
3. Apply Sika® Primer-290 DC or Sika® MultiPrimer Marine thinly but opaquely with a clean brush, a wool felt applicator or a foam applicator.
4. Flash-off time: Minimum 30 minutes to maximum 24 hours.

STEP 3: BONDING

EXPLANATION OF THE WORK STEPS

1 Apply Sikaflex®-298 to the pre-treated surface and spread it with a toothed spatula (4 mm). The layer thickness should be around 1.2 mm (approx. 2 × 600 ml sausages per m^2).

2 The deck covering must be positioned within 20 to 30 minutes after the adhesive has been applied. Therefore, adhesive should only be applied to an area on which deck covering can be applied within this time. Air bubbles must be avoided.

3 Once the deck covering is positioned, it should be peeled off from the centre outwards with a rubber roller to remove air bubbles and push out excess adhesive under the edges. This can then be removed.

Please note that: If the deck covering is laid under tension, the edges must be weighted accordingly.

4 Fix the deck overnight with weights or a vacuum press.

5 Uncured Sikaflex® can be removed from tools with Sika® Remover-208. On rough surfaces, we recommend allowing the adhesive to cure and then removing it mechanically.

2.2 GENERAL OUTDOOR APPLICATIONS

2.2.1 BONDING OF WOODEN COMPONENTS

INTRODUCTION

Sikaflex® adhesives and sealants vary in viscosity from paintable, self-levelling liquids to highly viscous, resistant pastes and are selected according to the application and required functional properties. The products are available in cartridges, sausage, tubes, hobbocks and drums and can be processed by hand or by means of commercially available manual pressure, air pressure or cordless guns. Pneumatically or hydraulically operated pump systems are used when working with hobbocks and drums.

The choice of container shape depends on the cycle frequency, the quantity to be processed and the ambient application conditions. Compressed air or cordless guns are particularly suitable for applying long continuous adhesive beads, such as for the deck-to-hull joint, as they enable continuous and jerk-free dispensing, for example when working with high-viscosity products such as Sikaflex®-292i or Sikaflex®-296.

STEP 1: SURFACE PRE-TREATMENT

GRP SURFACES

1. Clean heavily soiled adhesive surfaces with Sika® Remover-208 to remove the coarsest dirt.
2. Grind adhesive surface with a non-woven abrasive pad and vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply a thin but covering layer of Sika® MultiPrimer Marine to the bonding surface using a clean brush, melamine foam or felt applicator.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

STAINLESS STEEL, E.G. LADDERS

1. Heavily soiled adhesive surfaces can be cleaned with Sika® Remover-208 to remove the coarsest dirt.
2. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.

MATERIALS COATED WITH 2K PAINT MADE OF WOOD, ALUMINIUM OR STEEL - REFIT

1. Before use, make sure that the deck material is workable and compatible with Sikaflex®-298. Otherwise, the surface to be processed must be sanded down to the metal surface and pretreated with a 2-component corrosion protection coating (e.g. with SikaCor® ZP Primer).
2. Treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
3. Flash-off time: Minimum 10 minutes to max. 2 hours.

UNTREATED WOOD

1. Grind the adhesive surface on the deck with a non-woven abrasive pad (80/100 grit).
2. Vacuum away abrasive dust.
3. Apply a thin but covering layer of Sika® Primer-290 DC or Sika® MultiPrimer Marine to the adhesive surface with a felt roller.
4. Flash-off time: Minimum 30 minutes to max. 24 hours.

IMPORTANT: For the pre-treatment of other substrates, please refer to the pre-treatment table for Sika Marine applications on page 70.

STEP 2: BONDING OF WOODEN COMPONENTS

The nature of the wooden component determines which product is used:

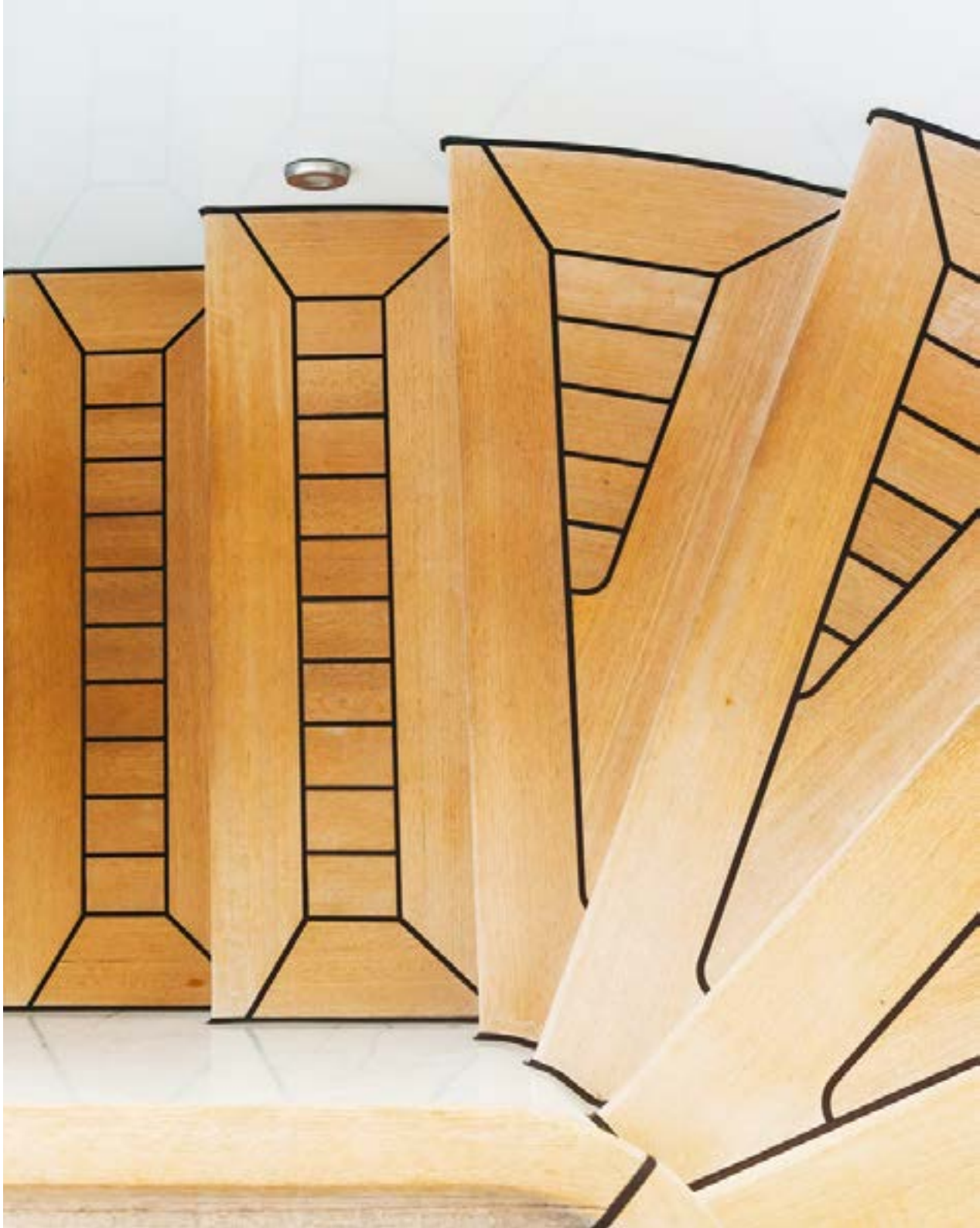
Large horizontal surfaces

Ideally, use Sikaflex®-298 or Sikaflex®-291i. Thanks to the low viscosity, the products can be spread easily with a toothed trowel.

Vertical substrates

Sikaflex®-291i adhesive is only used on vertical surfaces.

EXPLANATION OF THE WORK STEPS	
1	Apply the product to the substrate and distribute it across the surface with a toothed spatula (4 mm). The layer thickness should be at least 1.2 mm (2 × 600 ml sausage per m^2). Non-flat bonding is done with a triangular bead.
2	Join the wooden part within 15 minutes after applying the adhesive. For this reason, it is advisable to only wet one surface with adhesive that can be processed within this time. The joined structure shall be fixed for at least 24 hours without further processing.



2.2.2 BONDING AND SEALING OF FITTINGS

APPLICATION DESCRIPTION

Deck fittings must be absolutely watertight, some are exposed to high forces such as tensile, shear ortorsional movements. Leaks can cause considerable damage such as corrosion, osmosis or leaks.

EMBEDDING AND SEALING OF MECHANICALLY HIGHLY STRESSED FITTINGS

Embedding and deck fittings such as chain plate, jib lead or Genoa rails, winches and deflection rollers must withstand strong dynamic forces. It is therefore advisable to use a high-performance adhesive such as Sikaflex®-292i as a supplement to mechanical fastening. Sealing of fittings subject to high mechanical loads

EMBEDDING AND SEALING OF FITTINGS SUBJECT TO LESS MECHANICAL LOADS

Deck fittings such as ventilation flaps or cover strips must be sealed first of all, but are not otherwise exposed to high forces. These fittings can be sealed with Sikaflex®-291i or Sikaflex®-295 UV or Sikaflex®-591 for visible joints.

STEP 1: SURFACE PRE-TREATMENT

Mask off surrounding surfaces with masking tape for protection before surface pre-treatment and application of adhesive. Refer to the Sika Marine pre-treatment table on page 70.

BRONZE, BRASS OR STAINLESS STEEL FITTINGS IN COMBINATION WITH SIKAFLEX®-591

1. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
2. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly. Check compatibility in advance.
3. Flash-off time: Minimum 10 minutes to max. 2 hours.
4. Apply a thin but full-coverage layer of Sika® MultiPrimer Marine to the adhesive surface with a clean brush or felt applicator.
5. Flash-off time: Minimum 30 minutes to max. 24 hours.

WOODEN DECKS

1. Grind the adhesive surface on the deck with a non-woven abrasive pad (80/100 grit).
2. Vacuum away abrasive dust.
3. Apply a thin but covering layer of Sika® Primer-290 DC or Sika® MultiPrimer Marine to the adhesive surface with a felt roller.
4. Flash-off time: Minimum 30 minutes to max. 24 hours.

PAINTED DECKS

1. Pre-treat the surface with Sika® Aktivator-100 or, if Sikaflex®-591 is used, with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly. Check compatibility in advance.
2. Flash-off time: Minimum 10 minutes to max. 2 hours.

ALUMINIUM FITTINGS

1. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
2. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly. Check compatibility in advance.
3. Flash-off time: Minimum 30 minutes to max. 24 hours.

STEP 2: BONDING AND SEALING THE FITTINGS

Product recommendation for mechanically loaded fittings: Sikaflex®-292i product recommendation for mechanically low stressed fittings: Sikaflex®-291i for non-visible sealing joints, Sikaflex®-295 UV or Sikaflex®-591 for visible sealing joints.

EXPLANATION OF THE WORK STEPS

1	Apply adhesive to the deck and into the fixing holes provided in the necessary layer thickness. Then position the fittings and embed them in the adhesive.
2	Carefully tighten the mounting bolts until the adhesive still has a layer thickness of at least 1 mm.
3	Remove excess adhesive with a flexible plastic spatula and remove masking tape.
4	Do not tighten the bolts until after 24 hours.

IMPORTANT: For non-ferrous metals, use only Sikaflex®-295 UV or Sikaflex®-591 in combination with Sika® Aktivator-205 or Sika® MultiPrimer Marine. For more information, see page 70 in the Sika Marine pre-treatment table.

IMPORTANT: When working with fittings or decks made of materials not described here, please refer to the Sika Marine pre-treatment table on page 70.

Working with Sikaflex®-591

Selection of different clamps that can be sealed or bonded with Sikaflex®

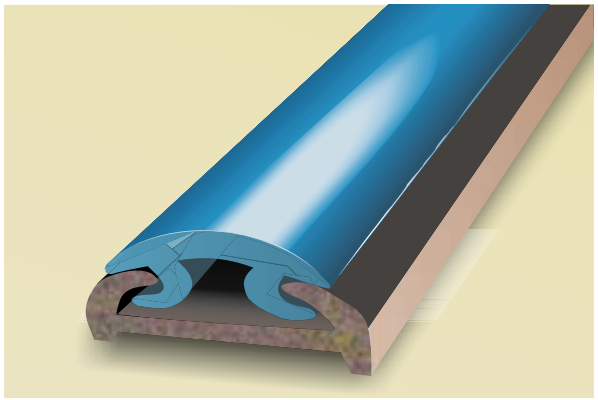
2.2.3 BONDING OF RUB RAILS

APPLICATION DESCRIPTION

Rub rails protects the hull from damage. They are primarily designed to absorb shocks and abrasion loads and to provide the most elastic suspension possible.

By using an elastic adhesive joint, for example, the impact resistance of the joint can be significantly improved so that the hull is optimally protected. With the elastic adhesive Sikaflex®-292i, rub rails made from common materials such as wood, PVC or PUR can be attached with high strength. Loads occurring during attachment and removal manoeuvres are largely absorbed. With screw-fastened rails, a comparable effect can be achieved by backfilling the rub rails with the highly elastic sealant Sikaflex®-291i. In addition to absorbing the torsional movements, this seals the bolt holes and prevents water or dirt from penetrating the rub rails.

IMPORTANT: Also observe the current product data sheet and safety data sheet. These can be downloaded from **www.sika.com/marine**.



Section (example) of a rub rail

STEP 1: SURFACE PRE-TREATMENT

GRP HULL

1. Clean heavily soiled adhesive surfaces with a clean solvent (Sika® Remover-208) to remove the coarsest dirt.
2. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply a thin but full-coverage layer of Sika® MultiPrimer Marine to the adhesive surface with a clean brush or felt applicator.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

ALUMINIUM OR STEEL HULL COATED WITH 2-COMPONENT PAINTS OR VARNISHES

1. Treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
2. Flash-off time: Minimum 10 minutes to max. 2 hours.
3. For bonding, apply Sika® Primer-209 D using a clean brush or felt applicator thinly but opaquely covering the adhesive surface.
4. Flash-off time: Minimum 10 minutes to max. 24 hours.

WOODEN RUB RAILS

1. Sand the adhesive surface on the deck with a non-woven abrasive pad (80/100 grit). Vacuum away abrasive dust.
2. Apply Sika® Primer-290 DC or Sika® MultiPrimer Marine with a clean brush or felt roller thinly but opaquely covering the adhesive surface.
3. Flash-off time: Minimum 30 minutes to max. 24 hours.

MOULDED PVC OR POLYURETHANE RUB RAILS

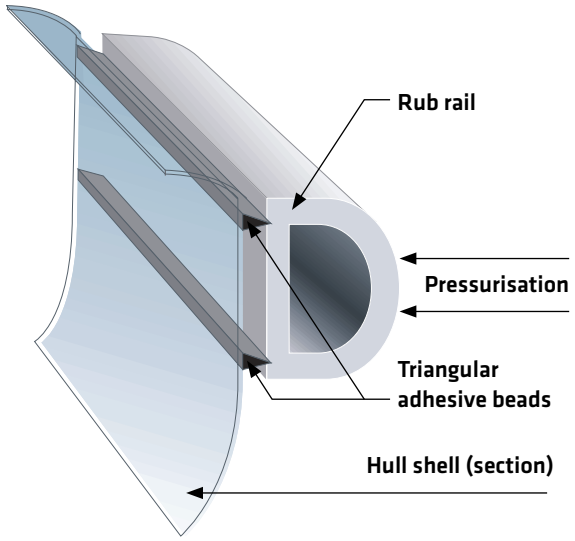
1. The bonding surface of the rub rails must be free of release agents or other substances that impair adhesion. All traces of such substances must be removed before working with Sika® Remover-208.
2. Sand the rub rails with a coarse sandpaper (60/80 grit) to roughen the surface.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly. Check compatibility in advance.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply Sika® Primer-290 DC with a clean brush or felt roller thinly but opaquely covering the adhesive surface.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

STEP 2: BONDING THE RUB RAILS

For proper processing, we recommend our product Sikaflex®-292i. Alternatively, you can also use Sikaflex®-291i.

EXPLANATION OF THE WORK STEPS

1	Position elastic spacers with a thickness of approx. 2 mm and a hardness grade Shore A (approx. 50).
2	Apply Sikaflex®-292i (or Sikaflex®-291i if rub rails are fixed using additional mechanical fixing) to the adhesive surface with a suitable bead profile.
3	Install the rub rail within 20 minutes after applying the adhesive.
4	Press on the rub rail or press onto the pre-profiles and fix in place.
5	While the adhesive is curing, fix the rub rails in place with clamps or other fixing aids. If additional screwing is required, the screw holes must also be filled with the adhesive.
6	Remove excess adhesive and masking tape. Uncured Sika adhesive and sealant residues can be removed with Sika® Remover-208.
7	Clamps and other fixation aids can be removed after 24 hours.
8	Full load-bearing capacity is reached after approx. 7 days.



Design of a rub rail

Bonding of the rub rail with Sikaflex®-292i

2.3 INTERIOR APPLICATIONS

2.3.1 BONDING OF LIGHTWEIGHT PANELS IN INTERIOR FITTINGS

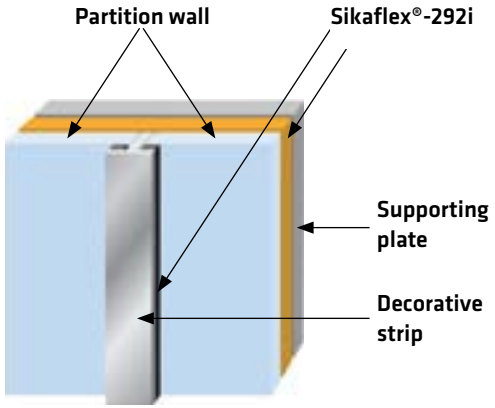
APPLICATION DESCRIPTION

Lightweight panels are usually manufactured as sandwich wood panel composites with foamed polyurethane anchors. They are particularly suitable as partition walls for cabins or storage spaces due to their low weight compared to solid wood panels and their sound-absorbing properties.

Due to their foam core, the sandwich panels cannot be mechanically mounted to the hull shell, unlike conventional plywood panels. Therefore, bonding with Sikaflex®-292i is an ideal fastening method that absorbs both movement and other stresses to which the component is subjected.

The uniform dissipation of the acting forces prevents damage that can occur at voltage peaks.

Bonding of the panels with Sikaflex®-292i is recommended by the lightweight panel manufacturers.



Sikaflex®-292i application

STEP 1: SURFACE TREATMENT

For pre-treatment, please refer to the pre-treatment table for Sika Marine applications on page 70.

Sikaflex®-292i on a lightweight plate before bonding

STEP 2: BONDING OF LIGHTWEIGHT PANELS IN INTERIOR FITTINGS

For processing, we recommend our one-component polyurethane adhesive Sikaflex®-292i.

EXPLANATION OF THE WORK STEPS	
1	Fit the panels dry, make sure they fit correctly and pre-treat the corresponding surfaces.
2	Place spacer for adhesive layer thickness (thickness approx. 3 mm, hardness Shore A approx. 50).
3	Apply a sufficient amount of Sikaflex®-292i in the correct bead shape on the bonding surface.
4	Assemble the components within 20 minutes after applying the adhesive.
5	Uncured Sika adhesive and sealant residues can be removed with Sika® Remover-208.
6	If necessary, fix the plates with a clamping device during the adhesive curing.
7	After 24 hours, clamps or other fixation aids can be released.

IMPORTANT: Also observe the current product data sheet and safety data sheet. These can be downloaded from **www.sika.com/marine**.

2.3.2 BONDING OF DECORATIVE PANELS AND WORK SURFACES

APPLICATION DESCRIPTION

A variety of conventional and modern materials such as mirror glass, Avonite® or Corian® are often used for the interior of yachts. They are made into decorative or work surfaces. For both areas of application, the elastic bonding technology represents a simple and permanent installation method without having to use visible and less visually appealing fasteners.

The correct pre-treatment method for the wide range of materials used for decorative panels and work surfaces can be found in the pre-treatment table for Sika Marine applications on page 70.

If any of the materials to be processed are unknown, preliminary bonding tests are essential in order to identify the correct adhesive and the appropriate pre-treatment method.

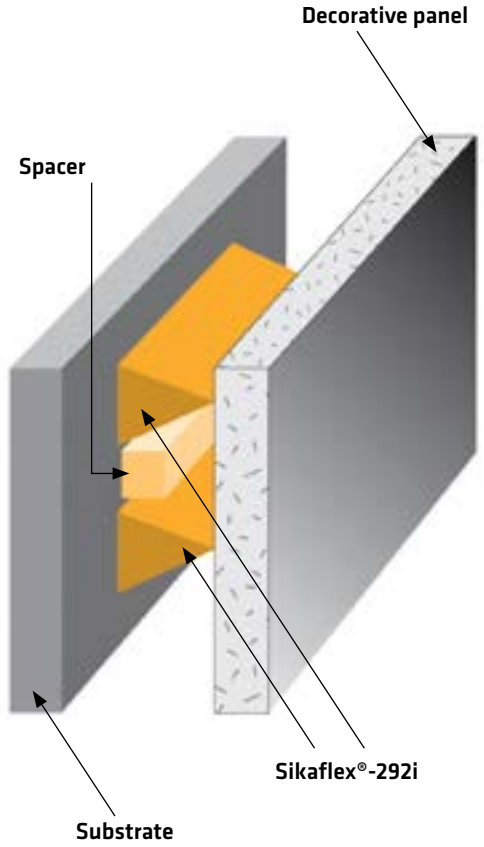
VERTICAL DECORATIVE PANELS AND WORKTOPS

For processing, we recommend our one-component polyurethane adhesive Sikaflex®-292i.

EXPLANATION OF THE WORK STEPS

1. Surface pre-treatment according to Sika Marine pre-treatment table, page 70. Place spacer for adhesive layer thickness (thickness 2 mm, hardness Shore A approx. 50).
2. Apply a sufficient number of parallel beads of Sikaflex®-292i with an approximately 8 x 10 mm triangular nozzle.
3. Assemble the components within 20 minutes after applying the adhesive.
4. If necessary, fix the plates with a clamp or other fixation aids during curing.
5. Clamps and other fixation aids can be removed after 24 hours.
6. Immediately remove residues of uncured Sika adhesives and sealants with Sika® Remover-208.

IMPORTANT: Also observe the current product data sheet and safety data sheet. These can be downloaded from **www.sika.com/marine**.



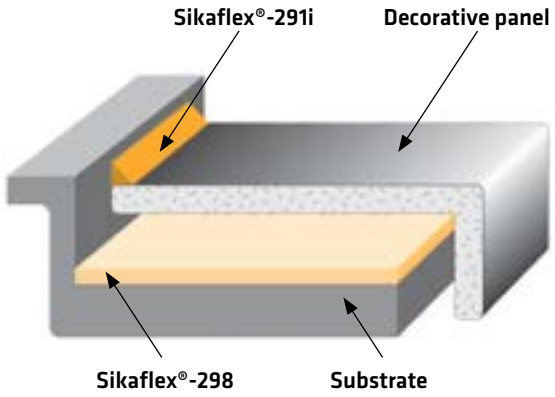
Vertical bonding of decorative panels

HORIZONTAL DECORATIVE PANELS AND WORKTOPS

For flat substrates we recommend Sikaflex®-298 or Sikaflex®-298 FC. Sikaflex®-291i is recommended for inclined beams.

EXPLANATION OF THE WORK STEPS

1	Surface pre-treatment according to Sika Marine pre-treatment table, page 70. Fit the panels dry beforehand. Apply adhesive to the pre-treated primer coat and spread it across the surface using a triangular toothed spatula (4 mm). The coating thickness depends on the surface tolerances. However, it is usually 1 to 2 mm. Gap and indentations must be filled.
2	For diffusion-tight materials, the adhesive should be moistened with a fine spray mist (approx. 1 g water per m^2) to ensure faster curing.
3	The deck panel must be positioned within the skin formation time of the adhesive and then pressed lightly to remove air pockets.
4	Clamps, weights or screws can be used to secure the plates while the adhesive is curing and can be removed after curing. Alternatively, the vacuum press can be used.
5	After approx. 24 hours, sufficient strength is built up and the clamping devices can be removed.



Surface bonding of decorative panels

Sikaflex® applications in restaurants

Application of Sikaflex®-291i

2.4 ASSEMBLY

2.4.1 DECK-TO-HULL BONDING

APPLICATION DESCRIPTION

The most critical connection of a boat is probably the one between the deck and the hull. Sika's elastic single-component adhesives offer numerous advantages for both designers and boat builders. For boat builders, it is no longer critical to have the right adhesive system if the deck and hull are made of different materials. Nevertheless, they can be joined together to form a component that is both stable and durable.

The connection surface between the two components does not necessarily have to be level, as smaller deviations are compensated for by the tolerance-compensating, gap-filling properties of the adhesive. Due to the strength of the adhesive, mechanical connections are not necessary. Its elasticity also ensures that stresses and loads due to temperature changes, shocks and torsional forces can be absorbed. For the boat builder, the assembly techniques are simple and standardised. The elastic bonding technology eliminates the need for complex lamination work. It also provides reliable protection against water ingress.

If mechanical fixings are omitted, the surfaces do not need to be drilled and subsequently resealed. Apart from this, you save time for drilling, setting and tightening the screws.

STEP 1: SURFACE TREATMENT

ALUMINIUM OR GRP	
1	Clean heavily soiled adhesive surfaces with Sika® Remover-208 to remove the coarsest dirt.
2	Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3	Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4	Flash-off time: Minimum 10 minutes to max. 2 hours.
5	Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6	Flash-off time: Minimum 30 minutes to max. 24 hours.

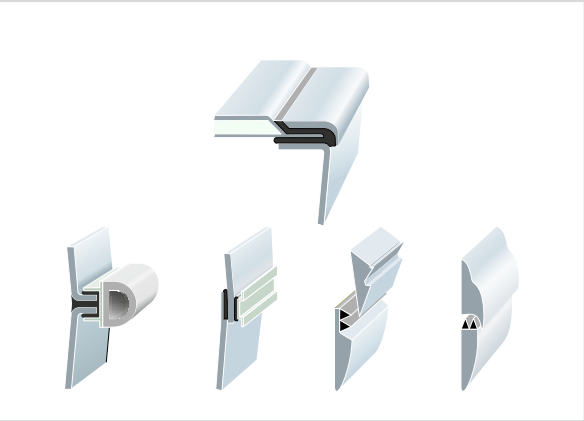
IMPORTANT: When working with materials not described here, please refer to the pre-treatment table for Sika Marine applications on page 70.

STEP 2: DECK-TO-HULL BONDING

For processing, we recommend our one-component polyurethane adhesive Sikaflex®-292i.

It is possible to speed up this step by using Sikaflex®-268 PowerCure or Sikaflex®-268 + SikaBooster® P-50. Please contact the Industry division of Sika.

IMPORTANT: Please check the correct fit of the joining parts before bonding to avoid a tedious correction of the joint.



Examples of deck-to-hull bonding

EXPLANATION OF THE WORK STEPS

1. Elastic spacers with a thickness of at least 4 mm and a hardness Shore A of approx. 50. Alternatively, these can also be applied after the adhesive has been applied.
2. Apply Sikaflex®-292i in a continuous bead of glue in a zigzag pattern all around the circumference of the hull shell. The amount of adhesive depends on the width of the bonding surface. Completely embed existing recesses and holes (e.g. for deck supports, pipes or putting irons) in adhesive to ensure water-tight connections.
3. Join the components within 20 minutes after applying the adhesive.
4. Use clamps or other fixing aids to press the deck and hull part down to the thickness of the spacers.
5. Clamps and other fixing aids can be removed after 24 hours. Full load-bearing capacity is reached after approx. 7 days.
6. Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.

Sikaflex®-292i is applied in a thick layer on the bonding surface

A locating pin helps to accurately align the adhesive bead

2.4.2 KEEL-TO-HULL BONDING

APPLICATION DESCRIPTION

The connection between the keel and hull is exposed to extremely high stresses, especially when sailing, when "dry falling" or in the event of possible grounding. This connection must therefore be planned and executed very carefully so that it can withstand the loads that occur. This special connection tends to be leaky. Rust stains on the keel only show the leaks after the boats have been taken out of the water.

IMPORTANT: Also observe the current product data sheet and safety data sheet. These can be downloaded from **www.sika.com/marine**.

STEP 1: SURFACE TREATMENT

ALUMINIUM HULL COATED WITH 2-COMPONENT PAINT

1. Clean heavily soiled adhesive surfaces with Sika® Remover-208 to remove the coarsest dirt.
2. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.

GRP HULL

1. Clean heavily soiled adhesive surfaces with Sika® Remover-208 to remove the coarsest dirt.
2. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

STEEL HULL AND STEEL KEEL COATED WITH 2-COMPONENT CORROSION PROTECTION

IMPORTANT: Before use, make sure that the hull and keel coatings are workable and compatible with the corresponding Sika® adhesive system. Otherwise, it must be completely removed and replaced with a 2-component epoxy resin paint.

1. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
2. Flash-off time: Minimum 10 minutes to max. 2 hours.

IMPORTANT: Lead keels must be coated with a 2-component epoxy resin protective varnish at the connection point.

For pre-treatment of other substrates, please refer to the pre-treatment table for Sika Marine applications on page 70.

STEP 2: KEEL-TO-HULL BONDING

PRODUCT RECOMMENDATION: SIKAFLEX®-292i

1 Position elastic spacers with a thickness of approx. 10 m and a hardness Shore A of approx. 50.

2 Apply a sufficient amount of Sikaflex®-292i. Each adhesive bead must form a continuous, closed ring without gaps. The same applies to the beads that are drawn around the bolt holes.

3 The keel must then be lifted and the keel bolts tightened up to the spacers. Always observe the open time of Sikaflex®-292i. The escaping adhesive can be smoothed out.

4 Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.

5 After 3 to 4 days, the keel bolts must be tightened. The additional contact pressure on the adhesive ensures the final torsional stiffness of the keel-to-hull joint. After the adhesive has cured, the sealing joint can be coated with a commercially available 2K-EP primer and then with a commercially available antifouling according to the manufacturer's specifications. The sealing joint absorbs the dynamic loads and forms an absolutely watertight keel-to-hull joint.

ALTERNATIVE FOR PROFESSIONAL USERS ONLY: SIKAFLEX®-268 POWERCURE

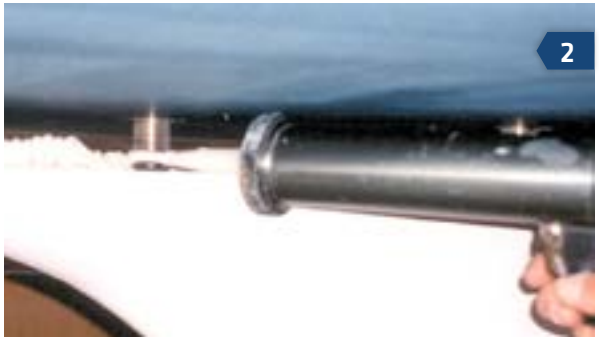
1 Position elastic spacers with a thickness of approx. 10 mm and a hardness Shore A of approx. 50.

2 Apply sufficient amount of Sikaflex®-268 PowerCure. Each adhesive bead must form a continuous, closed ring without gaps. The same applies to the beads that are drawn around the bolt holes.

3 The keel must then be lifted and the keel bolts tightened up to the spacers. The open time according to the product data sheet must be observed. The excess adhesive can be smoothed out within the open time.

4 The residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.

5 When bonding with Sikaflex®-268 PowerCure, the keel bolts can be tightened after just 4 hours. The additional contact pressure on the adhesive ensures the final torsional stiffness of the keel-to-hull joint. After the adhesive has cured, the sealing joint can be coated with a commercially available 2K-EP primer and then with a commercially available antifouling according to the manufacturer's specifications. The sealing joint absorbs the dynamic loads and forms an absolutely watertight keel-to-hull joint.



1 **Gently push the keel into the desired position**
2 **Adhesive application**
3 **The connection joint is completed**

2.4.3 BONDING OF FLYBRIDGE STRUCTURES

APPLICATION DESCRIPTION

Many modern motor yachts have flybridges. The advantage of elastically bonded Flybridge constructions is that they prevent stress peaks and thus prevent damage to the structure. Thanks to their elastic properties, they also prevent material fatigue that can occur due to permanent stress.

At high speeds, flybridges are exposed to enormous stress. Due to its dynamically high load-bearing capacity, Sikaflex®-292i is perfectly suited for this application. The weather-resistant sealants Sikaflex®-295 UV or Sikaflex®-591 in white are suitable for permanent visual enhancement of the connection joint.

Modern motor yacht with elastically bonded flybridge construction

STEP 1: SURFACE TREATMENT

GRP SURFACE	
1	Clean heavily soiled adhesive surfaces with Sika® Remover-208 to remove the coarsest dirt.
2	Grind adhesive surface with a very fine non-woven abrasive pad (80 grit). Vacuum away abrasive dust.
3	Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4	Flash-off time: Minimum 10 minutes to max. 2 hours.
5	Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6	Flash-off time: Minimum 30 minutes to max. 24 hours.

IMPORTANT: When working with fittings or decks made of materials not described here, please refer to the pre-treatment table on page 70.

STEP 2: DECK-TO-HULL BONDING

PRODUCT RECOMMENDATION: SIKAFLEX®-292I	
1	Position elastic spacers with a thickness of approx. 3 mm and a hardness Shore A of approx. 50.
2	Apply a suitable amount of Sikaflex®-292i around the entire circumference of the flybridge. For higher loads, pull an additional bead.
3	Join the components within 20 minutes after applying the adhesive.
4	Use clamps or other fixing aids to press adhesive down to the thickness of the spacers.
5	Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.
6	For visible joints, Sikaflex®-292i can be covered with a layer of Sikaflex®-295 UV or Sikaflex®-591 (after curing of Sikaflex®-292i).
7	Clamps and other fixing aids can be removed after 24 hours. Full load-bearing capacity is reached after approx. 7 days.

2.5 DIRECT GLAZING

2.5.1 INTRODUCTION

INTRODUCTION

The evolution of traditional glazing methods has always been linked to the performance of the panes. Thus, the essential task of a rigid frame was to hold the pane and protect it from the effects of dynamic or mechanical forces. In addition, the size of the panes was limited and any damage in the event of glass breakage seriously reduced safety for the entire ship.

In addition to this, legal provisions apply which specify exactly where the use of adhesives is permitted and where additional mechanical connections must be installed. If a ship is subject to regulations such as IMO or SOLAS, it makes sense to contact classification societies.

Today, both mineral and plastic glasses are used in modern shipbuilding. The manufacturing processes now allow high-performance letters to be produced in almost unlimited sizes, shapes and curvatures, giving designers a great deal of design freedom for their ideas of a modern watercraft.

As a result, the primary task of the window as protection against the forces of nature and as a light inlet has been expanded to include another component. Bonding in direct glazing has now established itself as the first choice, not least due to a whole range of advantages.

ADVANTAGES OF DIRECT GLAZING:

- Better protection against the forces of nature
- Significantly greater design freedom for yacht and ship designers thanks to the option of eliminating panels, frames or screws
- Larger window areas
- Weight saving ensures lower operating costs due to lower fuel consumption, among other things
- Material savings ensure lower manufacturing costs and faster processing times
- Improved rigidity of the entire watercraft
- Sound and vibration dampening for more comfortable travel conditions
- Improved aerodynamics reduce wind noise, among other things
- Bridging tolerances
- Significantly shorter production times and thus lower labour costs and faster delivery
- Less glass breakage both in production and in operation
- Easy repair worldwide – not least thanks to Sika's worldwide presence

DESIGN SPECIFICATIONS

Direct glazing is a straightforward process in which the glass is bonded directly to the ship's structure. The relevant legal regulations and industry standards must be taken into account.

UV PROTECTION

The adhesive surface must be protected against UV radiation, otherwise the adhesion will be attacked and destroyed. This is usually achieved by applying an opaque cover directly to the glass. Examples of suitable UV protection:

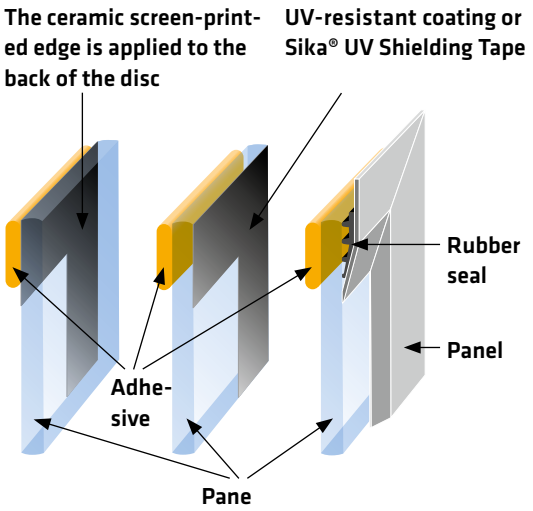
- Ceramic screen-printed edge, circumferentially around the mineral glass pane
- UV-resistant lacquer or paint for plastic glass panes
- Exterior panel
- Sika® UV Shielding Tape

The black screen-printed edge of the pane is often feathered towards the centre of the pane in order to achieve a visually interesting shadow effect. If it serves to improve the overall appearance, an external panel can also be used to protect against UV light.

See page 60 for adhesive layer sizing.

SELECTION OF PRODUCTS

	WINDSCREEN BONDING	SEALING JOINT
MINERAL GLASS (SINGLE GLAZING)	Sikaflex®-296 Sikaflex®-268 PowerCure	Sikaflex®-296
MINERAL GLASS (DOUBLE GLAZING)	Sikaflex®-296 Sikaflex®-268 PowerCure	Sikasil® WS-605 S
PLASTIC GLASS	Sikaflex®-295 UV	Sikaflex®-295 UV
MINERAL GLASS (INSULATING GLASS)	Sikaflex®-296 Sikaflex®-268 PowerCure	Sikasil® WS-605 S
MINERAL GLASS (LAMINATED)	Sikaflex®-296 Sikaflex®-268 PowerCure	Sikaflex®-296



Suitable UV protection measures

SIKAFLEX®-268 POWERCURE ADHESIVE SYSTEM

Sikaflex®-268 PowerCure is an accelerated adhesive system. Curing of Sikaflex®-268 PowerCure is accelerated by Sika's PowerCure technology and is therefore largely independent of environmental conditions.

Further information:
www.sika.com/powercure

INSTALLATION DIMENSIONS

Not only must the pane fit into the recess provided for installation, but it must also be taken into account that the entire structure of the watercraft moves and twists during operation. The design of the joint geometry shall take into account the basic rules of joint calculation developed by Sika. If movements of the deck structure can be ignored, use the following dimensioning recommendations. Classification association recommendations and regulations must always be observed.

ADHESIVE SURFACE

The overlap area of the frame and glass is the adhesive surface. Make sure it is wide enough to hold a sufficient amount of glue to bear the weight of the pane and withstand water pressure and suction load.

GAP FILLING

Sufficient space should be left between the edge of the pane and the border to compensate for movements or different length expansions.

SURFACE PRE-TREATMENT

Please observe the correct pre-treatment for all materials in use (glass pane, substrate), in particular the flash-off times for the pre-treatment agents used. Make sure to stay within the coordinated, verified Sika system. The use of third-party products is not recommended.

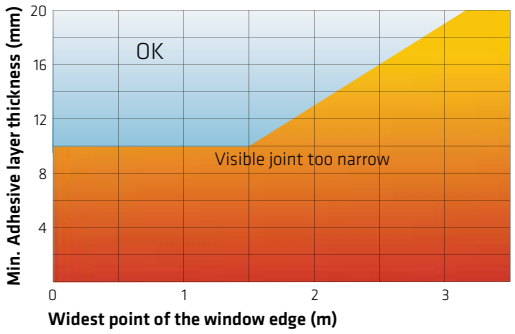
WINDOW SEALING

Caulking the gap between window and frame with Sikaflex® products serves both visual and technical purposes. Process the surfaces in exactly the same way as for bonding. On the one hand, the window sealant protects the adhesive from standing water, and on the other hand, it visually enhances the window. The joint must be completely filled; there must be no gap between the adhesive bead and the joint. The figure in the top right-hand side illustrates the required visual gap dimensions for mineral glass panels when using Sikaflex®-295 UV or Sikaflex®-296. This can also be taken into account for plastic glass panes with the exception of plastic glass panes that come into contact with each other (bottom right). Due to the thermal expansion of both panes, the visible joint must be twice the width.

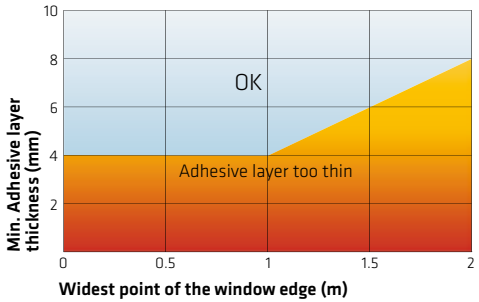
ADHESIVE LAYER THICKNESS

The adhesive needs to be permanently elastic to be able to divert dynamic, thermal and weather-related influences on the overall structure. See the diagram on the right for dimensioning and page 10 for suitable tools.

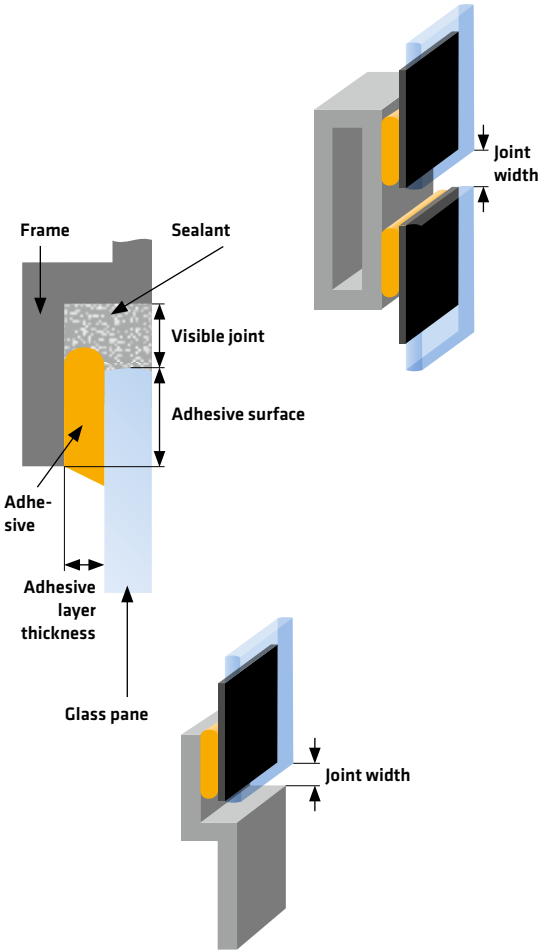
Ratio of visible frame joint to window size



Ratio of adhesive layer thickness to window size



ADHESIVE JOINT PARAMETERS



2.5.2 INSTALLATION OF PLASTIC GLASS PANES

APPLICATION DESCRIPTION

The plastic glass commonly used in boat construction are made of transparent or dyed polymethyl methacrylate (PMMA) or polycarbonate (PC).

These plastic glasses have specific properties that must be taken into account before processing or bonding. Generally, plastic glass tend to form stress cracks if not processed properly. Choosing the wrong adhesive can further increase this risk.

In contrast to mineral glass, plastic glasses have higher thermal length expansion coefficients. For this reason, a minimum 8 mm circumferential joint must be planned in the design between the window rebate and the window pane, which absorbs the thermally-induced movements. Likewise, if any bolt holes are present, the diameter of the hole must be larger than the bolt diameter.

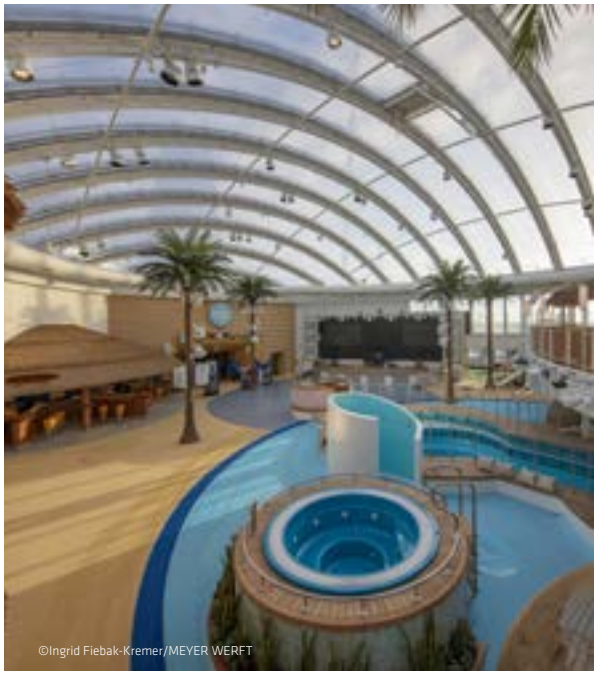
Due to the risk of stress cracking, flat panes may only be installed flat and not be bent by mechanical fixing. Curved windows must be prefabricated and tempered by a plastic glass processing company to ensure stress-free installation.

Due to the variety of plastic glass types, it is recommended to check the compatibility with Sikaflex®-295 UV before use.

The tendency for stress cracking varies from manufacturer to manufacturer. Please contact the plastic glass company in question directly.

Information on this is available from the Industry division of Sika.

IMPORTANT: Also observe the current product data sheet and safety data sheet. These can be downloaded from **www.sika.com/marine**.



STEP 1: SURFACE PRE-TREATMENT

GRP HULL

1	Mask off all necessary areas.
2	Sand down the adhesive surface of the gel coat with a non-woven abrasive pad. Vacuum away abrasive dust.
3	Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4	Flash-off time: Minimum 10 minutes to max. 2 hours.
5	Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6	Flash-off time: Minimum 30 minutes to max. 24 hours.

ALUMINIUM FRAME

1	Mask off all necessary areas.
2	Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3	Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4	Flash-off time: Minimum 10 minutes to max. 2 hours.
5	Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6	Flash-off time: Minimum 30 minutes to max. 24 hours.

PMMA/PC PLASTIC GLASS PANES

1	Mask off all necessary areas. Apply UV protection if necessary (UV impermeable paint or strip)
2	Sand down the adhesive surface with sandpaper or a very fine non-woven abrasive pad. Sand the adjacent areas with sandpaper (80 grit) if the plastic glass has an anti-scratch coating. Vacuum away abrasive dust.
3	Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4	Flash-off time: Minimum 10 minutes to max. 2 hours.
5	Apply Sika® Primer-209 D thinly but opaquely covering the adhesive surface using a clean brush or felt applicator.
6	Flash-off time: Minimum 10 minutes to max. 24 hours.

WOOD OR ALUMINIUM FRAMES COATED WITH 2K LACQUER

1	Mask off all necessary areas.
2	Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
3	Flash-off time: Minimum 10 minutes to max. 24 hours.

IMPORTANT: For the pre-treatment of other substrates, please refer to the pre-treatment table for Sika Marine applications on page 70.

STEP 2: INSTALLATION OF PLASTIC GLASS PANES

PRODUCT RECOMMENDATION: SIKAFLEX®-295 UV

1	Position elastic spacers (hardness Shore A approx. 30). The spacers should be selected depending on the size of the glass pane (see page 60).
2	The spacers must not interrupt the adhesive bead.
3	Apply Sikaflex®-295 UV with a triangular nozzle with a width of at least 10 mm at a sufficient height on the glass rebate or on the glass.
4	Install the glass within 20 minutes after applying adhesive.
5	If the windows are vertical, additional wooden or plastic blocks must be fitted to prevent them from sagging. After curing, these must be removed again. The visible joint must be at least 8 mm wide.
6	Clamps and other fixing aids can be removed after 24 hours. After the adhesive has cured, the expansion joint can be sealed with Sikaflex®-295 UV. Even before the adhesive has formed a skin, it can be smoothed with Sika® Smoothing Agent N.
7	After caulking, remove all masking tape before the adhesive has formed a skin.
8	Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.

IMPORTANT: Observe the dimensions of the adhesive and expansion joint geometry on page 60.

STEP 3: ADHESIVE LAYER PROTECTION

Plastic glass panes generally do not protect the adhesive layer from damage caused by UV radiation. For this reason, the adhesive layer must be protected from direct sunlight using one of the following methods.

- Internally applied ceramic screen-printed edge or UV impermeable varnish
- Externally mounted, opaque cover profile with sufficient width
- Only for plastic glass with a UV transmission of less than 0.5%, SikaPrimer-209D can be used as the sole UV protection.

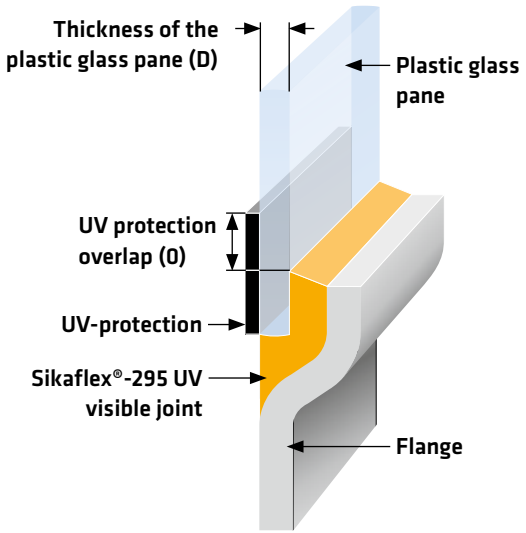
Recommendation for minimum width of UV protection for the bonding surface

Recommended calculation formula:
O = 2 x D

Example:
If D = 8 mm, then the overlap (O) should be at least 16 mm.

STEP 4: WINDOW SEALING

For window sealing, please refer to the instructions on page 60.



2.5.3 INSTALLATION OF MINERAL GLASS

APPLICATION DESCRIPTION

Installing mineral glass into a frame or directly into the ship structure requires special care and solid basic knowledge. The glass used must comply with all specifications and standards such as those of the International Maritime Organisation (IMO) or the classification societies for the intended application. The adhesive layer on the adhesive surface of the glass must be protected against UV radiation. The following options are available for this purpose:

- Black ceramic coating in the edge area (screen printing edge) with a light transmission of less than 0.01%.
- Opaque cover (plastic or metal trim strip) that must overlap the bonding area by twice the glass thickness.
- For glass without screen-printed edge or cover profile, Sika® UV Shielding tape should be used as a suitable protection for the bonding.

IMPORTANT: The national and international legal regulations relevant for the design must be observed.

STEP 1: SURFACE PRE-TREATMENT

GRP FRAME

1. Mask off all necessary areas.
2. Sand down the adhesive surface of the gel coat with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

ALUMINIUM FRAME

1. Mask off all necessary areas.
2. Abrade the adhesive surface with a very fine non-woven abrasive pad. Vacuum away abrasive dust.
3. Pre-treat the surface with Sika® Aktivator-205 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
4. Flash-off time: Minimum 10 minutes to max. 2 hours.
5. Apply a thin but full-coverage layer of Sika® Multi-Primer Marine to the adhesive surface with a clean brush or felt applicator.
6. Flash-off time: Minimum 30 minutes to max. 24 hours.

GLASS WITH UV PROTECTION THROUGH COVER STRIPS OR WITH BLACK CERAMIC RIM (LIGHT TRANSMISSION <0.01%)

1. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
2. Flash-off time: Minimum 10 minutes to max. 2 hours.

Application of Sika® Activator

Pre-treatment of the ceramic screen-printed edge with Sika Aktivator-100

GLASS WITH BLACK CERAMIC RIM (LIGHT TRANSMISSION <0.01%)

1. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
2. Flash-off time: Minimum 10 minutes to max. 2 hours.
3. Apply Sika® Primer-206 G+P thinly but opaquely covering the adhesive surface using a clean brush or felt applicator.
4. Flash-off time: Minimum 10 minutes to max. 24 hours.

WOOD OR ALUMINIUM FRAMES COATED WITH 2K LACQUER

1. Mask off all necessary areas.
2. Pre-treat the surface with Sika® Aktivator-100 using a clean, lint-free cloth or paper fleece. The cloth or paper fleece must be changed regularly.
3. Flash-off time: Minimum 10 minutes to max. 2 hours.

IMPORTANT: For pre-treatment of other substrates, please refer to the pre-treatment table for Sika Marine applications on page 70.

IMPORTANT: Observe the dimensions of the adhesive and expansion joint geometry on page 60.

STEP 2: INSTALLATION OF MINERAL GLASS PANES

PRODUCT RECOMMENDATION: SIKAFLEX®-296

1. Position the elastic spacers. Depending on the size of the glass pane, the spacers with a hardness Shore A (approx. 40) should be selected.
2. The spacers must not interrupt the adhesive bead.
3. Apply Sikaflex®-296 with a triangular nozzle with a width of at least 10 mm at a sufficient height on the glass rebate or on the glass.
4. Assemble the components within 20 minutes after applying the adhesive.
5. Additional wooden or plastic spacers must be fitted to vertical windscreens to prevent sagging. After curing, these must be removed again. The fold gap (expansion joint) must be at least 10 mm wide.
6. Clamps and other fixation aids can be removed after 24 hours. After the adhesive has cured, the expansion joint can be sealed with Sikaflex®-296. Even before the adhesive has formed a skin, it can be smoothed with Sika® Smoothing Agent N.
7. After caulking, you can remove all masking tape even before the adhesive has formed a skin.
8. Residues of uncured Sika adhesives and sealants must be removed with Sika® Remover-208.

IMPORTANT: Please also observe the current product data sheet and the safety data sheet at **www.sika.com/marine**.

Application of Sikaflex®-296

Adhesive application on the edging

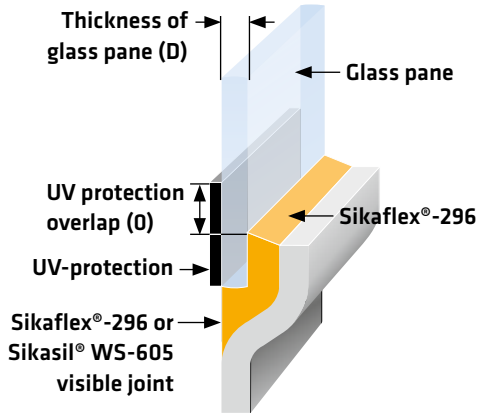
STEP 3: ADHESIVE LAYER PROTECTION

Standard glass (without ceramic screen-printed edge) does not provide UV protection for the bonding surface. For this reason, the adhesive layer must be protected from direct sunlight by one of the following methods:

- Ceramic screen-printed edge with a light transmission value of less than < 0.01%
- Externally mounted, opaque cover profile with sufficient width
- Externally applied Sika® UV Shielding Tape

Recommendation for minimum width of UV protection for the bonding surface

Recommended calculation formula: O = 2 x D
Example: If D = 8 mm, then the overlap (O) should be at least 16 mm.



STEP 4: WINDOW SEALING

For window sealing, please refer to the instructions on page 60.

Inserting the window

The window can still be aligned immediately after joining

03 OVERVIEW OF PRE-TREATMENT FOR SIKA MARINE APPLICATIONS

3.1 CONSUMPTION TABLES AND CALCULATION FORMULAS

ACTIVATORS AND PRIMERS

PRODUCT	YIELD PER 100 ML AT 20 MM WIDTH (M)	CONSUMPTION (ML/M2)
SIKA® ACTIVATOR-100/ SIKA® ACTIVATOR-205	25-30	40
SIKA® PRIMER-206 G+P	17-22	100–150
SIKA® PRIMER-209 D	12-15	150–200
SIKA® PRIMER-290 DC	12-15	150–200
SIKA® MULTIPRIMER MARINE	12-15	150–200

JOINT YIELD OF SIKAFLEX®-290 DC PRO

YIELD PER CONTAINER (LFM.)	JOINT GEOMETRY (W × D IN MM) 4×5	6×5	8×5	10×5	10×8
300 ML CARTRIDGE	15	10	7	6	3
600 BAGS	30	20	15	12	6

CONSUMPTION OF SIKAFLEX®-298

LAYER THICKNESS OF SIKAFLEX® -298 IN MM	CONSUMPTION IN L/M 2	REQUIREMENT PER M 2 (600 ML BAG)
2	2	3
4	4	6

ADHESIVE LAYER THICKNESS (MM)	LINEAR METRES PER 300 ML CARTRIDGE			LINEAR METRES PER 100 ML MINI BAG		
JOINT WIDTH (MM)	5	10	15	5	10	15
1	60.0	30.0	20.0	20.0	10.0	6.7
2	30.0	15.0	10.0	10.0	5.0	3.3
3	20.0	10.0	6.7	6.7	3.3	2.2
4	15.0	7.5	5.0	5.0	2.5	1.7
5	12.0	6.0	4.0	4.0	2.0	1.3
6	10.0	5.0	3.3	3.3	1.7	1.1
7	8.6	4.3	2.9	2.9	1.4	1.0
8	7.5	3.8	2.5	2.5	1.3	0.8
9	6.7	3.3	2.2	2.2	1.1	0.7
10	6.0	3.0	2.0	2.0	1.0	0.7

APPROXIMATION OF THE REQUIRED VOLUME IN LITRES

Normal bead application (dimensions with freshly applied adhesive in rectangular cross-section):

$$\text{Quantity in litres} = \frac{\text{Bead width (mm) x adhesive layer thickness (mm) x joint length (metres)}}{1000}$$

Large areas:

Quantity in litres = width of the area x length of the area (metres) x thickness of the adhesive layer of the newly applied adhesive (mm)

DETERMINATION OF THE VOLUME OF A SEMI-CIRCULAR ADHESIVE BEAD

$$\text{Quantity in litres} = \frac{\text{TT (3.14) x Diameter (mm) x Bead Length (metres)}}{1000}$$

DETERMINING THE VOLUME OF A TRIANGULAR BEAD

$$\text{Quantity in litres} = \frac{\text{Width (mm) x Height (mm) x Bead Length (metres)}}{2000}$$

CONVERSION KILOGRAMMES/LITRES

$$\text{Quantity in litres} = \frac{\text{Weight in kg/lbs}}{\text{Density (grammes per ml or kg per litre)}}$$

3.2 PRE-TREATMENT TABLES

PRODUCT

SUBSTRATE	EH*	Sikaflex®-291i Sikaflex®-298			Sikaflex®-295 UV			Sikaflex®-292i Sikaflex®-296 Sikaflex®-268 Powercure			Sikasil® WS-605 S Sikasil® SG-20 Sika® Firesil Marine N			Sikaflex®-591		
		Mech. pre-treatment	Clean + Act.	Primer	Mech. pre-treatment	Clean + Act.	Primer	Mech. pre-treatment	Clean + Act.	Primer	Mech. pre-treatment	Clean + Act.	Primer	Mech. pre-treatment	Clean + Act.	Primer
Aluminium (AlMg3, AlMgSi1)	1	SVF-R	100		SVF-R	205	SMM	SVF-R	205	SMM	SVF-R	205		SVF-R	205	
			205	SMM										SVF-R	100	
Aluminium (anodized)	2		100			100		SVF-R	100		SVF-R	205				SMM
			205	SMM		205	SMM		205	SMM						
Steel (stainless steel, austenitic stainless)	3	SVF-R	100		SVF-R	205	SMM	SVF-R	205	SMM	SVF-R	205			205	
		SVF-R	205	SMM											100	
Steel (hot-dip galvanised, zinc-coated)	4	SVF-R	205	SMM	SVF-R	205	SMM	SVF-R	205	SMM	SVF-R	205			205	
			205												100	
Non-ferrous metals (brass, copper, bronze,...)	5				SVF-R	205	SMM				SVF-R[8]	205[8]	SMM[8]	SVF-R	205	SMM
Metal, primed (shop primer)	6		100		SVF-R[3]	100	SMM	SVF-R[3]	100	SMM		205			205	
						100	206 GP		100	206 GP					SCP	
Metal, 2K lacquered (acrylic/PU)	6		100			100			100	206 GP		205			205	
						100	206 GP								SCP	
GRP (unsaturated polyester), Gelcoat side or SMC	7		100		SVF-R		209 D	SVF-R		209 D		205[7]	SMM[7]	SVF-R	205	
				209 D	SVF-R	205	SMM	SVF-R	205	SMM				SVF-R	SCP	
GRP (unsaturated polyester), layup side	7	S-AS		290 DC	S-AS		290 DC	S-AS	205	290 DC		205[7]		S-AS		SMM
		S-AS		209 D	S-AS		209 D	S-AS		290 DC				SVF-R	205	
ABS	8			290 DC			290 DC			290 DC		205[7]			205	290 DC
				209 D			209 D			209 D						
Hard PVC	8			290 DC					205	290 DC		205[7]				290 DC
				209 D						209 D					100	
PMMA/PC (without scratch-resistant coating)	9				SVF-AS		209 D				SVF-R[7]	205[7]				
SikaTransfloor®-352 SL	10	S-AS[4]														

PRODUCT

SUBSTRATE

	EH *1	Sikaflex®-291i Sikaflex®-298 A*2	B*3	C*4	Sikaflex®-295 UV A*2	B*3	C*4	Sikaflex®-292i Sikaflex®-296 Sikaflex®-268 Powercure A*2	B*3	C*4	Sikasil® WS-605 S Sikasil® SG-20 Sika® Firesil Marine N A*2	B*3	C*4	Sikaflex®-591 A*2	B*3	C*4
Mineral glass	11								100 100[6]	206 GP		100 SCP			100 205	
Glass with ceramic screen-printed edge	11								100	206 GP		100			100 205	
Teak	12			290 DC SMM			290 DC SMM									290 DC SMM
Wood and wooden materials	12			290 DC SMM			290 DC SMM			290 DC SMM			290 DC SMM			290 DC SMM
Plywood, phenolic resin coated	13	S-AS[5] S-AS[5]		290 DC SMM				S-AS[5] S-AS[5]		290 DC SMM	S-AS[5] S-AS[5]		290 DC SMM	S-AS[5] S-AS[5]		290 DC SMM

PRODUCT

	EH *1	Sikaflex® 290 DC PRO A*2	B*3	C*4	SikaTransfloor®-352 SL A*2	B*3	C*4
Aluminium (AlMg3, AlMgSi1)	1				S-AS[1]	205	ZP
Steel (hot-dip galvanised, zinc-coated)	4				S-AS[2]	205	ZP
Metal, primed (shop primer)	6				S-AS	205	ZP
SikaTransfloor®-352 SL	10				S-AS[4]		
Teak	12			290 DC SMM			
Wood and wooden materials	12			290 DC SMM			

*1 EH = Explanatory notes on the substrates can be found on page 72, *2 A = Mechanical pre-treatment, *3 B = Cleaning or activation, *4 C = Primer

ABBREVIATION

PRODUCT/ EXPLANATION

SVF-R	Abrasive fleece, "very fine", then cleaning step by dry wiping or with Sika® Cleaner P
SVF-AS	Abrasive fleece, "very fine" and extract
S-AS	Sanding (60-80 grit) and extract
SCP	Sika® cleaner P
100	Sika® Activator-100
205	Sika® Activator-205
SMM	Sika® MultiPrimer Marine
206 GP	Sika® Primer-206 G+P
209 D	Sika® Primer-209 D
290 DC	SikaPrimer 290 DC
ZP	Sika® Cor ZP primer

LEGEND:
1. line = Recommendation
2. row = Alternative

[1] Alternative: Sandblasting/corundum blasting with aluminium oxide

[2] alternatives: Sand blasting

[3] If shop primer is damaged, it should be sanded off (SVF) and not scraped off

[4] Do not clean with solvents

[5] Sand phenolic resin layer in bonding/sealing area down to the bare wood

[6] Please only use **Sika® Aktivator-100** in combination with **Sikaflex®-296** for this application. All other adhesives are not suitable (ensure proper UV protection)

[7] **Sikasil® SG-20** must not be applied here

[8] **Sikasil® WS-605 S** and **SikaFiresil® Marine N** must not be applied here

3.3 INFORMATION ON MATERIALS

CONSUMABLE MATERIALS

ALUMINIUM
Alloys containing magnesium or silicon may have an unstable layer on the surface. This layer must be removed with a very fine non-woven abrasive pad.

COATED SURFACES, PAINTS
As a general guideline: Cathodic dip paints, powder coatings, epoxy or polyurethane coatings can be bonded with Sikaflex® products. Alkyd resin-based paints with oxidative drying are not suitable as an adhesive surface. When using the following paint systems: Polyvinyl butyral or epoxy resin ester is usually the cohesion higher than the adhesion to the adhesive surfaces. Please note that: Paint or colour additives can negatively affect adhesion on the paint surface. Certain coatings can be adversely affected by weathering. Therefore, they must be protected against UV radiation and other weather influences before bonding.

NON-FERROUS METALS
Metals such as brass, copper and bronze tend to react with adhesives and sealants. For this reason, it is recommended to contact Technical Service for these surfaces.

STAINLESS STEEL
The terms “stainless steel” and “special steel” encompass a whole group of products that have an important influence on the adhesion behaviour. The adhesion can be improved by sanding with a very fine non-woven abrasive pad.

ANODIZED ALUMINIUM
A simple pre-treatment is usually sufficient for aluminium whose surface has been chromated, anodized or coated, for example. Due to the variety of the anodizing process, it is necessary to carry out preliminary tests in order to achieve satisfactory adhesion.

GRP (GLASS-FIBRE REINFORCED PLASTIC)
GRP is usually a thermoset made of unsaturated polyester (UP), less commonly made of epoxy resin and vinyl ester or phenol formaldehyde resin. Newly manufactured components have not yet fully reacted and are therefore subject to subsequent shrinkage. For this reason, only older or tempered GRP components should be bonded. The smooth side (gel coat side) may have mould release agents which impair the adhesion properties of the surface. The rough side facing the air during production must be sanded before the further Surface pre-treatment steps are carried out. For transparent or translucent GRP parts, the information on UV protection in the “General information” must be observed.

SYNTHETIC MATERIALS
Some plastics can only be bonded after physicochemical pre-treatment (flaming or plasma process in combination with chemical pre-treatment). This applies to e.g. polypropylene or polyethylene. For plastic blends, a binding statement is not possible due to the variety of components as well as internal and external separating agents. There is a risk of stress cracking in thermoplastics. Thermally formed parts must be brought into a stress-free state by means of controlled heat treatment before bonding. For transparent and translucent plastics, please observe the notes under “General information” on this page.

MINERAL GLASS / CERAMIC SCREEN PRINTING
Some windscreens may contain silicone residues on the glass or ceramic screen-printed edge due to the manufacturing process. These can be removed with Sika® Cleaner PCA.

PHENOLIC COATED PLYWOOD
These waterproof plywood panels are coated with a yellow or brown top layer. The surface pre-treatment is the same as for paints and coatings. In some cases, the top layer must be sanded down to the bare wood layer and then pretreated like wood.

PMMA/PC
If the PMMA or PC component is coated with a scratch-resistant coating, this must be sanded in the bonding area with sandpaper (120 grit) and the bonding surface must be pretreated like uncoated surfaces. Please note that the mechanical properties of PMMA/PC may change as a result. Contact the Industry division of Sika for solutions for which the scratch-resistant coating does not need to be removed. For PMMA/PC we recommend Sika® UV Shielding Tape as UV protection.

SIKATRANSFLOOR®-352 SL
This solvent-free 2K polyurethane filler and levelling compound is used to level underdecks on ships and boats before processing other deck coverings (e.g. teak). Do not use solvents to clean cured and sanded Sika®Transfloor-352 SL. Please refer to the latest local data sheets for more information.

GENERAL INFORMATION

TEAK/WOOD AND WOODEN MATERIALS

The quality of teak has a significant influence on the functionality and visual appearance of teak floors. Standing annual rings and a lack of alternating rotational vegetation are important criteria to ensure uniform deformation of the teak strips under different climatic conditions. The recommended joint width depends on the width of the wood strip and the moisture of the core wood. Please observe the processing instructions in our current marine manual.

GALVANISED STEEL (HOT-DIP GALVANISED, ZINC-COATED)

With hot-dip galvanised steels, the surface compositions are not uniform. It is therefore necessary to check their adhesion properties regularly. Oiled galvanised steel must be degreased before use. In galvanised steel, the substrate is defined and the surface composition is almost uniform. Do not use abrasive on galvanised steel.

COATINGS

Due to the large number of different coatings and changes in the production processes, such surfaces should be checked regularly.

EPDM/SBR

Rubber can be made from natural rubber or artificial rubber. This makes a wide variety of material compositions possible. These substrates must therefore be tested for their adhesion beforehand.

ESC (ENVIRONMENTAL STRESS CRACKING)

Stress cracks are one of the most common causes of brittle fractures in thermoplastics, especially in amorphous polymers. Stress cracks are mainly caused by environmental stresses, external stresses and liquid chemicals. Every bonding process must therefore be checked.

CORROSION PROTECTION

All of the pre-treatment agents listed here do not provide comprehensive corrosion protection. In most cases, the primer layer protects the substrate against corrosion to a certain degree. Whether this protection is sufficient for the individual application is at the discretion of the customer.

TRANSPARENT/TRANSLUCENT SUBSTRATES

For transparent or translucent substrates where the bonding surface is exposed to sunlight, UV protection of the bonding surface is necessary. This can consist of an opaque cover strip, an optically dense ceramic screen-printed edge or, in the case of semi-transparent substrates (e.g. translucent GRP or screen prints), a black primer. Due to the high UV exposure outdoors, a black primer alone is not sufficient for UV protection; but it is sufficient for interior applications or bonding surfaces that are only occasionally exposed to UV radiation.

YOUR NOTES

YOUR NOTES

YOUR NOTES

YOUR NOTES

Sika AG is one of the world's leading suppliers of sealants and adhesives for industrial production as well as construction chemical product systems.

Our current terms and conditions apply.
Always consult the most recent local product data sheet before use/processing.

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