

# Installation Manual.

Corrosion Protection Coating of  
Steel Plates & Shear strengthening  
with externally bonded steel plates.





### Safety Instructions

Please read the Safety Data Sheets (SDS) and Technical Data Sheets (TDS) before using the products! When working with chemical products, use suitable protective clothing, protective gloves and safety glasses. **IMPORTANT:** Please follow the application instructions, which are included in every package.

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Noncompliance leads to a damage claim. All rights are reserved in the case of patents, utility models or designs. These application instructions were created with care. However, fischerwerke GmbH & Co.KG does not take over any liability for any errors in these application instructions and their consequences. There is also no liability for direct or consequential damage taken from incorrect use of the products.

Performance of construction materials (Epoxy resins) vary with external conditions (e.g. project site conditions such as temperature or humidity).

The suitability of the strengthening kit must be checked and confirmed by the responsible planer. All product names and brand names used belong to the owner, even if not explicitly marked as such. The content is subject to changes.

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# 1 Introduction

This installation manual describes the safe use of externally bonded steel plates and the coating of steel plates with fischer FRS-CP red, FRS-CP grey Corrosion Protection Primer and FRS-CS Epoxy Mortar. The externally bonded steel plates can increase the shear capacity of existing beams. Note that the coating procedure may generally be applied to exposed structural steel components. This document must be used or referred to in conjunction with all relevant Technical Data Sheets (TDS), Safety Data Sheets (SDS), Technical Assessments and project specifications. Structural strengthening works shall only be carried out by experienced and trained specialists. For professional product trainings and in case of any questions about our design software REINFORCE-FIX®, please consult the technical team of the national fischer subsidiaries. Note that the inadequate choice on the strengthening or retrofitting method, incorrect structural design, inadequate installation might cause significant risks.

## 2 System description

### 2.1 Intended use

The primary intended use of the fischer C-Fiber Force Strengthening System is the strengthening of reinforced concrete or prestressed concrete structures. The fischer C-Fiber Force Strengthening System was developed for safety relevant applications.

*The manufacturer strongly recommends the use of the fischer C-Fiber Force Strengthening System as a whole. Combined applications with products from other manufacturers are out of the responsibility range of the fischer group.*

### 2.2 References

This installation manual was written in accordance with the recommendations given in the DAfStb Guideline (Strengthening of concrete members with adhesively bonded reinforcement, Part 3: Execution, 2012).

### 2.3 Restrictions

This product shall only be used for its intended purpose. Further design details or design information are to be found in the structural design, technical drawings, specifications and risk assessments of the corresponding design engineer or specialist contractor.



# 3 fischer C-Fiber Force Strengthening System

The primary intended application scope of the fischer C-Fiber Force Strengthening System is to strengthen reinforced or prestressed concrete members. The FRS-CP red, FRS-CP grey Corrosion Protection Primer and FRS-CS Epoxy Mortar are system components of the fischer C-Fiber Force Strengthening System.

Table 1: Constituents of the fischer C-Fiber Force Strengthening System with corresponding short product descriptions

Product name	Description
FRS-L-S & FRS-L-H FRS-L-S NSM & FRS-L-H NSM	Pultruded, precured carbon fiber reinforced polymer (CFRP) Laminates for the structural strengthening
FRS-CS	Thixotropic, 2-component epoxy mortar for the installation of CFRP Laminates and steel plates
FRS-W U300 FRS-W U600	Unidirectional Carbon Fiber Fabrics with 300 g/m <sup>2</sup> or 600 g/m <sup>2</sup> area density
FRS-FC	Unidirectional open end high-strength carbon fiber anchor for optimal end-anchorage of Carbon Fiber Fabrics
FRS-CF	Thixotropic, 2-component epoxy-based saturating resin for the application of FRS-W and FRS-FC
FRS-PC 11	Thixotropic, high-viscosity, low-shrinkage, 3-component epoxy-based concrete repair mortar for reprofiling, surface levelling and for increasing or restoring concrete cover
FRS-BA	2-component, epoxy-based, solvent-free high performance bonding agent for optimal adhesion between different concrete repair mortars and existing concrete as well as corrosion protection for embedded steel reinforcing bars
FRS-CP red FRS-CP grey	Low viscosity, 2-component, epoxy-based corrosion protection primer for exposed steel surfaces as well as embedded steel rebars in two color versions, red and grey
FRS-SF	Highly UV resistant and water repellant, waterborne protective coating with high durability against environmental exposure for CFRP reinforcement in outdoor applications.
FRS-FP	Waterborne, intumescent coating for CFRP strengthening systems against fire and smoke development
FRS-CA	Universal cleaning agent for the FRS-L-S, FRS-L-H, FRS-L-S NSM, FRS-L-H NSM CFRP Laminate and tools

# 4 Certification and technical approval

The scope of the fischer C-Fiber Force Strengthening System using FRS-CP red and FRS-CP grey as Corrosion Protection Primer is regulated in the following documents:

- Allgemeine Bauartgenehmigung (Z.xx.xx-xx) „Schubverstärkung von Bauteilen durch aufgeklebte Stahllaschen „C-Fiber Force Strengthening System“ nach der DAfStb-Verstärkungs-Richtlinie“
- Allgemeine Bauartgenehmigung (Z.xx.xx-xx) „Verstärken von Stahlbetonbauteilen durch schubfest aufgeklebte Kohlefaserlamellen „C-Fiber Force Strengthening System“ nach der DAfStb-Verstärkungs-Richtlinie“
- Allgemeine Bauartgenehmigung (Z.xx.xx-xx) „Verstärken von Stahlbetonbauteilen durch in Schlitze verklebte Kohlefaserlamellen „C-Fiber Force Strengthening System“ nach der DAfStb-Verstärkungs-Richtlinie“

# 5 Storage conditions

The materials shall be stored in closed and undamaged original packaging in a dry environment at ambient temperature. Please note the minimum and maximum storage temperature and the shelf life in the corresponding product data sheets and product labels.

The using FRS-CP red, FRS-CP grey Corrosion Protection Primer and FRS-CA Epoxy Mortar shall only be transported in the original packaging or with other adequate protection against mechanical and chemical damage.

# 6

## Recommended equipment

### 6.1 Equipment, devices, tools and accessories

For the adequate installation of the fischer C-Fiber Force Strengthening System, it is recommended to have the following equipment on site for proper installation:

- Humidity meter
- Equipment for measuring the moisture content of components e.g. concrete moisture meter (CMM)
- Thermometer for air and surface temperatures
- Crack width ruler
- Concrete surface tester to determine the surface unevenness
- Concrete pull-off tester including steel disks with a diameter of 50 mm disc to determine the concrete tensile strength
- Diamond core drilling machine and accessories (for concrete pull-off tests)
- Concrete scanner to determine concrete cover and / or position and/or diameter of rebars
- Weighing scale with suitable weight range and precision
- Equipment for substrate preparation (by caulking, blasting, grinding and for cleaning work)
- Handheld agitator suitable for mixing the chemical products, with a rotation speed ( $\leq 300$  rpm)
- Application equipment  
(Trowel, spatula, steel brushes, adhesive application device, cleaning cloth, etc.)
- Ruler and visible marker
- Wet film thickness gauge

### 6.2 Cleaning of tools and accessories

All tools and processing accessories must be cleaned immediately after use with FRS-CA Cleaning Agent or another suitable solvent. Cured materials can only be removed mechanically.

# Health and safety

## 7.1 Risk assessment

All health and safety risks must be assessed and adequate countermeasures shall be defined. This includes the very condition of the structure and the resulting risks thereof, the processing of all materials used on site as well as working methods.

All work and working procedures must be carried out in full compliance with the relevant local safety and environmental regulations in force on site.

## 7.2 Personal safety

During the installation, safety shoes, safety gloves and other suitable skin protection must be always worn. It is strongly recommended to use adequate disposable safety equipment during the processing and application of the materials. Since epoxy adhesives, saturating mortars, epoxy-based primer can cause skin irritation, always wear protective gloves e.g. nitrile-based hand gloves when working with them. Unprotected skin must always be covered with protective cream before starting work.

Always wear suitable eye protection during processing, mixing and installation of the products. It is recommended to carry eye wash with you at all times. Always wash hands with suitable soap and clean water after processing the materials and before consuming food, smoking, going to the toilet.

The work area must be well ventilated and workers should take regular breaks in the fresh air, to avoid health problems. The developing dust and quartz sand during drilling, grinding or sandblasting the concrete can be hazardous. The concrete dust or CFRP dust must not be inhaled. To protect yourself and others, use e.g. vacuum cleaner or other adequate suction techniques. For detailed health and safety information, see the relevant Safety Data Sheets (SDS).

### 7.3 First aid

If the epoxy mortar-based chemicals come into contact with the eyes or mucous membranes, the contact lenses must be removed and the eyes must be rinsed immediately with clean, warm water for 10–15 min. and a medical doctor should be consulted.

If chemicals come into contact with the skin, it must be cleaned immediately and carefully rinsed with clean warm water.

In case an accident happens, despite all the preventive measures, the corresponding SDS must be immediately handed over to the emergency services. This helps the emergency services to select the appropriate medical treatment(s). For detailed health and safety information, refer to the relevant Safety Data Sheet (SDS) of the individual products.



### 7.4 Waste disposal

Excess materials must not be poured down in drains or into water supplies. Waste and packaging must be disposed by specialized waste management companies or partners in accordance with local legislation and official requirements. Furthermore, chemical materials must not be allowed to enter the soil, watercourses, drains or sewers. Chemical waste in uncured form or leaking adhesive must be disposed as hazardous waste.

Waste in the form of cured adhesive can be safely disposed of as normal construction waste in accordance with local legislation. For detailed environmental and safety information, refer to the relevant Safety Data Sheet (SDS).

# 8 Installation steps

## 8.1 Preparation, substrate and environmental conditions

### Requirements and preparation



#### Environmental conditions

- Verify the residual moisture content of the concrete using an adequate device (e.g. CCM).
- The residual moisture content of the concrete shall not exceed max. 4 % by weight of concrete grade C30/37 and 3 % by weight for concrete grade C35/45, measured with a CM device.
- The residual moisture content of the concrete shall not exceed max. 4 % by weight according to the DAfStb Guidelines (Strengthening of concrete members with adhesively bonded reinforcement, Part 3: Execution).
- Verify the permitted temperature range of the member with a thermometer.
- Verify that the chemicals are stored at the permitted storage temperature before use.
- Underground temperature of the member to be strengthened should be higher than +10 °C and at least 3 K above dew point during and after application throughout the curing time.
- The maximum temperature should not exceed 40 °C and the relative humidity should be below 75 %. Check the humidity with an adequate humidity measurement device.

**Concrete substrate conditions**

Concrete patching / Concrete Reprofilling / crack injection / corrosion inhibition works on the substrate may be necessary prior to the application of the CFRP Laminate if<sup>1</sup>:

- There are visible defects in the concrete, such as concrete spalling, or unevenness exceeding 4 mm void depth. The unevenness of concrete surface can shall be verified by concrete surface tester
- There is insufficient concrete cover. The concrete cover of the internal reinforcement shall comply with the valid design standard but at minimum shall be 10 mm. The concrete cover thickness shall be verified by a concrete scanner device. If the concrete cover is insufficient it should be elevated by application repair mortar, concrete or shotcrete.
- There are cracks of more than (0.25 mm) present<sup>2</sup>. Crack sizes can be measured with a crack width ruler. Care should be taken to seal cracks that may cause infiltration of water.<sup>3</sup>
- When active corrosion of reinforcement rebars is part of the insufficient concrete.

If these conditions are not fulfilled, the thickness of the concrete cover shall be increased by adequate means, methods and materials. Further instructions on the adequate concrete patching can be found in e.g. DAfStb Guideline (Strengthening of concrete members with adhesively bonded reinforcement, Part 3: Execution, 2012); Information on corrosion inhibition can find in the norm DIN EN 1504-9 principles 7–11.

The concrete surface needs to be dry, oil, dust-free and free of any chemically separating substances.

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<sup>1</sup> It's essential to have an intact substrate without damaged or deteriorating concrete prior to installation of strengthening system.

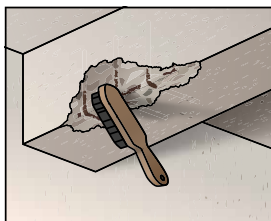
<sup>2</sup> Cracks > 0.254 mm (10 mils) are an indicator for movements in the structure that may affect the durability of the strengthening system.

<sup>3</sup> Permanent moisture may affect the durability of the strengthening systems.

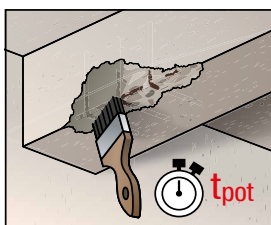
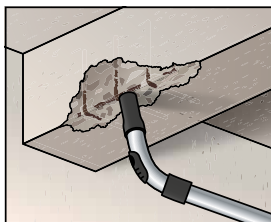
## EN 8.2 Concrete repair (optional)

In most cases, concrete repair works on the damaged concrete surface are necessary prior to the steel plates installation. The concrete repair or concrete patching works shall be carried out by adequate means, methods, and materials, depending on the size of the damage and in accordance with the corresponding design standards. In the following, the concrete repair procedure is described using the components (FRS-PC 11 Epoxy Repair Mortar and FRS-BA Bonding Agent) of the fischer C-Fiber Force Strengthening System.

### Concrete repair works (optional)



The damaged concrete fracture surface needs to be properly cleaned prior to the application of the concrete patching material or bonding agent. The concrete surface to be repaired or reprofiled must be dry, oil and dust free and the loose concrete parts must be removed. Tools such as steel brush, vacuum cleaner, compressed air might be used to clean the concrete surface.

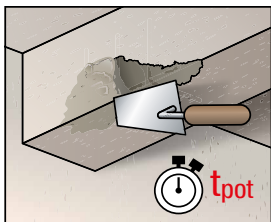


Apply the fischer FRS-BA Bonding Agent as a thin film layer on the concrete fracture surface using e.g. a brush. For the recommended thickness to be applied and detailed processing information please consult the Technical Data Sheet (TDS) of fischer FRS-BA.

Material consumption: 0.5–0.8 kg/m<sup>2</sup> FRS-BA is recommended.

Note that the material consumption is dependent on the surface roughness. The thickness of the applied film layer should be, in possible, verified by a wet film thickness gauge.





Apply the fischer FRS-PC 11 Epoxy Repair Mortar wet-in-wet into the concrete cavity with a spatula or trowel, which was beforehand primed with the FRS-BA Bonding Agent. Concrete cavities of 4–30 mm depth can be repaired using the fischer FRS-PC 11 and maximum 500 mm in longitudinal direction of the steel plates strengthening.

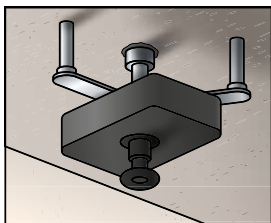
For the detailed processing information such as pot life, hardening times etc., please consult the Technical Data Sheet (TDS) of fischer FRS-PC 11.

The material consumption of concrete repair mortar (FRS-PC 11) is primarily dependent on the size of the concrete cavity and it needs to be estimated prior to the project.

Note that according to DAfStb Guideline “Strengthening of concrete members with bonded reinforcement” and in accordance with the EAD 17-16-0086-03.01, the concrete repair works can be made with one of the following materials:

- Recommended material listed in the Technical Approval of the manufacturer (e.g. fischer FRS-PC 11 Epoxy Repair Mortar and FRS-BA Bonding Agent)
- Concrete grout with strength resistance class M3 according to DAfStb Strengthening Guideline
- Concrete according to EN 206-1 in connection with DIN 1045-1
- Shotcrete according to DIN EN 14487-17 in connection with DIN 185518

under consideration of the exposure class. The national regulations must be followed. The choice on the concrete repair material is the responsibility of the experienced structural engineer.



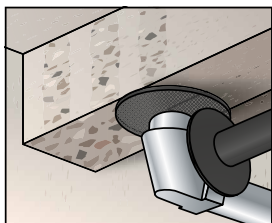
#### Additional quality instructions

According to the national regulations DAfStb “Strengthening of concrete members with bonded reinforcement” (2012) and according to our recommendation, if concrete repair works are executed prior to the actual steel plates strengthening, concrete pull-off tests should be executed on the repaired/reprofiled concrete surface before the application of the bonded steel plates (see “Surface testing” below). The hardening times of the materials used for reprofiling must be considered.

## 8.3 Installation of bonded steel plates on concrete surface

In the following, the corrosion protection coating of steel plates with FRS-CP Corrosion Protection Primer, as well as their recommended application as shear strengthening of beams with FRS-CS Epoxy Mortar is described. The corrosion protection coating procedure of exposed steel structural components can be considered as a general and independent procedure.

### Surface preparation of concrete



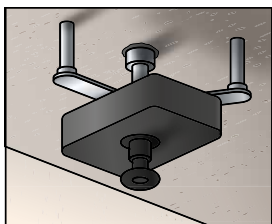
The concrete surface, where the steel plates will be applied must be roughened up by means of one the following techniques:

- Compressed air blasting with solid abrasives
- Shot peening
- Processing with a needle pistol
- Grinding (see figure)
- High-pressure water blasting

After the surface pretreatment, the coarse aggregates of the concrete ( $D_{\max} \geq 4 \text{ mm}$ ) must be visible on the concrete surface. The roughened concrete surface enables the penetration of epoxy into the substrate and ensures proper adhesion. The remaining loose concrete parts as well as dust must be removed.

Care shall be taken of the national work safety regulations. It is recommended to indicate the final position of the steel plates on the concrete surface with a suitable marker. The cleaned concrete surface should be protected until the steel plates application.

### Surface testing



Prior to application of the steel plates or other strengthening materials, the suitability of the concrete surface must be verified through concrete pull-off tests. The concrete surface tensile strength is to be determined using concrete pull-off device. If concrete repair works were performed, the surface tensile strength is to be determined on the reprofiled concrete surface.

The concrete surface tensile strength must be measured by means of concrete pull-off adhesion testing device according to EN 1542 or according to ASTM C1583/C1583 M after surface preparation.

At least five tests in different locations have to be performed. The number and position of the pull-off tests is the responsibility of the design engineer.

The characteristic mean concrete surface tensile strength must be at least  $\geq 1.0 \text{ N/mm}^2$  according to DAfStb Guideline (Strengthening of concrete members with adhesively bonded reinforcement, Part 3: Execution, 2012) or  $\geq 1.4 \text{ N/mm}^2$  according to ACI 440.2R (2017). If higher values are used in the structural design, these values have to be verified by concrete pull-off tests.

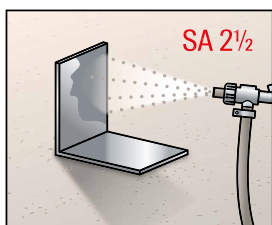
In case the requirement on the minimum concrete surface tensile strength is not met, the decision on the adequacy of the strengthening method with steel plates is the responsibility of an experienced structural engineer. The detailed procedure of the surface testing procedure is described in a separate manual.



The geometry of the steel plates (width, thickness, steel grade, etc.) and their correct position on the concrete is to be specified by an experienced design engineer.

In case the structural steel plates are used as externally bonded shear plates for shear strengthening of reinforced concrete beams, the design rules of DAFStb "Strengthening of concrete members with bonded reinforcement" (2012) should be followed.

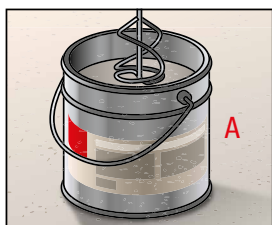
The structural steel plates should be cut, welded etc. to the specified geometry by adequate means and measures prior the installation.



The steel plates should consist of at least S235 (JR) grade steel and be treated by sand blasting to achieve a grade of surface quality SA 2½ (EN ISO 8501-2).

The steel plates should be free of rust, dirt and any separating substances like oils or grease. FRS-CA can be used to clean the steel plates.

After the surface preparation of the steel plates, the surface needs to be protected against moisture until the coating application.

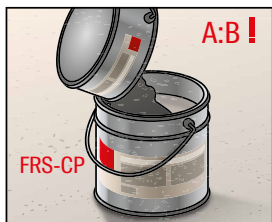


The same processing instructions apply for both the FRS-CP red and FRS-CP grey.

The two components of FRS-CP must be prepared by following the processing steps given the Technical Data Sheet (TDS) of FRS-CS. Note the required mixing ratio, pot life, the proper mixing procedure.

Special care should be taken of the work safety while working with fischer FRS-CP.

If phase separation is observed after opening the can components, the individual can components should be homogenized by stirring them separately, before mixing them. This is especially recommended when partial quantities are taken.

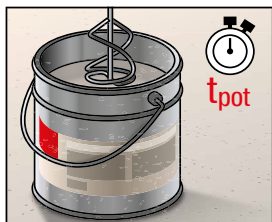


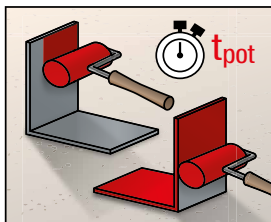
Add component B to component A and mix it (handheld agitator) for 3 minutes with 300 rpm without air bubbles until a homogeneous and uniform red or gray tone is achieved, for FRS-CP red and FRS-CP grey, respectively.

If partial quantities are taken, then please observe the mixing ratio by weight of component A and component B (1:1). Using weighing scale is recommended for adhere the mixing ratio.

The intended use of FRS-CP in the temperature range from 10 °C to 40 °C

The pot life (working time) is 35–40 minutes at 23 °C and it's depending on environment temperature. Precooled material and smaller quantities can help to prolong the pot life.



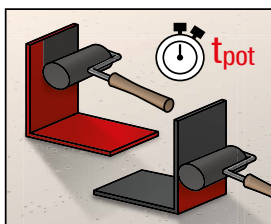
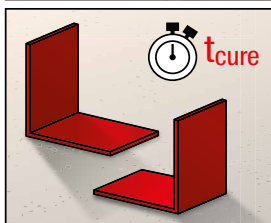


The plates should be properly cleaned with FRS-CA or acetone before coating with FRS-CP corrosion protection in two subsequent layers of min. 200 µm thickness each.

The thickness must be validated with a wet-film thickness gauge.

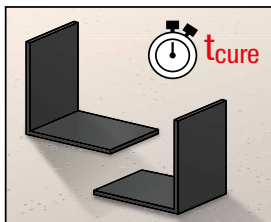
The plates are completely coated with the first layer of FRS-CP. Using FRS-CP red is recommended.

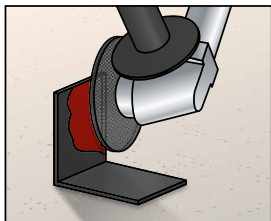
For consumption rates and curing time please see the technical data sheet.



After curing of the first layer of FRS-CP, the primed plate has to be coated with the second of FRS-PC grey.

After curing the coating should be visually inspected.

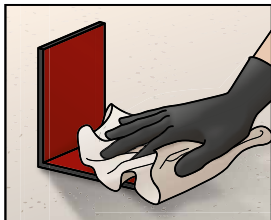




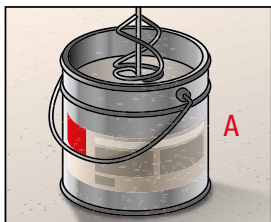
The bonding area of the plates should be roughened up until the first (red) layer of the corrosion protection coating becomes visible.

The sanded area has to be cleaned with FRS-CA and needs to be free of dust, loose particles or any other separating substance.

Note that bonding areas where the plates overlap also need to be sanded and cleaned properly.



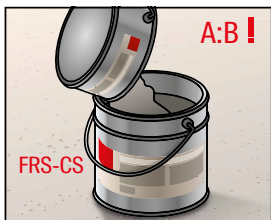
#### Preparation of epoxy mortar and steel plates installation



The two components FRS-CS Epoxy Mortar must be prepared by following the processing steps given the Technical Data Sheet (TDS) of FRS-CS. Note the required mixing ratio, pot life, the proper mixing procedure.

Special care should be taken of the work safety while working with fischer FRS-CS.

If phase separation is observed after opening the can components, the individual can components should be homogenized by stirring them separately, before mixing them. This is especially recommended when partial quantities are taken.

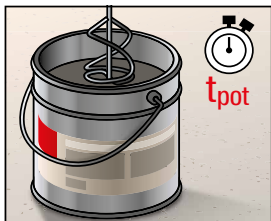


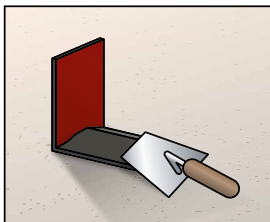
Add component B to component A and mix it (handheld agitator) for 3 minutes with 300 rpm without air bubbles until a homogeneous and uniform gray tone is achieved.

If partial quantities are taken, then please observe the mixing ratio by weight of component A and component B (4:1). Using weighing scale is recommended for adhere the mixing ratio.

The intended use of FRS-CS in the temperature range from 10 °C to 40 °C

The pot life (working time) is 45 minutes at 23 °C and it's depending on environment temperature. Precooled material and smaller quantities can help to prolong the pot life.

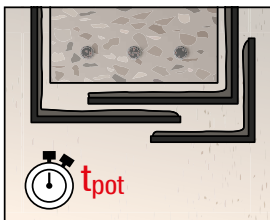




FRS-CS should be applied to the inner side of the steel plates, which have been roughened up. Apply the FRS-CS in a roof shaped profile of twice the desired joint thickness.

The final thickness of the adhesive joint should be 1 mm – 5 mm.

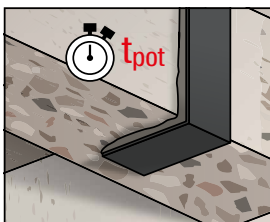
After exceeding the pot-life of FRS-CS, the material must not be used.



The following plate arrangement is based on best practice and on the DAfStb "Strengthening of concrete members with bonded reinforcement" (2012).

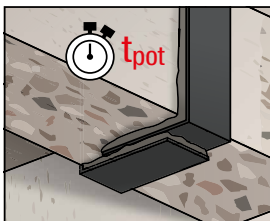
The first plate pressed against the beam until excess adhesive (FRS-CS) is visible at the joints and temporary fixed for the duration of curing.

The second plate is placed opposite of the first plate with overlapping. The (minimum) overlap length of the two plates should comply with the specified values in the structural design. According to the DAfStb "Strengthening of concrete members with bonded reinforcement" (2012) the overlap length should not be less than the width of the concrete member – 20 mm.

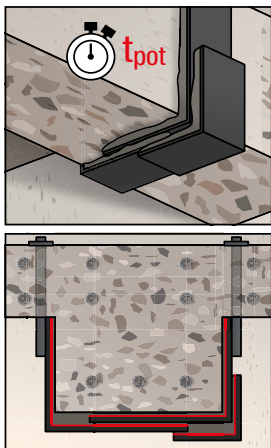


A third short plate is placed on the overlap of the first and second plate to fix the joint. The overlap length of the third plate should not be less than half the difference of the width of the concrete member and the plate width + 20 mm.

Additional mechanical anchorage of the plates has to be installed for safety reasons in the case of fire. Therefore end anchorage e.g. reinforcement bars for steel plates is recommended. The welding for connection of reinforcement bars and the steel plates is performed prior to bonding the steel plates to the concrete substrate. It's not allowed to welding on coated or already bonded steel plates to prevent thermal damage of the adhesive or corrosion protection coating. The end anchorage must be coated with FRS-CP Corrosion Protection coating.



The plates should be coated with another layer of FRS-CP grey after installation covering at least the steel plates, the joint as well as 10 mm to the left and right of the plates.



The live loads on the structure are allowed after 48 h curing at 20 °C. Lower temperatures result in longer curing time.

The strength development of the different material parameters as a function of the hardening time is given in the Technical Data Sheet (TDS) of FRS-CS.

### Inspection and Quality control after the installation



After the epoxy mortar FRS-CS has cured, the bonded surface is checked for voids by carefully tapping it or by means of pulse thermography or an equivalent method.

To verify the adhesion of the steel plate to the concrete substrate at least 5 pull-off tests according to EN 1542 or according to ASTM C1583/C1583 M should be performed on a reference steel plate placed in a representative location according prior to loading of the strengthened structural member.

The minimum requirement on the characteristic mean surface tensile strength is  $\geq 1.0 \text{ N/mm}^2$  according to DAfStb Guideline (Strengthening of concrete members with adhesively bonded reinforcement, Part 3: Execution, 2012) or  $\geq 1.4 \text{ N/mm}^2$  according to ACI 440.2R (2017) and the failure should occur in the concrete layer (concrete cohesion failure) and not at the steel plate-concrete interface. If a higher value was used in the structural design this value must be verified.

The concept of the quality inspection plan of the strengthened structure or structural member is the duty of the responsible structural engineer, following the national and international regulations.



# 9

## Legal notes

The above information, in particular the suggestions for processing and use of our products, are based on our knowledge and experience under normal conditions, provided the products have been stored and used properly. Due to the different materials, substrates and deviating working conditions, a guarantee of a work result or liability, from whatever legal relationship, can neither be justified from these instructions nor from verbal advice, unless we are charged with intent or gross negligence in this respect. In this context, the user must prove that he has in writing all knowledge required for a proper and reasonable assessment by fischer, has been communicated to fischer thoroughly and on time. The user must test the products regarding their suitability for the intended use.

The product specifications are subject to change without notice. Third party property rights must be observed. In all other respects, our respective terms and conditions of sale and delivery apply. Always the latest product data sheet (TDS) applies, which should be requested from us.



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