

Catalogue Structural Strengthening



**“Our innovative strength
and technological know-how
strengthen our position on
the market.”**



Foreword

Dear business partners,

Sustainability gains more and more importance worldwide, meanwhile in every sector. We, at fischer group, understand our responsibility in the context of the construction industry, and we incorporated an extensive sustainability strategy into our corporate strategy. Among others, we continuously extend our assortment with products using sustainable raw materials along with innovative manufacturing technologies to significantly reduce the CO₂ footprint of the construction industry for a better tomorrow. It is now time to take it one step further.

The majority of the existing engineering structures needs to be retrofitted over their service life, due to functional change in their use, due to material deterioration processes, due to increased live-loads, increased traffic intensity on bridges, design flaws and due to the introduction of more stringent building codes. Open-source statistic on the general condition of the infrastructure in almost every country call for measures effective immediately, whether it be preventive or restorative. The maintenance, rehabilitation and repair of existing structures present without doubt one of the greatest challenges for today's construction industry.

After years of intensive product development, we proudly present to you our continuously growing portfolio for structural strengthening products & solutions covering various applications, primarily for the industry and infrastructure. Our new products meet the highest requirements; they comply with various national and international assessment documents to ensure ultimate safety and maximum flexibility.

The comprehensive product range covers a wide range of safe strengthening applications: flexural and shear strengthening of reinforced concrete members using CFRP laminates, carbon fabrics, and bonded steel

plates, concrete overlay strengthening using concrete shear connectors, axial strengthening of concrete columns by concrete jacketing using post-installed rebars and beyond.

Further chemical products such as an epoxy-based concrete repair mortar for concrete patching works, bonding agents and protective coatings compliment the strengthening assortment for ultimate flexibility.

fischer commits for the sustainable construction industry with this new assortment. Your national fischer sales organisation is looking forward to your inquiries, questions and projects.

We hope you enjoy planning and installing our structural strengthening products.

Dr. Máté Tóth

Head of Business Unit Structural Retrofitting



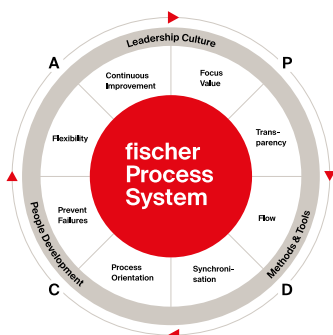
“Whoever chooses fischer receives more than a range of safe products. The aim is to always develop the best solutions for our customers across the globe.”

Besides the innovative products, this predominantly concerns support that is focused on the customer, and services designed to improve customer benefit.

A brand and its promise to perform.

Continuous improvement

With the fischer Process-System (fPS), we ensure that we are adapting and optimising our processes in line with customer requirements in a flexible manner and on a continuous basis.

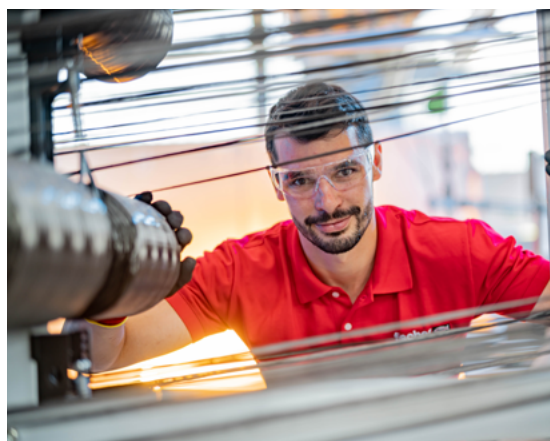


Safety that connects. Decisive quality.

We don't make any compromises when it comes to the safety of our products. A whole host of our products are distinguished by comprehensive, up-to-date and international approvals. The fischer product range is well-positioned in all sectors of fixing technology – Steel, Nylon and Chemical fixings. In award-winning quality which continues to impress both professional clients and private customers with equal measure.



International approvals characterise many of our products.





Always on the pulse of time

At fischer, innovation is more than just a sum of the patents. We are open to new things and are prepared for change – always with the aim of offering our customers the greatest possible benefits. Over the years, our own development and production sites have been developing numerous fixing solutions for the most wide-ranging applications. Be it new production procedures or materials, such as renewable raw materials: We are carrying out the research for your safety and will continue to do so in the future. This gives us such great flexibility that we can even develop tailor-made customer solutions. This power to innovate has seen fischer become market leader in anchor technology and the fixing industry.

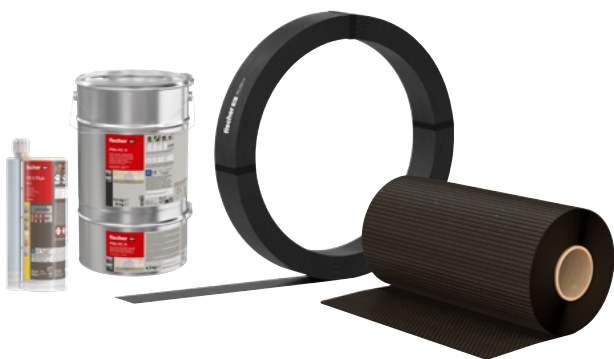
Our service to you

We are a reliable partner, one that will stand at your side and address your individual requirements with advice and action:

- Our products range from chemical systems to steel anchors through to plastic anchors.
- Competence and innovation through own research, development and production.
- Global presence and active sales service in over 100 countries.
- Qualified technical consulting for economical and compliant fastening solutions. Also on-site at the construction site requested.
- Training sessions, some with accreditation, at your premises or at the fischer academy.
- Design and construction software for demanding applications.

We take responsibility

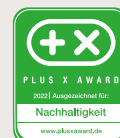
Our active environment management policy means that we are helping to maintain an intact environment for our generation and for those that follow. The environment management policy at the Tumlingen site has been certified in line with DIN EN ISO 14001. It fills us with particular pride that in 2020 we have received the most important and largest award in Europe in the field of sustainability: the German Sustainability Award – category large companies. This was in recognition of our holistic approach and the strategic anchoring of our sustainability management. With our greenline products we have launched the first range of fixings on the market that is based on renewable raw materials to more than 50%.



German Sustainability Award



German Green Brand Award



Plus X Award – Sustainability



Lean & Green Management Award



GreenLine assortment based on 50% regrowing raw materials

About fischer

Strengthening Solutions:

1. Carbon Fibre Reinforced Polymer (CFRP) Laminates

The precured CFRP laminates present state-of-the-art solutions when it comes to the structural strengthening of reinforced concrete, pre-stressed concrete structural members and beyond. The externally bonded (EB) and near surface mounted (NSM) CFRP laminates are considered as externally bonded reinforcements, improving the structural performance of concrete slabs, beams, walls and other structural members. In all cases, the structural design needs to be carried out by an experienced professional.

Externally Bonded FRS-L-S & FRS-L-H CFRP Laminates	26
Near Surface Mounted FRS-L-S NSM CFRP Laminates	30

2. Carbon Fibre (CF) Fabrics

Due to its flexibility, the CF fabrics are an optimal choice for a vast number of strengthening applications. CF fabrics are often used for column confinements, but also in flexural or shear strengthening applications, or in combination with the CFRP laminates, where the CF fabrics can be bent over edges. For an optimal end-anchorage of the CF fabrics, the application of the carbon fibre spike anchor offers a safe and flexible solution.

Carbon Fibre Fabric FRS-W U300 & FRS-W U600	37
Carbon Fibre Spike Anchor FRS-FC	40

3. Concrete overlay using concrete-concrete shear connectors

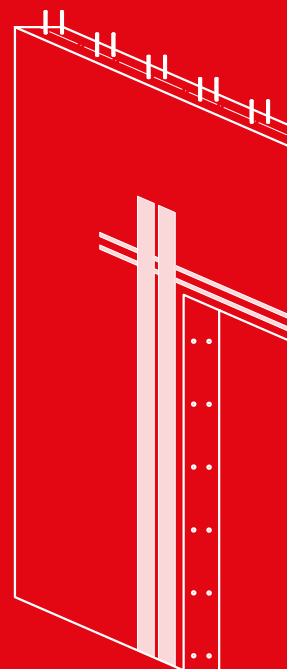
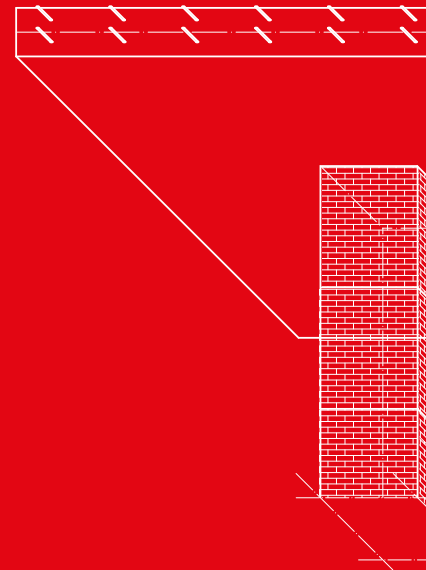
An additional concrete layer, which is poured onto the existing concrete, increases the internal lever arm of the cross-section, improving the flexural resistance of the member. The shear forces between the existing and new concrete layer can safely be transferred by concrete-concrete shear connectors.

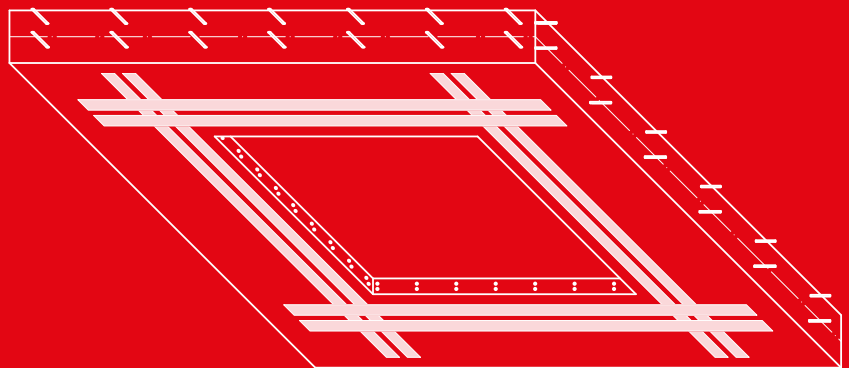
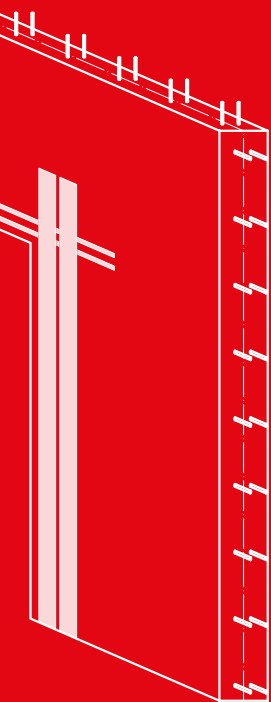
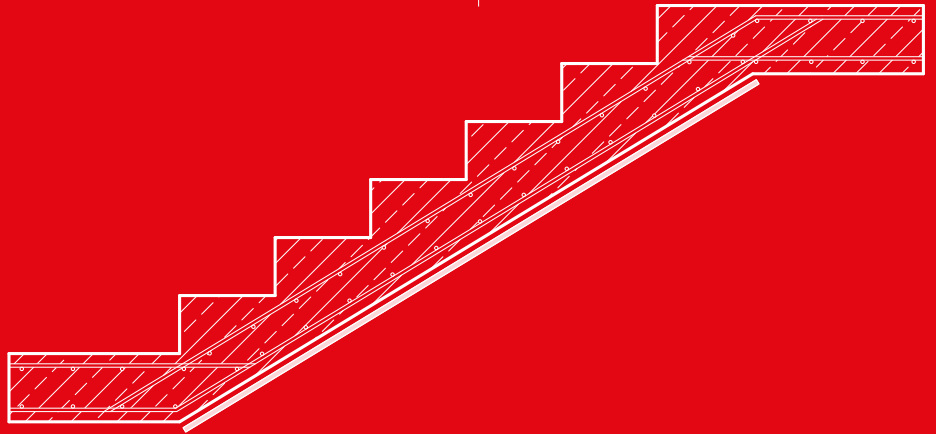
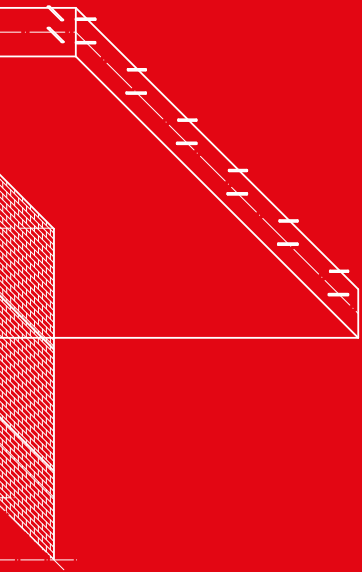
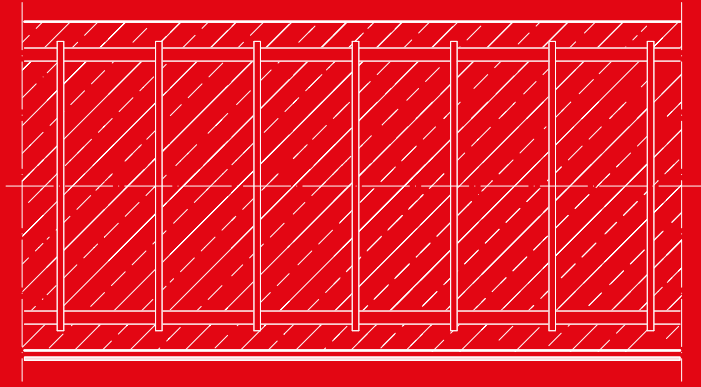
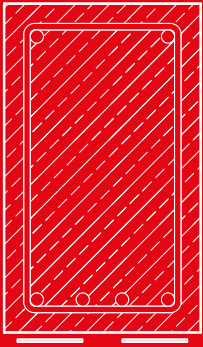
UltraCut FBS II Concrete Screws	74
FCC Concrete-Concrete Shear Connectors	80
FCC-B Bridge Cap Anchor	82

4. Post-installed rebars

Post-installed reinforcing bars are used in various applications in the construction industry to e.g., realise safe joints between concrete members. One typical application of post-installed rebars is column jacketing, in which the new longitudinal rebars need to be installed in the slabs and the new stirrups need to be anchored into the existing column, thus increasing both the flexural and axial resistance, as well as the punching shear resistance of the slabs over the column.

Epoxy mortars and injection systems for post-installed rebars	86
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Innovations that inspire professionals.

Content

Introduction	10	Chapter	1
Products for Structural Strengthening	22	Chapter	2
Basics – good to know	122	Chapter	3
Services	126	Chapter	4



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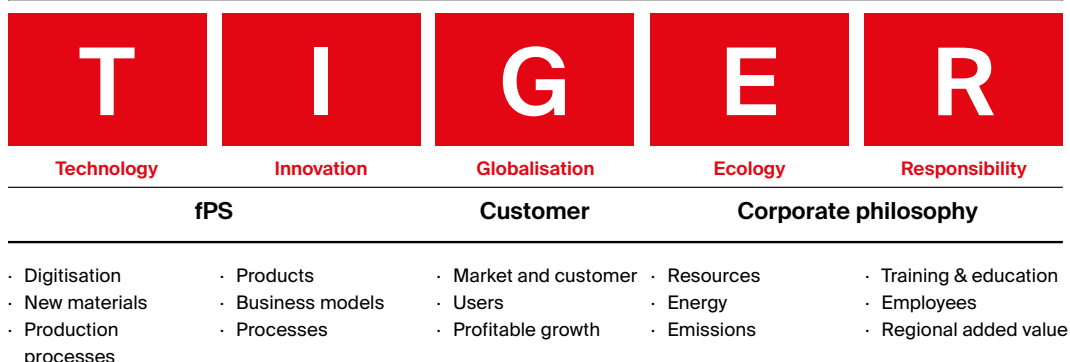
Introduction

fischer strategy for sustainability	12
Why structural strengthening?	14
Product overview	16
References	21

fischer strategy for sustainability.



2030 strategy



Strategy and integrity

For fischer, sustainability means ensuring the future viability of the company! The sustainability strategy is integrated into the corporate strategy. TIGER is the roof foil and the eye-catcher for the Strategy 2030 and the fischer strategy for sustainability. The strategy orientation pursues the goals of combining crisis security, competitiveness and climate protection. The acronym TIGER stands for the specific central sustainability pillars of the company:

Technology - Innovation - Globalization - Ecology - Responsibility. At the same time, TIGER provides an overview of the company's key strategic challenges in direct connection with the relevant SDGs. As a manufacturing company, the focus is on decoupling resource consumption from growth. In this context, the greatest potential lies in innovative strength and technological progress.

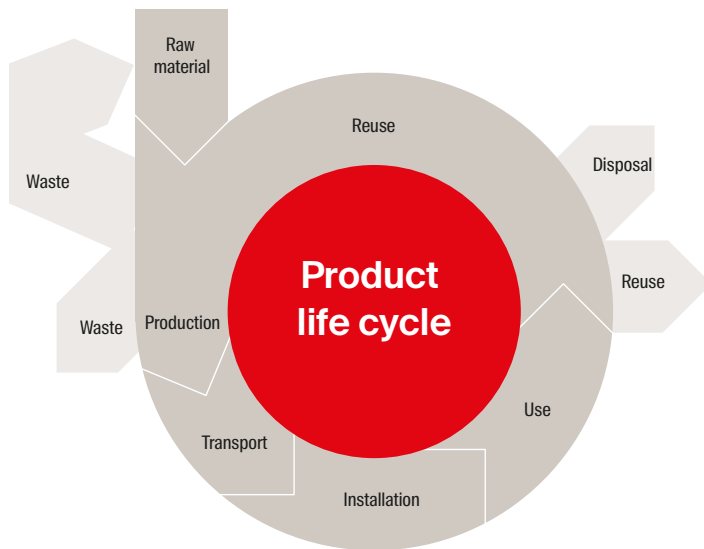


“Sustainability unites the aspects of environmental protection, technology and innovation with economic success and social responsibility.

At the fischer group of companies, we see the interplay of these aspects as a challenge encouraging us to live, work, and do business in harmony with nature.”

Professor E.h. (Tongji-Univ.), Dr.-Ing. E.h., Senator E.h. E.h.,
Dottore Magistrale ad honorem, Dipl.-Ing. (FH)
Klaus Fischer





Product responsibility

We, at fischer are exercising our product responsibility throughout the entire product life-cycle: sustainable and durable raw materials, waste management and waste recycling in the production, sustainable packaging, efficient transportation, user-friendly and time-efficient installation and product use, and reuse of the products.

Our products are analysed in detail throughout the entire product life cycle in value analysis workshops as part of efficiency projects, to check where and in which components we can reduce the use of raw materials or replace them entirely. We also investigate where valuable energy can be saved in manufacturing process steps and transport. By doing so, we at fischer are exercising our product responsibility throughout the entire life cycle.

1

Taking the next step

The construction sector is responsible for over 35% of the EU's total waste generation. The buildings and construction sector accounted for 36% of final energy use and 39% of energy and process-related carbon dioxide (CO₂) emissions in 2018, 11% of which resulted from manufacturing building materials and products such as steel, cement, and glass. We believe, that sustainability in the construction industry can only be achieved by preservation and restoration of the existing substance by new and innovative technologies and construction products.

The new fischer assortment reflects to the biggest challenge of the construction industry, namely to the rehabilitation and preservation of existing structures. We underline our commitment for a sustainable construction industry and enlighten our corporate sustainability philosophy from a new, different perspective. fischer not only focuses on the abovementioned product sustainability aspects, but the products, through their function, also contribute indirectly to a sustainable construction industry. The structural retrofitting products and strengthening solutions extend the service life of existing civil engineering structures leading to significant CO₂ reduction.



Why structural strengthening?

What drives structural strengthening?

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Civil engineering structures serve our daily lives, and their structural safety is of particular importance. Buildings, bridges, tunnels present our built environment, and they surround us, wherever we are. The need for structural strengthening is commonly driven by the following reasons:

In case the **function** of existing buildings is **changed** e.g. a residential building is used further as an office building, the structural analysis should verify the structural safety under the increased live-loads and reveal the need for structural strengthening.

The **traffic intensity** and **traffic loads** are increasing on existing bridges over time. Open-source statistics on the condition of existing bridges verify the urgent need for the strengthening or retrofitting works worldwide.

Existing high-rise buildings are often upgraded by **additional floors**. This is mainly driven by the shortage on ground space, particularly in major cities. The additional floors exert the existing building skeleton to additional loads and the load-bearing capacity must be verified or achieved by means of strengthening works.

Design deficiencies, poor execution quality or bad material quality often present the reason for structural strengthening. Some examples include concreting using the wrong concrete strength class, installing incorrect rebar diameters, having a lack of steel reinforcement, or making false assumptions in the structural design.

The engineering structures are designed to withstand mechanical, chemical, physical, biological, thermal and fire attacks throughout their service life. This is ensured by considering a vast number of aspects in the design & execution. Nonetheless, there might be several factors leading to accelerated **material deterioration processes** e.g., concrete and steel corrosion, which needs to be addressed with adequate strengthening or retrofitting methods.

Over time, the **building codes** are getting more stringent and more sophisticated. For example, the increasing seismic activity in different regions provokes the adaptation of appropriate and safe regulations. There are currently thousands of buildings being assessed in post-earthquake zones to evaluate their structural safety and millions of engineering structures are being pro-actively strengthened to avoid the severe consequences of further earthquakes from happening again.

Wall or slab openings are often made at a later stage of the construction phase. Depending on their dimensions, these might **change the static system** of the building, making strengthening works necessary.





Principals of structural strengthening

There exist several state-of-the-art structural strengthening techniques in the engineering practice. The main goal of strengthening is to improve the performance of existing engineering structures. A distinction can be made between restorative strengthening and strengthening that increases the resistance of the structure.

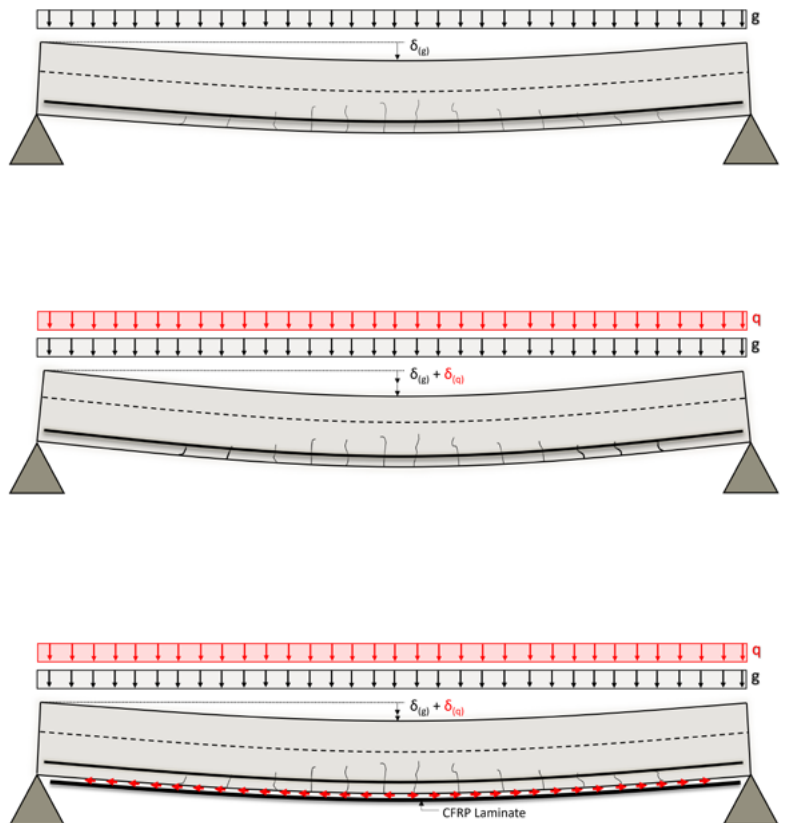
Restorative strengthening assumes a loss of the structural resistance compared to the intended performance of the structure, caused by e.g. steel corrosion. The primary aim of the strengthening is to restore the initially intended structural performance by e.g. replacing the corrosion-affected rebars, adding embedded rebars or by applying externally bonded steel or carbon fibre strengthening materials. As a result of the strengthening, the required global structural safety of the structure can be ensured.

Due to additional loads, the performance of the structures or structural members needs to be increased over their intended service life. Reasons for that include among others the increasing seismic activity and the thereof resulting more stringent building codes, the increased live loads on bridges and buildings. The structure is not necessarily damaged at the time of the strengthening works, hence the global safety of the structure can only be maintained by upgrading its initial structural performance by adequate **strengthening**.

Expected structural behaviour

Strengthening explained simply.

Reinforced concrete structural members, already under their dead-load, display a certain deflection (δ_g) with anticipated hairline cracks, which should be kept under $< 0,3 \text{ mm}$, thus fulfilling the requirements at the Serviceability Limit State (SLS). This is almost always the condition of the structural member at the time of the strengthening application. Due to additional live loads and the thereof resulting further deformation (δ_q), the post-installed strengthening materials (CFRP reinforcement, CF fabric, Steel Plates, etc.) are engaged and they contribute to the overall resistance of the cross-section. An adequate and slip-free load-transfer between the member to be strengthened and the strengthening material must be ensured, whether it be mechanical or adhesive. Our strengthening systems undergo extensive state-of-the-art product qualification processes to ensure their ultimate safety. Even though our assortment meets the highest requirements and even though the structural response of the strengthening applications is thoroughly researched, the design of several applications still require high experience and engineering judgment. Therefore, the design, specification and the application of the structural strengthening products should be done by experienced professionals.





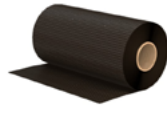



Selection guide of structural strengthening systems.

Carbon fibre based strengthening products



Cracked concrete

Product	Type		Individual products for structural strengthening on carbon fibre basis			
	Page		FRS-L-S FRS-L-H Externally Bonded CFRP Laminate 26 	FRS-L-S NSM Near Surface Mounted CFRP Laminate 30 	FRS-W U300 FRS-W U600 Unidirectional Carbon Fibre Fabric 37 	FRS-FC Carbon Fibre Spike Anchor 40 
Intended use	–	–	Structural strengthening	Structural strengthening	Structural strengthening	Structural strengthening
Base material	–	–	Concrete, masonry, timber	Concrete, masonry, timber	Concrete, masonry, timber	Concrete, masonry, timber
Geometry	–	Cross section	100 mm x 1.2 mm 75 mm x 1.2 mm 50 mm x 1.2 mm 100 mm x 1.4 mm 75 mm x 1.4 mm 50 mm x 1.4 mm	20 mm x 1.2 mm 15 mm x 1.4 mm 10 mm x 1.7 mm	200 mm (coil width) 500 mm (coil width)	Ø 10 mm (precured part) Ø 12 mm (precured part)
		Length of coil / roll	100 m, 150 m	150 m	100 m, 150 m	–
Approvals		ETA	●	●	–	–
		ICC-ES	●	–	●	–
		DIBt (ABG)	–	–	–	–

Technical data

Mean tensile strength	[N/mm ²] [=MPa]	≥ 3 000 (FRS-L-S) ≥ 3 400 (FRS-L-H)	≥ 3 000 (FRS-L-S NSM)	≥ 4 200 (dry fibres)	≥ 4 200 (dry fibres) ≥ 1600 (precured part)
Mean tensile modulus	[kN/mm ²] [=GPa]	≥ 170 (FRS-L-S) ≥ 200 (FRS-L-H)	≥ 170 (FRS-L-S NSM)	≥ 230 (dry fibres)	≥ 230 (dry fibres) ≥ 150 (precured part)
Mean ultimate strain	[%]	≥ 1.7 (FRS-L-S) ≥ 1.6 (FRS-L-H)	≥ 1.7 (FRS-L-S NSM)	≥ 1.8 (dry fibres)	≥ 1.8 (dry fibres) ≥ 1.0 (precured part)
Mean fibre content	[%]	≥ 67	≥ 67	n/a	n/a
Density	[g/cm ³]	≈ 1.6	≈ 1.6	≈ 1.8	n/a
Shelf life	[months]	Unlimited	Unlimited	24	24
Essential products for application	–	FRS-CS	FRS-CS FRS-CS 585 S	FRS-CF	FRS-CF FIS EM Plus









Selection guide of chemical products

Can and injection systems

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






Cracked concrete

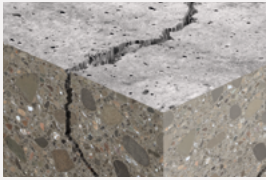
Product	Type		Individual products for structural strengthening			
	Page		FRS-CS Epoxy Mortar	FRS-CS 585 S Epoxy Mortar in injection cartridge	FRS-CF Saturating Resin	FRS-PC 11 Epoxy Repair Mortar
			33	33	43	47
						
Intended use	–	–	Structural bonding agent for CFRP installation & Universal repair mortar	Structural bonding agent for CFRP installation & Universal repair mortar	Saturating resin for CF Fabrics and spike anchors	Epoxy-based concrete repair mortar for levelling of concrete surface
Base material	–	–	Concrete, masonry, timber	Concrete, masonry, timber	Concrete, masonry, timber	Concrete
Delivery form	–	–	Can	Cartridge	Can	Can
No. of components	–	–	2	2	2	3
Filling	–	–	5 kg (A+B) 10 kg (A+B)	585 ml	5 kg (A+B) 10 kg (A+B)	11 kg (A+B+C)
Shelf life	–	–	36 months	36 months	36 months	36 months
Colour	–	–				
Approvals	Approval	ETA	●	●	–	●
		ICC-ES	●	●	●	–
		DIBt (ABG)	–	–	–	–
	Certificate	EN 1504	●	●	●	●

Technical data

Mean tensile strength	[N/mm ²]	≥ 35	≥ 35	≥ 30	≥ 20
Mean compressive strength	[N/mm ²]	≥ 85	≥ 85	≥ 60	≥ 140
E-Modulus under compression	[GPa]	≥ 7.5	≥ 7.5	≥ 3	≥ 20
Viscosity	[mPa*s]	≈ 8 x 10 ⁶	≈ 8 x 10 ⁶	≈ 15 000	–
Density	[g/cm ³]	≈ 1.8	≈ 1.8	≈ 1.3	≈ 2.0
Min. Curing Time 21 °C	[h]	24	24	48	48
Pot life 20 °C	[min]	≈ 85 (5 kg) ≈ 75 (10 kg)	≈ 90	≈ 145 (5 kg) ≈ 125 (10 kg)	≈ 80
Installation temperature	[°C]	10 – 40	10 – 40	10 – 40	10 – 40







FRS-BA Bonding Agent	FRS-CP red and FRS-CP grey Corrosion Protection Primer	FRS-SF UV Protection Coating	FRS-FP Fire Protection Coating	FRS-CA Universal Cleaning Agent
50	59	56	62	66
				
Improving adhesion between new and old concrete, corrosion protection for steel rebars	Corrosion protection for exposed steel surfaces and embedded rebars	Protection against UV radiation	Protection against fire and smoke development	Cleaning of CFRP Laminates surface and tools
Concrete, masonry, timber	Steel	CFRP, CF Fabric materials	CFRP, CF Fabric materials	CFRP laminate, Metallic surf.
Can	Can	Bucket	Can	Aerosol can
2	2	2	1	1
5 kg (A+B)	5 kg (A+B)	12.5 litre	25 kg	500 ml
36 months	36 months	12 months	9 months	48 months
				 (transparent)
●	–	–	–	●
–	–	–	●	–
–	–	–	–	–
●	●	●	–	–

≥ 35	≥ 35	–	–	–
≥ 120	≥ 80	–	–	–
≥ 7	–	–	–	–
≈ 50 000	≈ 3 000	≈ 3 000	≈ 35 000	–
≈ 2.0	≈ 1.4	≈ 1.3	–	–
24	24	6	24	–
≈ 50	≈ 25	–	–	–
10 – 40	10 – 40	5 – 30	5 – 40	5 – 40



Cracked concrete





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Product	Type	Individual products for structural strengthening, post-installed rebars and beyond Injection systems					
		FIS SB Injection Mortar	FIS EM Plus Epoxy mortar	FIS EB II Epoxy mortar	FIS V Plus Injection Mortar	FIS VL Injection Mortar	FIS RC II Injection mortar
		Page 88 	93 	98 	101 	112 	118 
Intended use	–	The concrete all-rounder	Rebar connections and cracked concrete	Standard applications in concrete	Universal mortar for concrete and masonry	Standard applications in cracked concrete	Post-installed rebar connections
Base material	–	Concrete	Concrete	Concrete	Concrete, solid masonry, perfor. masonry, aerated concrete	Concrete, solid masonry, perfor. masonry, aerated concrete	Concrete
Delivery form	–	Cartridge	Cartridge	Cartridge	Cartridge	Cartridge	Cartridge
No. of components	–	2	2	2	2	2	2
Content [ml]	–	390, 585	390, 585, 1 500	390, 585	300, 360, 410, 825	300, 360, 410	360, 825
Shelf life [months]	–	12	36	18	15 (410 ml) 18 (300 ml) 24 (360, 825 ml)	12 (300 ml) 15 (410 ml) 24 (360 ml)	24
Approvals	ETA	●	●	●	●	●	●
	ICC-ES	●	●	–	●	–	–
	DIBt (aBG / abZ)	–	●	–	–	–	–

Technical data

Curing Time 21 °C	[min] or [h]	45 min	10 h	24 h	45 min	45 min	45 min
Processing time 21 °C	[min]	4	14	30	4	4	4
Installation temperature	[°C]	-15 – 40	-5 – 40	5 – 40	-10 – 40	-10 – 40	-5 – 40

Suitable for following applications

Product	Application						
Concrete-Concrete Shear Connector Ultracut FBS II 	Concrete overlay	–	–	–	–	–	–
Concrete-Concrete Shear Connector FCC 	Concrete overlay	●	●	–	●	–	●
Bridge cap anchor FCC-B 	Post-installed bridge edge	●	●	–	–	–	–
Post-installed rebar 	Column jacketing	●	●	●	●	●	●

References

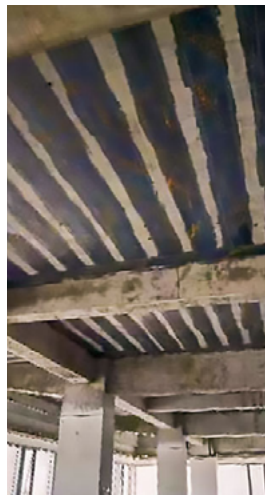
Column jacketing with post-installed rebars in Dubai

fischer FZE, United Arab Emirates

The performance of RC columns of a multi-storey building was enhanced through increasing the column cross-sections by means of post-installed rebars and subsequent monolithic concreting. The reinforcing bars were installed using our injection system FIS EM Plus, which has the ETA for the use as post-installed rebar connections. Beside the longitudinal reinforcing bars, perpendicular rebar connectors were also installed to ensure the adequate load-transfer between the new concrete layer and the existing column cross-section.



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Multiple structural strengthening projects in China

fischer (Taicang) fixings Co. Ltd., China

The flexural resistances of existing RC slabs were increased using carbon fibre fabric. The slabs were designed initially as one-way slabs and consequently, the carbon fibre fabric stripes were applied along the main load-bearing directions.

Due to the increased requirements as well as material deterioration, the RC silos were confined using carbon fibre fabric to enhance the horizontal reinforcement of silos. The silos are used as grain stock warehouse.
























The axial strengthening of existing RC columns using backfilled bonded steel plates in a technique we do often throughout China.





2

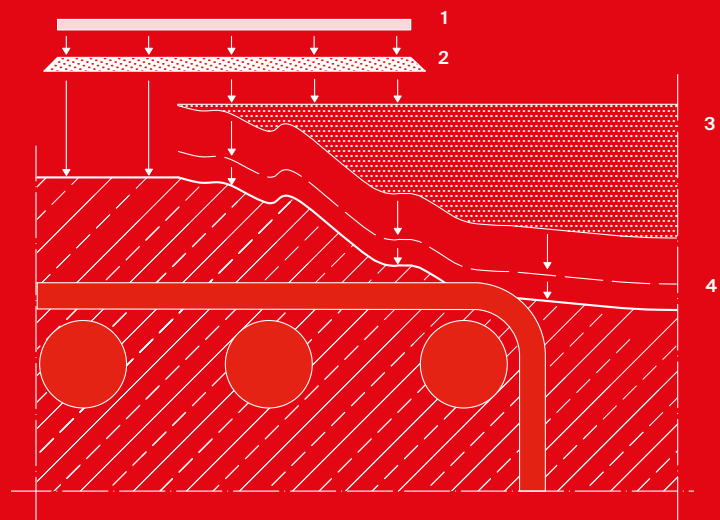
Products for Structural Strengthening

Externally Bonded CFRP Laminates FRS-L-S & FRS-L-H	26		Adhesive application device	68	
Near Surface Mounted CFRP Laminates FRS-L-S NSM	30		Laminate coiler	70	
Epoxy Mortar FRS-CS	33		Concrete screw UltraCut FBS II	74	
Carbon Fibre Fabric FRS-W U300 & FRS-W U600	37		Concrete-concrete shear connector FCC	80	
Spike Anchor FRS-FC	40		Bridge cap anchor FCC-B	82	
Saturating Resin FRS-CF	43		Injection mortar FIS SB	88	
Epoxy Repair Mortar FRS-PC 11	47		Epoxy mortar FIS EM Plus	93	
Bonding Agent FRS-BA	50		Epoxy mortar FIS EB II	98	
UV-Protection Coating FRS-SF	56		Injection mortar FIS V Plus	101	
Corrosion Protection Primer FRS-CP	59		Injection mortar FIS VL	112	
Fire Protection Coating FRS-FP	62		Injection mortar FIS RC II	118	
Cleaning Agent FRS-CA	66				

fischer C-Fiber Force Strengthening System

The fischer C-Fiber Force Strengthening System and its product components are the perfect choice to improve the structural performance of reinforced concrete and pre-stressed concrete members. The product components of the C-Fiber Force System have state-of-the-art technical assessments and certificates covering a wide range of strengthening applications: European Technical Assessment for externally bonded (EB) CFRP laminates and for near surface mounted (NSM) CFRP Laminates (ETA-24/0281 acc. to EAD 160086-01-0301), ICC-ES Evaluation Report (ESR-4774) acc. to AC125.

Please always consider the valid national and international standards and regulations in conjunction with the corresponding technical assessments, design specifications, installation manuals, technical and safety Datasheets prior to design and application of these products and contact our technical experts in your fischer national subsidiary in case of any inquiries. Please note that the applications scope and the design relevant parameters of the same products might slightly vary in the different technical approvals and assessments.



1 CFRP Laminate
FRS-L-S or FRS-L-H

2 Epoxy Mortar
FRS-CS

3 Epoxy Repair
Mortar
FRS-PC 11

4 Bonding Agent
FRS-BA

Carbon Fibre Reinforced Polymer (CFRP) Laminates

Externally bonded CFRP Laminates FRS-L-S and FRS-L-H	26
Near Surface Mounted CFRP Laminates FRS-L-S NSM	30
Epoxy Mortar FRS-CS	33

Carbon Fibre (CF) Fabric

Carbon Fibre Fabrics FRS-W U300 and FRS-W U600	37
Spike Anchor FRS-FC	40
Saturating Resin FRS-CF	43

Concrete Repair

Epoxy Repair Mortar FRS-PC 11	47
Bonding Agent FRS-BA	50

Protective Coatings

UV-Protection Coating FRS-SF	56
Corrosion Protection Primer FRS-CP	59
Fire Protection Coating FRS-FP	62

Complementary Products

Cleaning Agent FRS-CA	66
Adhesive Application Device FRS-AD	68
Laminate Coiler FRS-LC	70



Externally bonded CFRP Laminates

FRS-L-S, FRS-L-H

Externally bonded Carbon Fibre Reinforced Polymer (CFRP) Laminates for structural strengthening with standard (≥ 170 GPa) and high tensile elastic modulus (≥ 200 GPa).

2



Applications

- Structural Strengthening of reinforced concrete and pre-stressed concrete members
- Enhancing the tensile reinforcement area of existing concrete members
- Buildings, infrastructure and park decks
- Beams, concrete slabs, walls
- Wall and ceiling openings

Advantages

- Available with standard (≥ 170 GPa) and high tensile elastic modulus (≥ 200 GPa)
- Easy installation due to light weight
- Crack width limitation
- Strengthening without significantly increasing the dead-load of existing structures, minimal reduction of the interior height
- Very good alkaline and corrosion resistance
- Different geometries for cost-efficient design and flexibility

Functioning

- The FRS-L-S and FRS-L-H laminates are externally bonded to the concrete surface using the epoxy mortar FRS-CS
- The FRS-L-S and FRS-L-H CFRP laminate contribute to the load-bearing capacity of members, on which they are applied

Certificates

Product component of the fischer C-Fiber Force strengthening system with ETA and ICC-ES Evaluation Report (ETA-24/0281, ESR-4774, ICC-ES Evaluation Report)



Building materials

Approved for:

- Concrete

Applicable for:

- Concrete
- Masonry
- Steel
- Timber

Principles of concrete repair and protection (EN 1504-9)

- Principle 4.3 Strengthening of concrete members – Bonded Reinforcements

For use with:

FRS-CS
Epoxy Mortar

33



FRS-CA
Cleaning Agent

66



FRS-FP
Fire Protection

62



Product range and approvals

Externally bonded CFRP Laminates FRS-L-S, FRS-L-H



FRS-L-S, FRS-L-H

Item	Item no.	Approvals		Delivery form	Sales unit [pcs]
		ETA	ICC		
FRS-L-S 50x1.2	562433	●	●	Coil 150 m	1
	569837	●	●	1 m*	1
FRS-L-S 75x1.2	562434	●	●	Coil 150 m	1
	569838	●	●	1 m*	1
FRS-L-S 100x1.2	562435	●	●	Coil 100 m	1
	569839	●	●	1 m*	1
FRS-L-S 50x1.4	562439	●	●	Coil 150 m	1
	569843	●	●	1 m*	1
FRS-L-S 75x1.4	562440	●	●	Coil 150 m	1
	569844	●	●	1 m*	1
FRS-L-S 100x1.4	562441	●	●	Coil 100 m	1
	569845	●	●	1 m*	1
FRS-L-H 50x1.2	562436	●	●	Coil 150 m	1
	569840	●	●	1 m*	1
FRS-L-H 75x1.2	562437	●	●	Coil 150 m	1
	569841	●	●	1 m*	1
FRS-L-H 100x1.2	562438	●	●	Coil 100 m	1
	569842	●	●	1 m*	1
FRS-L-H 50x1.4	562442	●	●	Coil 150 m	1
	569846	●	●	1 m*	1
FRS-L-H 75x1.4	562443	●	●	Coil 150 m	1
	569847	●	●	1 m*	1
FRS-L-H 100x1.4	562444	●	●	Coil 100 m	1
	569848	●	●	1 m*	1

* Custom length order is possible if smaller quantity is requested than the full coil length. Please note the minimum order length of 10 meters.

Technical data – physical properties

Item	Density	Mean fibre volume content	Width	Thickness	Area	Recommended FRS-CS consumption for installation*
	[g/cm ³]	[%]	[mm]	[mm]	[mm ²]	[kg/m]
FRS-L-S 50x1.2	1.60	≥ 67	50	1.2	60	0.30 – 0.40
FRS-L-S 75x1.2	1.60	≥ 67	75	1.2	90	0.40 – 0.50
FRS-L-S 100x1.2	1.60	≥ 67	100	1.2	120	0.60 – 0.70
FRS-L-S 50x1.4	1.60	≥ 67	50	1.4	70	0.30 – 0.40
FRS-L-S 75x1.4	1.60	≥ 67	75	1.4	105	0.40 – 0.50
FRS-L-S 100x1.4	1.60	≥ 67	100	1.4	140	0.60 – 0.70
FRS-L-H 50x1.2	1.60	≥ 67	50	1.2	60	0.30 – 0.40
FRS-L-H 75x1.2	1.60	≥ 67	75	1.2	90	0.40 – 0.50
FRS-L-H 100x1.2	1.60	≥ 67	100	1.2	120	0.60 – 0.70
FRS-L-H 50x1.4	1.60	≥ 67	50	1.4	70	0.30 – 0.40
FRS-L-H 75x1.4	1.60	≥ 67	75	1.4	105	0.40 – 0.50
FRS-L-H 100x1.4	1.60	≥ 67	100	1.4	140	0.60 – 0.70

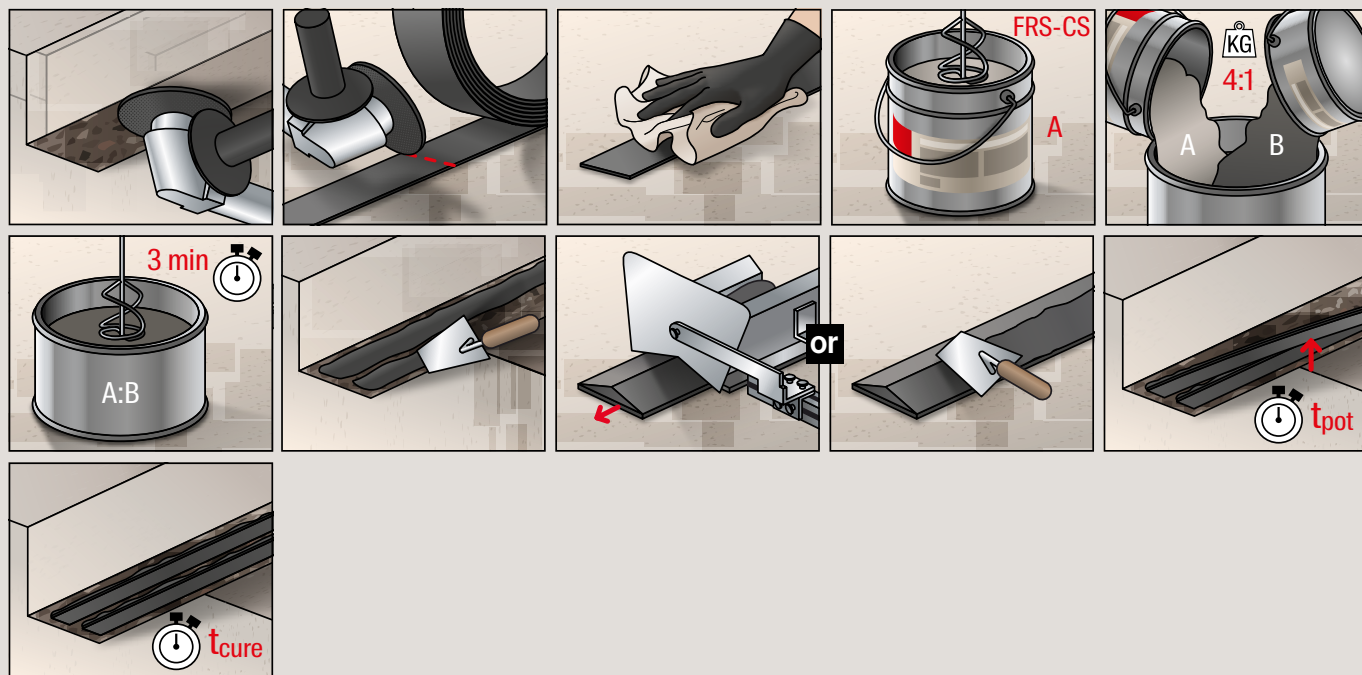
* Material consumption depends on the surface, profile, and roughness of the substrate as well as laminate crossings and the amount of waste. The effective material consumption may therefore deviate from the recommended values.

Technical data – mechanical properties

Item	Mean tensile strength* (EN 2561) [N/mm ² =MPa]	Mean elastic modulus* (EN 2561) [N/mm ² =MPa]	Mean ultimate tensile strain* (EN 2561) [%]
FRS-L-S 50x1.2	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S 75x1.2	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S 100x1.2	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S 50x1.4	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S 75x1.4	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S 100x1.4	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-H 50x1.2	≥ 3 400	≥ 200 000	≥ 1.6
FRS-L-H 75x1.2	≥ 3 400	≥ 200 000	≥ 1.6
FRS-L-H 100x1.2	≥ 3 400	≥ 200 000	≥ 1.6
FRS-L-H 50x1.4	≥ 3 400	≥ 200 000	≥ 1.6
FRS-L-H 75x1.4	≥ 3 400	≥ 200 000	≥ 1.6
FRS-L-H 100x1.4	≥ 3 400	≥ 200 000	≥ 1.6

* Values determined in accordance with EN 2561. Note that the different testing procedures defined in the different standards may result in slight deviations of the mechanical parameters. The values given in the valid technical approvals and assessments are always decisive for design.

Installation steps



Note that the above information presents only an informative summary of the essential installation steps and might not be complete. For the detailed installation instructions please refer to the Installation Manual for Externally Bonded CFRP laminates and the Technical Data-sheet of the corresponding products.



Near surface mounted CFRP Laminate FRS-L-S NSM

Near Surface Mounted Carbon Fibre Reinforced Polymer (CFRP) Laminates for structural strengthening with standard tensile modulus (≥ 170 GPa)

2



Applications

- Structural Strengthening of reinforced concrete and pre-stressed concrete members
- Enhancing the tensile reinforcement area of existing concrete members
- Buildings, infrastructure and park decks
- Beams, concrete slabs, walls
- Wall and ceiling openings

Advantages

- Tensile modulus (≥ 170 GPa)
- Increased aesthetics due to low visibility
- Higher utilization of the tensile strength compared to externally bonded laminates
- Combination and crossings with externally bonded CFRP laminates possible (e.g. bi-directional strengthening of slabs)
- Strengthening without significantly increasing the dead-load of existing structures, minimal reduction of the interior height
- Different geometries for cost-efficient design and flexibility

Functioning

- The FRS-L-S NSM laminates are installed into concrete grooves using the Epoxy Mortar FRS-CS or the injection system FRS-CS 585 S
- The FRS-L-S NSM CFRP laminates work as additional post-installed tensile reinforcement

Certificates

System component of the fischer C-Fiber Force strengthening system with ETA (ETA-24/0281)



Building materials

Approved for:

- Concrete

Applicable for:

- Masonry
- Timber

Principles of repair and protection (EN 1504-9)

4.3 Strengthening of concrete members – Bonded Reinforcements

For use with:

FRS-CS 585 S
Epoxy Mortar

33



FRS-CA
Cleaning Agent

66



Product range and approvals

Near surface mounted CFRP laminates FRS-L-S NSM



FRS-L-S NSM

Item	Item no.	Approvals		Delivery form	Sales unit [pcs]
		ETA	ICC		
FRS-L-S NSM 20x1.2	571700	●	–	Coil 150 m	1
	571712	●	–	1 m*	1
FRS-L-S NSM 15x1.4	571701	●	–	Coil 150 m	1
	571713	●	–	1 m*	1
FRS-L-S NSM 10x1.7	571702	●	–	Coil 150 m	1
	571714	●	–	1 m*	1

* Custom length order is possible if smaller quantity is requested than the full coil length. Please note the minimum order length of 10 meters.

Technical data – physical properties

Item	Density	Mean fibre volume content	Width	Thickness	Area	Recommended FRS-CS consumption for installation*
	[g/cm ³]	[%]	[mm]	[mm]	[mm ²]	[kg/m]
FRS-L-S NSM 20x1.2	1.60	≥ 67	20	1.2	24	0.09 – 0.2
FRS-L-S NSM 15x1.4	1.60	≥ 67	15	1.4	21	0.075 – 0.09
FRS-L-S NSM 10x1.7	1.60	≥ 67	10	1.7	17	0.06 – 0.075

* Note that the required amount of epoxy resin FRS-CS for installation depends on the depth and width of the groove. The effective material consumption may therefore deviate from the recommended values.

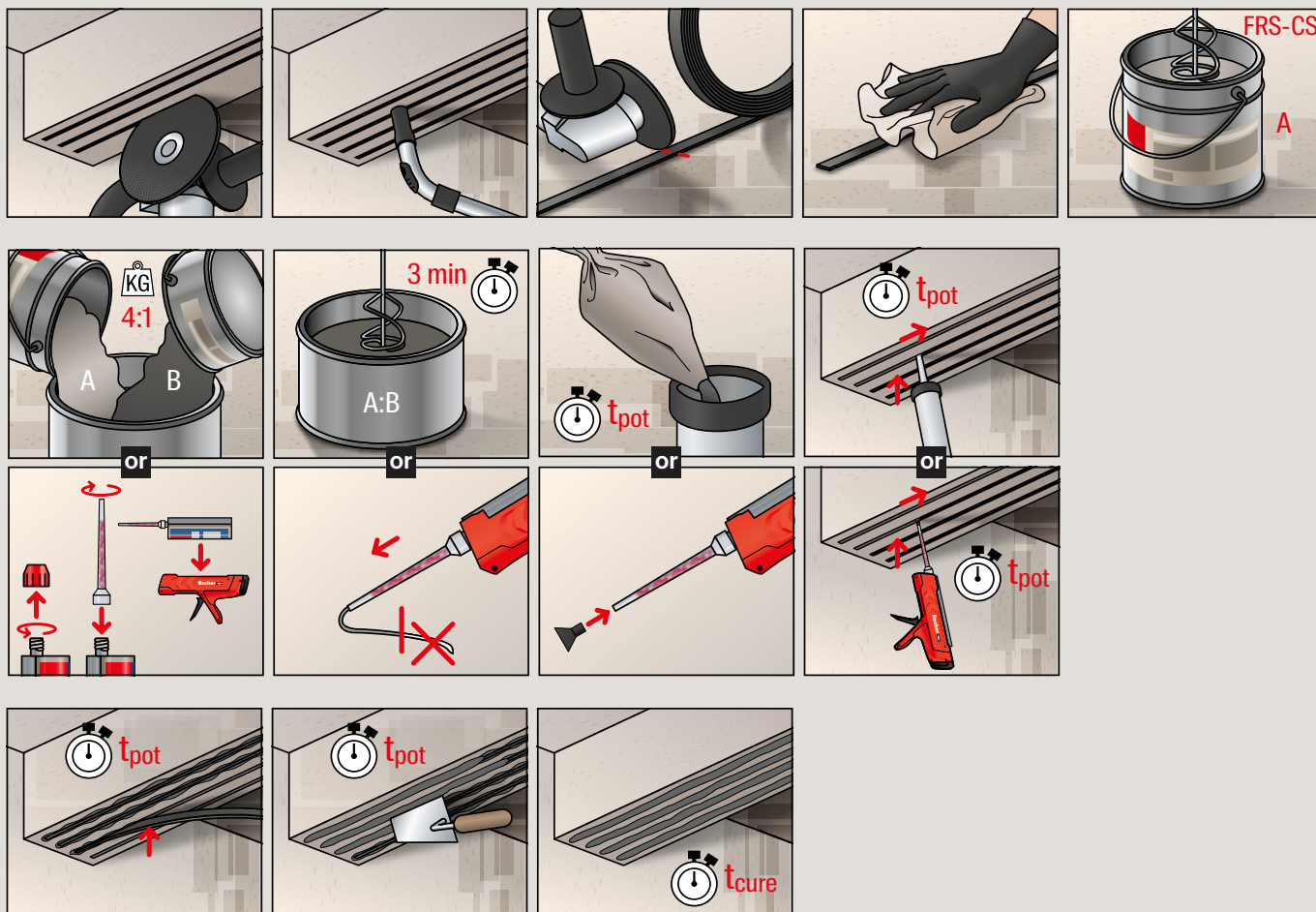
Technical data – mechanical properties

Item	Mean tensile strength* (EN 2561) [N/mm ² =MPa]	Mean elastic modulus* (EN 2561) [N/mm ² =MPa]	Mean ultimate tensile strain* (EN 2561) [%]
FRS-L-S NSM 20x1.2	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S NSM 15x1.4	≥ 3 000	≥ 170 000	≥ 1.7
FRS-L-S NSM 10x1.7	≥ 3 000	≥ 170 000	≥ 1.7

* Values determined in accordance with EN 2561. Note that the different testing procedures defined in different standards may result in slight deviations of the mechanical parameters. The values given in the valid technical approvals and assessments are always decisive for design.

Installation steps

2



For the detailed installation instructions please refer to the Installation Manual for Near Surface Mounted CFRP laminates and the Technical Datasheet of the corresponding products.

Epoxy Mortar FRS-CS

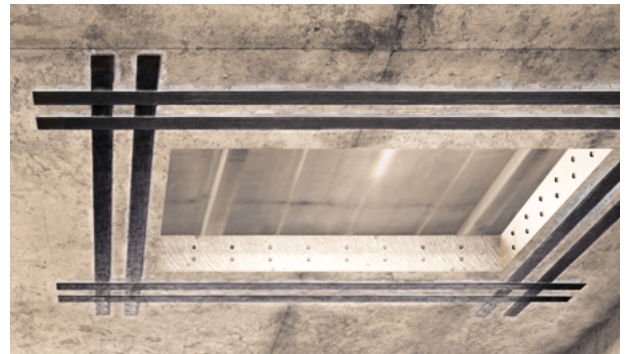
Thixotropic, 2-component structural bonding agent for the installation of EB and NSM CFRP Laminates and steel stirrups on concrete substrates, universal repair mortar



FRS-CS



FRS-CS 585 S



Applications

- Installation of externally bonded and near surface bonded FRS-L-S, FRS-L-H, FRS-L-S NSM CFRP laminates
- Post-installed shear reinforcement using steel stirrups
- Levelling mortar for concrete surface unevenness (≤ 4 mm)
- Universal construction adhesive mortar for different construction materials according to EN 1504-4
- Repair mortar according to EN 1504-3
- Post-installed rebar connection according to EN 1504-6

Advantages

- Available in can system or injection cartridge
- Thixotropic behaviour for efficient application, even in overhead applications
- No additional primer required
- Perfectly optimized performance combined with the externally bonded and near surface bonded FRS-L-S, FRS-L-H, FRS-L-S NSM CFRP laminates
- Fast injection in groove using FRS-CS injection cartridge systems
- No mixing equipment required if cartridge systems are used

Functioning

- Ambient temperature curing, solvent free two component epoxy mortar
- Versatile structural adhesive and repair mortar

Certificates

System component of the fischer C-Fiber Force Strengthening System with ETA (ETA-24/0281), EN 1504-4, EN 1504-3, EN 1504-6, ESR-4774 (ICC-ES Evaluation Report)



Building materials

Approved for:

- Concrete

Applicable for:

- Masonry
- Timber

Principles of repair and protection (EN 1504-9)

- 3.1 Concrete replacement – Hand application of mortar
- 4.3 Strengthening of concrete members – Bonded Reinforcements
- 4.4 Strengthening of concrete – Increase in cross section by addition of mortar or concrete
- 5.3 & 6.3 Increase of physical / chemical resistance – Addition of mortar or concrete
- 7.1 Preservation or restoration of passivity – Increase of the concrete cover by addition of mortar or concrete
- 7.2 Preservation or restoration of passivity – Replacement of contaminated or carbonized concrete

For use with:

Externally Bonded FRS-L-S and FRS-L-H CFRP Laminates

26



Near Surface Mounted FRS-L-S NSM CFRP Laminates


30





Product range and approvals


2


Epoxy Mortar FRS-CS



FRS-CS (10 kg)


FRS-CS (5 kg)


FRS-CS 585 S


FIS UMR


FRS-GA


FIS DM SL**

Item	Item no.	Approvals			Shelf life* [months]	Storage condition [°C]	Delivery form	Content	Sales unit [pcs]
		ETA	ICC	EN 1504 -3/-4/-6					
FRS-CS (10 kg)	569984	●	●	● / ● / ●	36	5 – 40	Can	10 kg (A+B comp.)	1
FRS-CS (5 kg)	569985	●	●	● / ● / ●	36	5 – 40	Can	5 kg (A+B comp.)	1
FRS-CS 585 S	571698	●	●	● / ● / ●	36	5 – 40	Cartridge	1x cartridge 585 ml, 1x FIS UMR, 1x FRS-GA	6
FIS UMR	520593	–	–	–	–	–	Bag	10x FIS UMR	1
FRS-GA	572382	–	–	–	–	–	Bag	10x FRS-GA	1
FIS DM SL	567768	–	–	–	–	–	Cardboard box	1x Manual Dispenser	1

* Shelf life after manufacturing date, expiry date is visible on the product labels.
**Note that the fischer Battery Dispenser FIS BD SL Pro (Item no. 562004) is also suitable for the installation of FRS-CS 585 S.

Technical data – physical properties

Item	Mixing ratio (weight)	Colour of the mixture	Layer thickness [mm]	Viscosity [mPa*s]	Density [g/cm³]	Application temperature [°C]
FRS-CS (10 kg)	4:1	Grey	1 – 5	8 x 10 ⁶	≈ 1.80	10 – 40
FRS-CS (5 kg)	4:1	Grey	1 – 5	8 x 10 ⁶	≈ 1.80	10 – 40
FRS-CS 585 S	77:23	Grey	1 – 5	8 x 10 ⁶	≈ 1.80	10 – 40

Technical data – mechanical properties

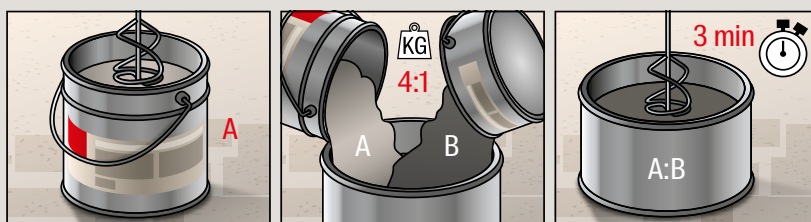
Item	Mean tensile strength (EN ISO 527-1) [N/mm ²]	Compr. strength (EN 196-1) [N/mm ²]	Elastic modulus (compression) (EN 13412) [N/mm ²]	Flexural strength (EN 178) [N/mm ²]	Glass transition temperature (EN 12164) [°C]	Coefficient of thermal expansion (EN 1770) [10 ⁻⁶ /K]
FRS-CS (10 kg)	≥ 35	≥ 85	≥ 7 500	≥ 30	≥ 50	30
FRS-CS (5 kg)	≥ 35	≥ 85	≥ 7 500	≥ 30	≥ 50	30
FRS-CS 585 S	≥ 35	≥ 85	≥ 7 500	≥ 30	≥ 50	30

Technical data – processing

Item	Temperature [°C]	Temperature [°F]	Max. processing time (5 kg) [min.]	Max. processing time (10 kg) [min.]	Min. curing time [h]
FRS-CS	10 – 20	50 – 68	90	80	48
	20 – 30	68 – 86	40	35	24
	30 – 40	86 – 104	20	20	16

The processing time/pot life depends on the environmental temperature and amount of mortar. The higher the temperature and the larger the quantity, the shorter the pot time. The pot life starts after the mixing time.

Installation steps



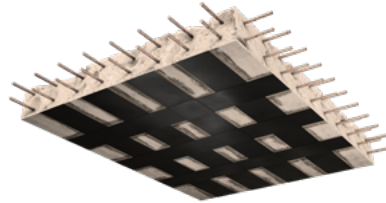
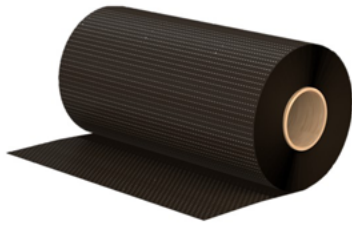
For the detailed installation instructions please refer to the Technical Datasheet (TDS) of FRS-CS.



Carbon Fibre Fabric

FRS-W U300 and FRS-W U600

Unidirectional, high-strength carbon fibre fabric for structural strengthening with 300 g/m² and 600 g/m² area densities



Applications

- Structural Strengthening of reinforced concrete and pre-stressed concrete members
- Enhancing the tensile reinforcement area of existing concrete members
- Buildings, infrastructure and park decks
- Beams, columns, concrete slabs, walls
- Wall and ceiling openings

Advantages

- Available in two variants with different area densities (300 g/m² and 600 g/m² area densities)
- Suitable for the strengthening of convex concrete members
- Strengthening without significantly increasing the dead-load of existing structures
- Different coil widths available for cost-efficient design and flexibility
- High corrosion resistance
- Suitable for the homogeneous strengthening of large area slabs

Functioning

- FRS-W unidirectional carbon fibre fabrics are used for the strengthening of concrete members in combination with the ambient temperature curing saturating resin FRS-CF
- The fabric is applied in either dry or wet layup application technique and cured on site.

Certificates

System component of the fischer C-Fiber Force Strengthening System with ICC-ES Evaluation Report (ESR-4774)



Building materials

Approved for:

- Concrete
- Concrete hollow blocks

Applicable for:

- Masonry

Principles of repair and protection (EN 1504-9)

4.3) Strengthening of concrete members – Bonded Reinforcements

For use with:

FRS-CF
Saturating Resin

43



FRS-SF
UV Protection

56



FRS-FP
Fire Protection

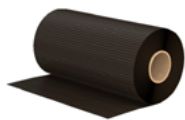
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Product range and approvals

Carbon Fibre Fabric FRS-W U300 and FRS-W U600

2



FRS-W U300, FRS-W U600

Item	Item no.	Approvals		Shelf life	Area density	Roll width	Roll length	Area	Delivery form	Sales unit
		ETA	ICC	[months]	[gr/m ²]	[mm]	[m]	[m ²]		[pcs]
FRS-W U300x500	562073	–	●	24	300	500	150	75	Roll	1
FRS-W U300x200	562072	–	●	24	300	200	150	30	Roll	1
FRS-W U600x500	562074	–	●	24	600	500	100	50	Roll	1
FRS-W U600x200	562075	–	●	24	600	200	150	30	Roll	1

Technical Data – mechanical properties

Carbon Fibre Fabric FRS-W U300 and FRS-W U600

(dry fibres)

Item	Mean ultimate tensile strength* (ISO 13934-1) [N/mm ² =MPa]	Mean elastic modulus* (ISO 13943-1) [N/mm ² =MPa]	Mean ultimate tensile strain (ISO 13943-1) [%]
FRS-W U300x500	≥ 4 200	≥ 230 000	≥ 1.8
FRS-W U300x200	≥ 4 200	≥ 230 000	≥ 1.8
FRS-W U600x500	≥ 4 200	≥ 230 000	≥ 1.8
FRS-W U600x200	≥ 4 200	≥ 230 000	≥ 1.8

* Note that the testing procedures defined in different standards might result in deviations of the mechanical parameters. The values given in the valid technical approvals and assessments are always decisive for design.

Carbon Fibre Fabric FRS-W U300 and FRS-W U600

(cured composite specimen prepared with FRS-W Carbon Fibre Fabric and Saturating Resin FRS-CF)

Item	Mean ultimate tensile strength of laminate made of FRS-W & FRS-CF* (ASTM D3039) [N/mm ² =MPa]	Mean tensile elastic modulus of laminate made of FRS-W & FRS-CF* (ASTM D3039) [N/mm ² =MPa]	Mean ultimate tensile strain of laminate made of FRS-W & FRS-CF* (ASTM D3039) [%]
FRS-W U300x500	1 061	83 000	1.28
FRS-W U300x200	1 061	83 000	1.28
FRS-W U600x500	967	77 000	1.26
FRS-W U600x200	967	77 000	1.26

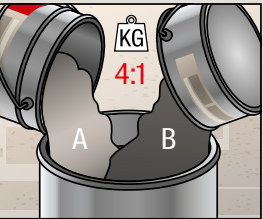
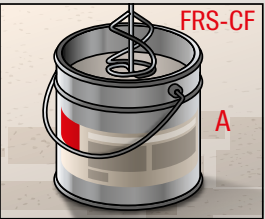
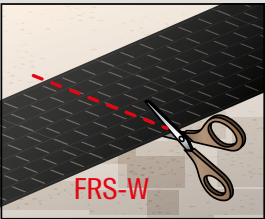

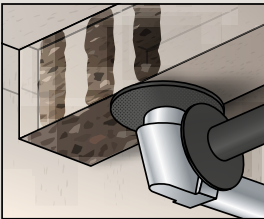
* Nominal thickness of the cured laminate: FRS-W U300 & FRS-CF: 0.51 mm; FRS-W U600 & FRS-CF: 1.02 mm

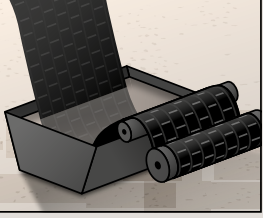
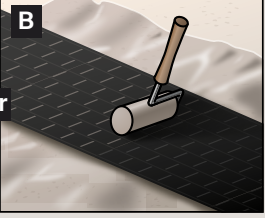
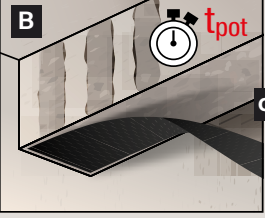
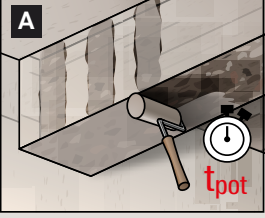
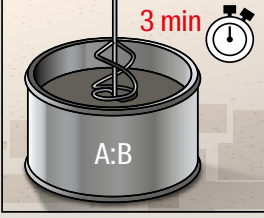
Note that the testing procedures defined in different standards might result in deviations of the mechanical parameters. The values given in the valid technical approvals and assessments are always decisive for design.

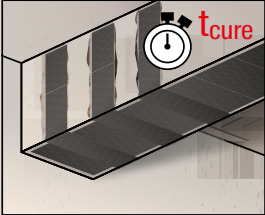
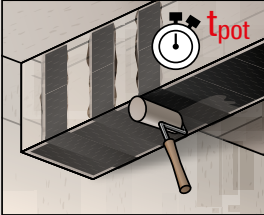
Technical data – physical properties

Carbon Fibre Fabric FRS-W U300 and FRS-W U600 (cured composite specimen prepared with FRS-W Carbon Fibre Fabric and Saturating Resin FRS-CF)				
Item	Density of the cured laminate [g/cm ³]	Nominal laminate thickness [mm]	Nominal laminate cross section [mm ²]	Recommended FRS-CF Consumption [kg/m ²]
FRS-W U300x500	1.55	0.51	255	0.8 – 1.0
FRS-W U300x200	1.55	0.51	102	0.8 – 1.0
FRS-W U600x500	1.55	1.02	510	1.0 – 1.2
FRS-W U600x200	1.55	1.02	204	1.0 – 1.2

Installation steps (wet or dry Layup)







A: Dry-layup installation technique (recommended for FRS-W U300)

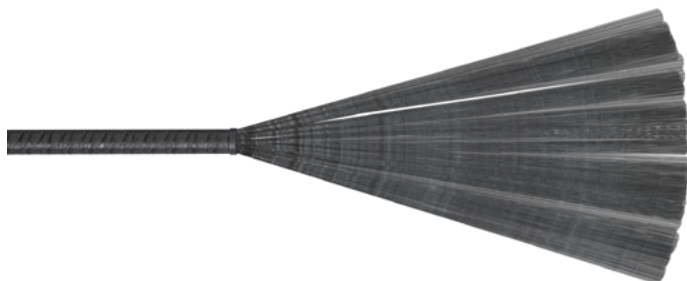
B: Wet-layup installation technique (recommended for FRS-W U600)

For the detailed installation instructions please refer to the Installation Manual for Carbon Fibre (CF) and the Technical Datasheet of the corresponding products.

Spike Anchor FRS-FC

Open end, high-strength carbon fibre anchor for optimal end-anchorage of carbon fibre fabrics

2



Applications

- Increased and optimised end-anchorage performance of FRS-W U300 and FRS-W U600 carbon fibre fabrics
- Anchorage of FRS-W U300 and FRS-W U600 carbon fibre fabrics in axial confinement of columns
- End anchorage of FRS-W U300 and FRS-W U600 carbon fibre fabrics in flexural strengthening
- Anchorage of FRS-W U300 and FRS-W U600 carbon fibre fabrics in corners and concave regions of curvature
- Typical application in fan and circular layout of the loose end

Advantages

- Precured side for convenient insertion into drilled holes
- Fast installation of the precured end with a suitable injection system and installation of the open end with saturating resin FRS-CF
- Different lengths for different applications available

Functioning

- FRS-FC unidirectional spike anchors are carbon fibre reinforced epoxy rods with a precured part and an open side of uncured loose carbon fibres
- The precured side is bonded into a drilled hole and the open side is typically laminated onto another layer of FRS-W U300 and FRS-W U600 carbon fibre fabrics
- The anchors provide additional physical anchorage to the CFRP reinforcement
- Increase efficiency of load introduction between CF fabrics and the base material

Certificates



Building materials

- Concrete
- Timber

For use with:

FRS-CF
Saturating Resin

43



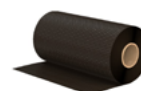
FIS EM PLUS
Epoxy Mortar

93



FRS-W U300 and
FRS-W U600
Carbon Fibre Fabric

37



Product range and approvals

Spike Anchor FRS-FC



FRS-FC

	Item no.	Total length [mm]	Length of loose CF-filaments [mm]	Length of the precured part [mm]	Diameter [mm]	Delivery Form	Content	Sales unit [pcs.]
Item								
FRS-FC 10 170/280	571718	450	280	170	10	Cardboard box	25 Spike Anchors	1
FRS-FC 12 170/280	574641	450	280	170	12	Cardboard box	25 Spike Anchors	1

Technical Data – physical properties

	Diameter (precured side) [mm]	Cross section [mm ²]	Fibre content (pre-cured side) [%]	Recommended FRS-CF Consumption [kg/pc]
Item				
FRS-FC 10 170/280	10	78	≥ 64	0.05 – 0.10
FRS-FC 12 170/280	12	113	≥ 64	0.05 – 0.10

Technical Data – mechanical properties of the dry fibres

	Glass transition temperature (precured side) (EN 12614) [°C]	Tensile strength of the dry fibres (ISO 13934-1) [N/mm ² =MPa]	Elastic modulus of the dry fibres (ISO 13934-1) [N/mm ² =MPa]	Mean ultimate tensile strain of the dry fibres (ISO 13934-1) [%]
Item				
FRS-FC 10 170/280	≥ 100	≥ 4 200	≥ 230 000	≥ 1.8
FRS-FC 12 170/280	≥ 100	≥ 4 200	≥ 230 000	≥ 1.8

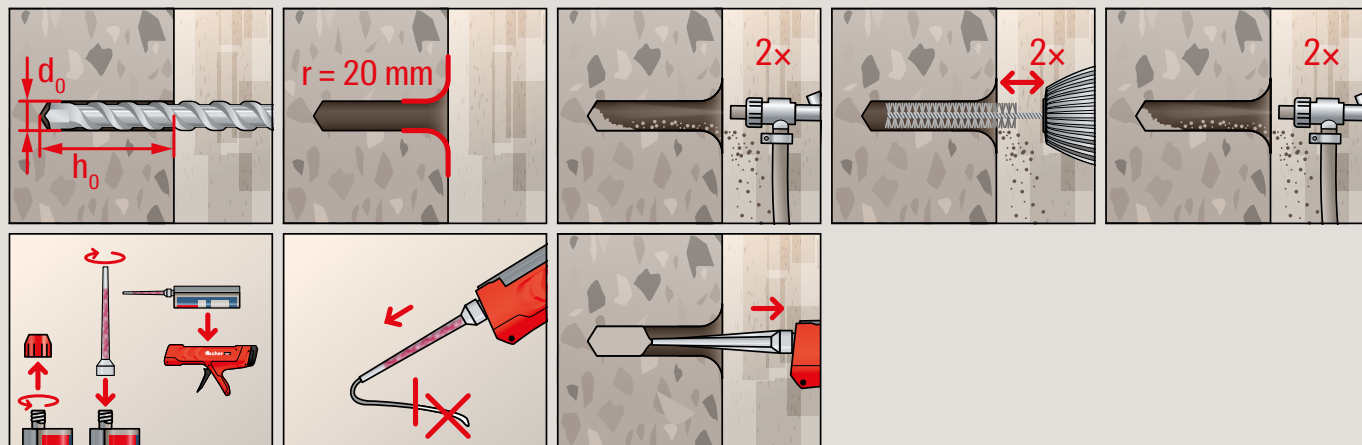
Installation steps

The precured part of the Spike Anchor FRS-FC is installed into a properly cleaned borehole using a suitable injection system and the loose fibre filaments of the Spike Anchor shall be pre-saturated using the FRS-CF before placing it onto the concrete or carbon fibre fabric surface.

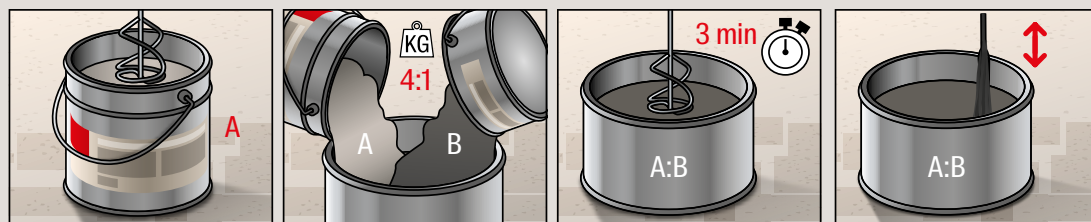
2

1. Preparation of the drilled hole and installation of the precured part of the Spike Anchor FRS-FC

In the following, the installation steps are shown using FIS EM Plus. If other injection system is used, the corresponding installation instructions shall be followed.

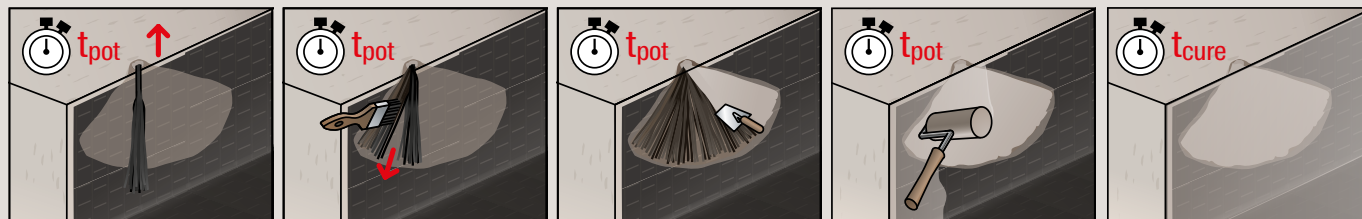


2. Pre-saturation of the loose end of the Spike Anchor FRS-FC



3. Final setting the Spike Anchor into the prepared borehole in common applications

For the final assembly, the borehole should have been prepared and filled with the injection mortar and the loose fibre filaments should have been pre-saturated with FRS-CF. Once the FRS-CF spike anchor has been inserted in the borehole and the loose ends were spread over the concrete surface or over the carbon fibre fabric, or in-between two carbon fibre fabric layers, it is recommended to use a grinder roll or brush to remove air voids to ensure the proper saturation of the fibres. Depending on the application, the spike anchor can be installed in fan shape or in circular layout or can be recessed into grooves in the concrete.



Please refer to the Installation Manual of the Spike Anchor FRS-FC for further details.

Saturating Resin FRS-CF

Two-component, epoxy based saturating resin for the impregnation and bonding of FRS-W carbon fibre fabrics and spike anchor FRS-FC for structural strengthening of concrete members



Applications

- Saturating resin and adhesive for FRS-W carbon fibre fabrics and Spike Anchor FRS-FC.
- Suitable for dry or wet layup impregnation of FRS-W carbon fibre fabrics

Advantages

- Thixotropic behaviour for efficient application, even in overhead applications
- Optimal saturating characteristics in dry and wet layup installations and high initial strength
- Suitable for surface levelling

Functioning

- The saturating resin FRS-CF is an ambient temperature curing epoxy used as adhesive and saturating resin for carbon fibre fabrics
- The resulting laminate is load bearing after curing of the saturating resin

Certificates

System component of the fischer C-Fiber Force Strengthening System with ICC-ES evaluation report (ESR-4774)



Building materials

Approved for:

- Concrete

Applicable for:

- Masonry

Principles of repair and protection (EN 1504-9)

4.3 Strengthening of concrete members – Bonded Reinforcements

For use with:

FRS-W U300 and
FRS-W U600
Carbon Fibre Fabric

37



FRS-FC
Spike Anchor

40



Product range and approvals

Saturating Resin FRS-CF



FRS-CF (10 kg)



FRS-CF (5 kg)

Item	Item no.	Approvals				Shelf life [months]	Storage condition [°C]	Delivery form	Content	Sales unit [pcs.]
		ETA	ICC	EN 1504-4	GB					
FRS-CF (10 kg)	569850	–	●	●	●	36	5 – 40	Can	10 kg (A+B comp.)	1
FRS-CF (5 kg)	569851	–	●	●	●	36	5 – 40	Can	5 kg (A+B comp.)	1

Technical data – physical properties

Item	Mixing ratio (weight)	Colour of the mixture	Min. Curing time (23 °C) [h]	Viscosity [mPa*s]	Density [g/cm3]	Application temperature [°C]
FRS-CF (10 kg)	3:1	Grey	48	≈ 15 000	≈ 1.3	10 – 40
FRS-CF (5 kg)	3:1	Grey	48	≈ 15 000	≈ 1.3	10 – 40

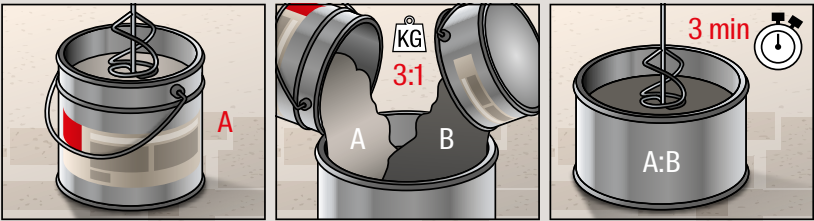
Technical data – mechanical properties

Item	Tensile strength (EN ISO 527-1) [N/mm ²]	Compressive strength (EN ISO 604) [N/mm ²]	Elastic modulus (compression) (EN 12190) [N/mm ²]	Flexural strength (EN 178) [N/mm ²]	Glass transition temperature (EN 12614) [°C]	Coefficient of thermal expansion (EN 1770) [x10 ⁻⁶ /K]
FRS-CF (10 kg)	≥ 30	≥ 60	≥ 3 000	≥ 45	≥ 50	<100
FRS-CF (5 kg)	≥ 30	≥ 60	≥ 3 000	≥ 45	≥ 50	<100

Technical data – processing

Item	Temperature [°C]	Temperature [°F]	Max. processing time (5 kg) [min.]	Max. processing time (10 kg) [min.]	Min. curing time [h]
FRS-CF	10 – 20	50 – 68	145	125	96
	20 – 30	68 – 86	60	45	48
	30 – 40	86 – 104	30	25	24

Installation steps



For the detailed installation instruction please refer to the Manual of Carbon Fibre (CF) and the Technical Datasheet of the corresponding products.



Epoxy Repair Mortar FRS-PC 11

Thixotropic, high-viscosity, low-shrinkage 3-component epoxy-based concrete repair mortar for concrete-patching, surface levelling and for increasing or restoring concrete cover



Applications

- Reprofiling of concrete spalling like edges and corners
- Surface levelling of damaged concrete cover
- Increasing concrete cover
- Maximum layer thickness 30 mm

Advantages

- High viscosity repair mortar for easy reprofiling of damaged concrete edges and corners
- Suitable for overhead application and high adhesive strength to concrete surface
- Fast curing
- Very low shrinkage
- Low chloride ion content
- High abrasion resistance
- R4 class concrete repair mortar acc. to EN 1504-3
- Very high compressive strength

Functioning

The repair mortar FRS-PC 11 should be applied wet-in-wet in combination with the bonding agent FRS-BA to ensure proper bonding between the new and old substrate

Certificates

System component of the fischer C-Fiber Force Strengthening System with ETA (ETA-24/0281), EN 1504-3 (Class R4)



Building materials

Approved for:

- Concrete

Applicable for:

- Masonry

Principles of repair and protection (EN 1504-9)

- 3.1 Concrete replacement – Hand application of mortar
- 4.4 Strengthening of concrete - Increase in cross section by addition of mortar or concrete
- 5.3 / 6.3 Increase of physical / chemical resistance - Addition of mortar or concrete
- 7.1 Preservation or restoration of passivity - Increase of the concrete cover by addition of mortar or concrete
- 7.2 Preservation or restoration of passivity - Replacement of contaminated or carbonized concrete

For use with:

FRS-BA
Bonding Agent

50



Product range and approvals

Epoxy Repair Mortar FRS-PC 11

2



FRS-PC 11 (11 kg)

Item	Item no.	Approvals			Shelf life	Storage condition	Delivery form	Content	Sales unit
		ETA	ICC	EN 1504-3	[months]	[°C]			[pcs.]
FRS-PC 11	561931	●	–	●	36	5 – 40	Can	11 kg (A+B+C comp.)	1

Technical data – physical properties

Item	Mixing ratio (weight)	Colour of the mixture	Permitted Layer thickness	Density	Mixing Time	Application temperature
			[mm]	[g/ml]	[min.]	[°C]
FRS-PC 11	9:1:17.5	Grey	4 – 30	-2.00	1 min (A+B) 3 min (A+B+C)	10 – 40

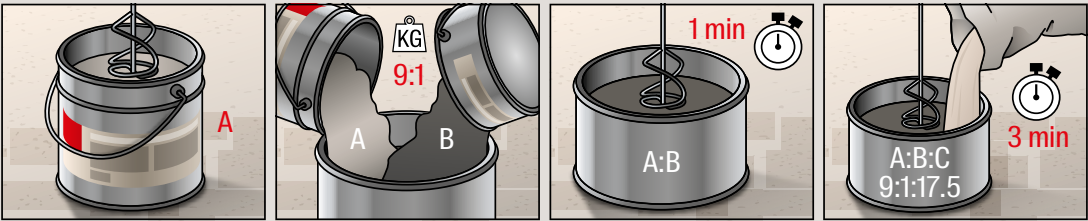
Technical data – mechanical properties

	Flexural strength (EN 178) [N/mm ²]	Compressive strength (EN 12190) [N/mm ²]	Elastic modulus (in compression) (EN 13412) [N/mm ²]	Chloride ion content (EN 1015-17) [%]
Item				
FRS-PC 11	≥ 40	≥ 140	≥ 20 000	< 0.05

Technical data – processing

	Temperature [°C]	Temperature [°F]	Max. processing time (11 kg) [min.]	Min. curing time [h]
Item				
FRS-PC 11	10 – 20	50 – 68	100	96
	20 – 30	68 – 86	45	24
	30 – 40	86 – 104	25	16

Installation steps

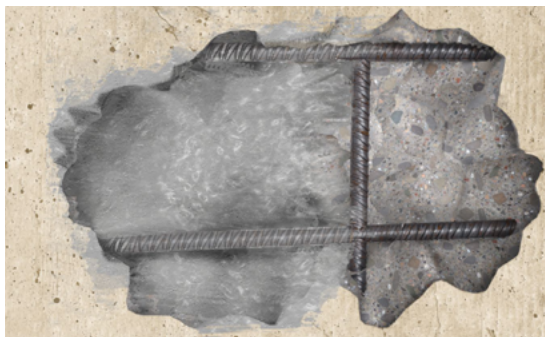


For the detailed installation instructions please refer to the Technical Datasheet of FRS-PC 11.

Bonding Agent FRS-BA

Two 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

2



Applications

- FRS-BA ensures an adequate adhesion between repair concretes and existing concrete substrates
- Protective coating for embedded steel reinforcing bars against corrosion

Advantages

- High tensile strength
- Low-viscosity ensures easy application using a brush
- Provides corrosion protection for embedded reinforcing steel rebars

Functioning

The dense film structure acts as diffusion barrier and hence protects coated reinforcing steel

Certificates

System component of the fischer C-Fiber Force Strengthening System with ETA (ETA-24/0281) and certified according to EN 1504-7



Building materials

Approved for:

- Concrete

Applicable for:

- Masonry

Principles of repair and protection (EN 1504-9)

Used together with FRS-PC 11:

- 3.1 Concrete replacement – Hand application of mortar
- 4.4 Strengthening of concrete – Increase in cross section by addition of mortar or concrete
- 5.3 / 6.3 Increase of physical / chemical resistance – Addition of mortar or concrete
- 7.1 Preservation or restoration of passivity – Increase of the concrete cover by addition of mortar or concrete
- 7.2 Preservation or restoration of passivity – Replacement of contaminated or carbonized concrete

FRS-BA:

- 8.1 Increase of the electrical resistance – Coating of surfaces

For use with:

FRS-PC 11
Epoxy Repair Mortar

47



Product range and approvals

Bonding Agent FRS-BA



FRS-BA (5 kg)

Item	Item no.	Approvals			Shelf life	Storage condition	Delivery form	Content	Sales unit
		ETA	ICC	EN	[months]	[°C]			[pcs.]
FRS-BA	561929	●	–	● EN 1504-7	36	5 – 40	Can	5 kg (A+B comp.)	1

Technical data – physical properties

Item	Mixing ratio (weight)	Colour of the mixture	Viscosity	Recommended consumption	Application temperature	Mixing time
			[mPa*s]	[kg/m²]	[°C]	[min]
FRS-BA	9:1	Grey	≈ 50 000	0.6 – 0.8	10 – 40	3

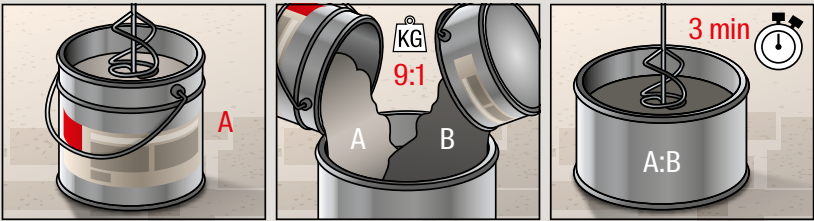
Technical data – mechanical properties

	Flexural strength (EN 178) [N/mm ²]	Tensile strength (EN ISO 527-1) [N/mm ²]	Compressive strength (EN ISO 604) [N/mm ²]	Elastic modulus (compression) (EN 13412) [N/mm ²]
Item				
FRS-BA	≥ 40	≥ 35	≥ 120	≥ 7 000

Technical data – processing

	Temperature [°C]	Temperature [°F]	Max. processing time (5 kg) [min.]	Min. curing time [h]
Item				
FRS-BA	> 10 – 20	50 – 68	110	60
	> 20 – 30	68 – 86	70	48
	> 30 – 40	86 – 104	40	40

Installation steps



For the detailed installation instructions please refer to the Technical Datasheet of FRS-BA.



Protective Coating Systems for CFRP Strengthening Systems

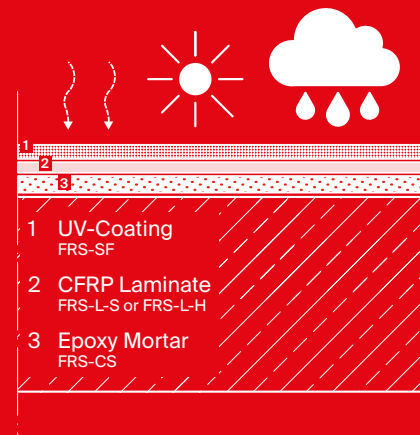
CFRP Strengthening Systems, once they have been installed, need to be protected against physical, thermal and chemical attacks and they should be protected against fire. In some cases, even mechanical protection is applied against potential vandalism. fischer therefore offers a range of protective coatings for CFRP strengthening systems for environmental and UV-protection as well as against smoke development. The protective coatings are product components of the fischer C-Fiber Force Strengthening System and were developed for the optimal and efficient protection of the CFRP strengthenings.

1. UV-Protection

If CFRP Strengthenings are applied in areas of high exposure to sunlight and subsequently UV-radiation, the premature aging needs to be avoided by means of adequate protective coating. Furthermore, permanent moisture and aggressive gas atmospheres can cause aging of CFRP materials.

UV-Protection Primer FRS-SF

56

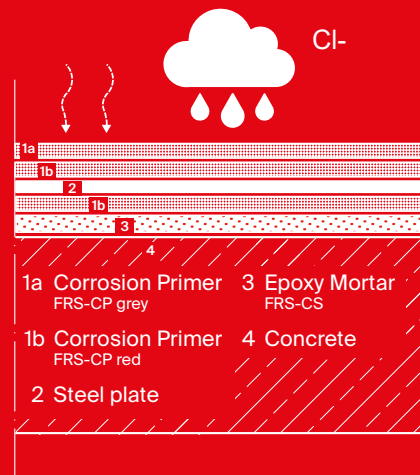


2. Corrosion Protection of steel

Paint coatings for steel structures have developed over the years to comply with industrial environmental legislation for long-term and reliable protection against aggressive corrosion promoting mediums. If externally applied steel stirrups are applied as e.g. shear strengthening, their corrosion protection can be solved by our corrosion protection primer FRS-CP. For practical and safety reasons, our corrosion protection primer is available in two colours, red and grey. FRS-CP (red and grey) is a product component of the fischer C-Fiber Force Strengthening System and it complies with the corrosion resistance category C according to DIN EN ISO 12944-2 and be universally used on exposed steel surfaces.

Corrosion Protection Primer FRS-CP red & grey

59



3. Fire Protection of CFRP Strengthenings

The fire protection the CFRP Strengthening is handled in various ways in the engineering practice. It should be verified during the design, that the unstrengthened structural member has got sufficient load-bearing capacity in the extraordinary load combination (fire event). Our Fire Protection Coating was tested together with our CFRP laminates and CF fabric according to ASTM E84 and it stops the smoke development in case of fire.

Fire Protection Coating FRS-FP

62





fischer
KORVAR®
EN 388 Art.: 1351202
KOR-RED
10/XL
CE Cat. II

UV Protection Coating FRS-SF

Highly UV-resistant and water repellent, 1-component protection coating with high durability against environmental exposure for CFRP reinforcement in outdoor applications

2



Applications

- UV-Protection for CFRP laminates and CF fabrics for exterior applications with direct UV-exposure (other than XO, XC1 or XC3 according to EN 1992-1-1)
- Conceal laminates and other reinforcements

Advantages

- High adhesion and bonding strength to CFRP laminates
- Long lasting UV-protection of CFRP laminates
- Good weathering resistance
- Applicable by airless spray or brush and roller
- Low VOC waterborne protective coating
- Prevents carbonization by low CO₂ diffusion coefficients

Functioning

UV-protective coating with high hiding strength and UV-stabilizers protects CFRP laminates and concrete surfaces

Certificates



Building materials

Applicable for:

- CFRP laminates and CF fabrics
- Concrete

Principles of repair and protection (EN 1504-9)

- 1.1 Protection against the penetration of substances – Coating of surfaces
- 2.2 Regulation of the water balance of the concrete – Coating of surfaces
- 6.2 Increase of the chemical resistance – Coating of surfaces
- 8.1 Increase of electrical resistance – Coating of surfaces

For use with:

FRS-L-S, FRS-L-H
CFRP Laminates

26



FRS-W U300 and FRS-W U600
Carbon Fibre Fabric

37



FRS-CS
Epoxy Mortar

33



FRS-CF
Saturating Resin

43



Product range and approvals

UV Protection Coating FRS-SF



FRS-SF (12.5 l)

Item	Item no.	Approvals			Shelf life [months]	Storage condition [°C]	Delivery form	Content	Sales unit [pcs.]
		ETA	ICC	EN 1504-2					
FRS-SF	569852	–	–	–	36	5 – 40	Bucket	12.5 litre	1

Technical data – physical properties

Item	CO ₂ -permeability (DIN EN 1062-6) [m]	Water absorption (DIN EN 1062-3) [kg/(m ² ·h ^{0.5})]	Reaction to fire (EN 13501-1)	Viscosity [mPa·s]
FRS-SF	S _d > 252	< 0.1	Class E	≈ 3 000

Technical data – processing

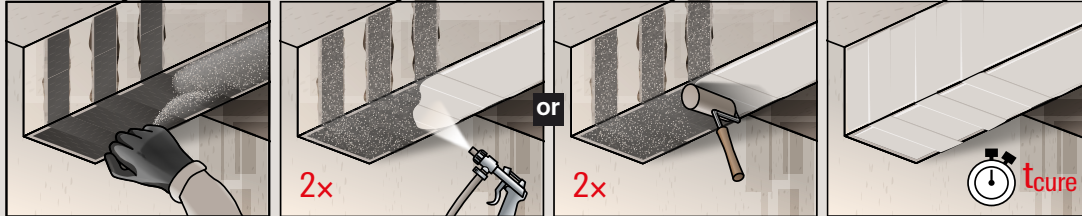
Item	Application techniques	Recommended consumption [g/m ²]	Recommended wet layer thickness [mm]	Recommended number of layers	Min. drying time [h]
FRS-SF	Brush, roller, airless spray	300	> 0.2	2	4

Installation steps

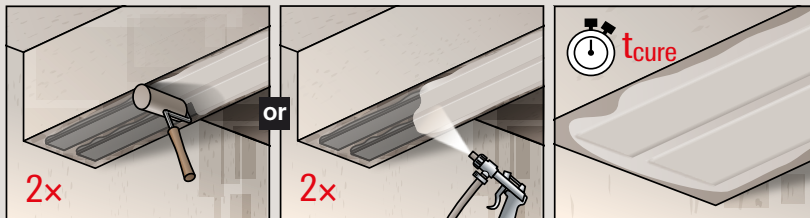
The UV-protection primer FRS-SF can be either applied via airless spray using a \varnothing 0.019–0.021 (\varnothing 0.49–0.53 mm) nozzle (20°–40° spray angle, 150–190 bar pressure) or with a roller or brush. The FRS-SF can be directly applied on the surface of the CFRP Laminates. If the FRS-SF coating is foreseen on the CF Fabric, sand-sprinkling is recommended into the uncured FRS-CF to promote a better adhesion of FRS-SF.

2

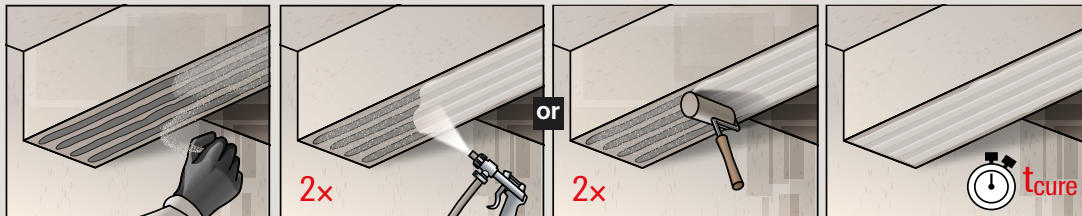
1. Recommended application on CF Fabrics with previous sand-sprinkling



2. Recommended application on Externally Bonded CFRP Laminates, without sand-sprinkling



3. Recommended application on Near Surface Mounted CFRP Laminate with previous sand-sprinkling



Please refer to the Installation Manual of the UV Surface Protection FRS-SF for further details.

Corrosion Protection Primer FRS-CP red & FRS-CP grey

Low-viscosity, two-component, epoxy-based corrosion protection primer for exposed steel surfaces as well as embedded steel rebars in two colour versions, red and grey

2



Applications

Corrosion protection primer for exposed steel surfaces as well as exposed and embedded steel rebars.

Advantages

- Corrosion resistance category C according to DIN EN ISO 12944-2
- Protects both embedded and non-embedded steel reinforcing bars
- Improved bond strength of steel rebars compared to uncoated steel rebars
- Two colours are available for maximum safety: For better visual control after grinding the outer primer layer

Functioning

- The application of two layers (red and grey) are recommended for highest level of corrosion protection.
- Functions as diffusion barrier
- The steel surface must be prepared to SA 2 1/2 purity grade before application

Certificates

System component of the fischer C-Fiber Force Strengthening System with ETA (ETA-24/0281) and ABG (General Construction Technique Permit, Germany) and certified according to EN-1504-7



Building materials

Approved for:

- Steel

Principles of repair and protection (EN 1504-9)

8.1 Increase of the electrical resistance – Coating of surfaces

For use with:

FRS-CS
Epoxy Mortar

33



FRS-CA
Cleaning Agent

66



Product range and approvals

Corrosion Protection Primer FRS-CP

2



FRS-CP grey



FRS-CP red

Item	Item no.	Approvals			Shelf life [months]	Storage condition [°C]	Delivery form	Content	Sales unit [pcs.]
		ETA	DIBt (ABG)	EN 1504-7					
FRS-CP red (5kg)	562071	-	●	●	36	5 – 40	Can	5 kg (A+B comp.)	1
FRS-CP grey (5kg)	561930	-	●	●	36	5 – 40	Can	5 kg (A+B comp.)	1

Technical data – physical properties

Item	Mixing ratio (weight)	Colour of the mixture	Application temperature [°C]	Viscosity at 23°C [mPa*s]	Density at 23°C [g/cm³]	Mixing Time [min.]	Consumption [kg/m²]
FRS-CP	1:1	Grey / Red	5 – 40	3 000	1.4	3	ca. 0.35

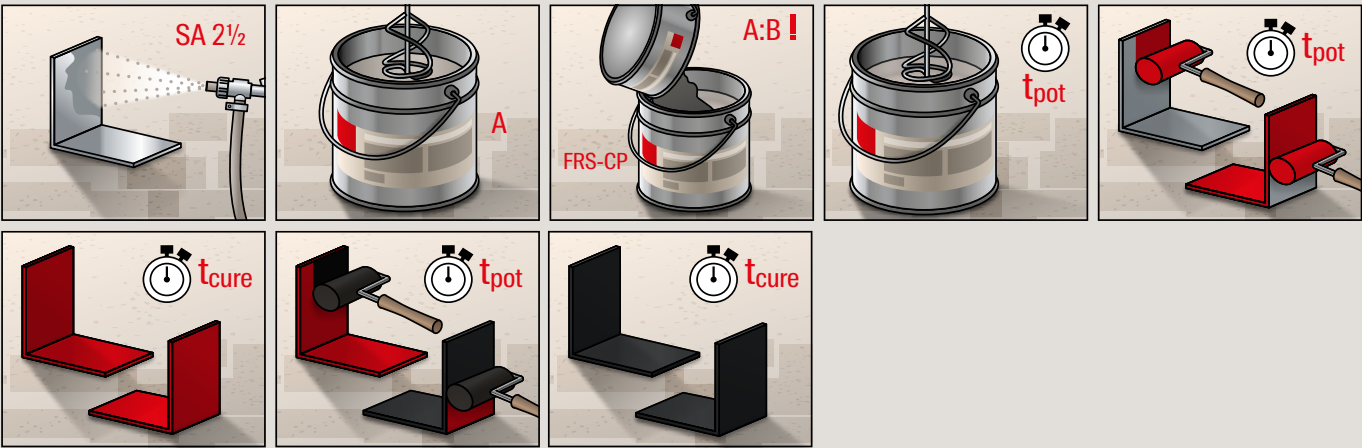
Technical data – mechanical properties

	Item no.	Tensile strength (EN ISO 527-1) [N/mm²]	Compressive strength (EN ISO 604) [N/mm²]	Elastic modulus (compression) (EN 13412) [N/mm²]	Flexural strength (EN 178) [N/mm²]	Chloride ion content (EN 1015-17) [%]
Item						
FRS-CP red (5 kg)	562071	≥ 35	≥ 80	-	≥ 45	< 0.05
FRS-CP grey (5 kg)	561930	≥ 35	≥ 80	-	≥ 45	< 0.05

Technical data – processing

	Temperature [°C]	Temperature [°F]	Max. processing time (5 kg) [min.]	Min. curing time [h]
Item				
FRS-CP red/grey	> 10 – 20	50 – 68	25	48
	> 20 – 30	68 – 86	15	12
	> 30 – 40	86 – 104	10	8

Installation steps



Fire Protection Coating FRS-FP

Water-based, intumescent coating for CFRP strengthening systems against fire and smoke development

2



Applications

Protection against fire and smoke development for CFRP strengthening systems (CFRP laminate or CF fabrics)

Advantages

- Provides ultimate fire protection and prevent smoke development when used with FRS-L-S, FRS-L-H, FRS-L-S NSM, CFRP laminates and FRS-W CF fabrics resistance
- Tested together with our CFRP products according to ASTM E84
- Strong effect against smoke development
- Low flame spread
- Waterborne low VOC coating
- Strong adhesion to concrete and carbon fibre laminates

Functioning

Intumescent coating to prevent smoke development and flame spread in case of fire

Certificates

Certified according to ASTM-E84 with FRS-L-S and FRS-L-H (Class A) and FRS-W U300 and FRS-W U600 (Class A)

Building materials

- Applicable for:
- CFRP laminates and CF fabrics
 - Concrete



For use with:

FRS-L-S, FRS-L-H
CFRP Laminates

26



FRS-W U300 and FRS-W U600
Carbon Fibre Fabric

37



FRS-CS
Epoxy Mortar

33



FRS-CF
Saturating Resin

43



Product range and approvals

Fire Protection Coating FRS-FP



FRS-FP (25 kg)

Item	Item no.	Approvals			Shelf life [months]	Storage condition [°C]	Delivery form	Content	Sales unit [pcs.]
		ETA	ICC	EN 13501-1					
FRS-FP	569849	–	●	●	9	5 – 35	Can	25 kg	1

Technical data – physical properties

Item	Adhesive strength (Concrete) (EN 1542) [N/mm ²]	Adhesive strength (CFRP) (EN 1542) [N/mm ²]	Reaction to fire (EN 13501-1)	Viscosity [mPa*s]
FRS-FP	≥ 1.5	≥ 1.5	Class E	≈ 35 000

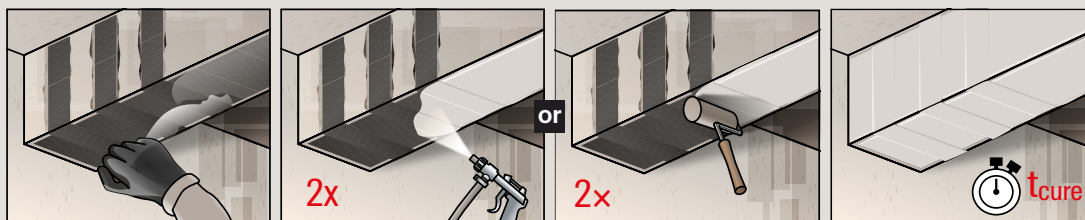
Technical data – processing

Item	Recommended wet layer thickness [mm]	Consumption [g/m ²]	Application temperature [°C]	Drying time* (tack-free) [h]	Drying time* (overcoatable) [h]	Processing techniques
FRS-FP	< 1 mm	< 1 500	5 - 40	1	4	Airless spray, brush, roller

*at 20 °C and 1 mm wet film thickness

Installation steps

The Fire Protection coating FRS-FP can be either applied via airless spray using a Ø 0,019–0,021 inch (Ø 0,49–0,53 mm) nozzle (20°–40° spray angle, 170–205 bar pressure) or with a roller or brush. The FRS-FP can be directly applied on the surface of the CFRP Laminates. If the FRS-FP coating is foreseen on the CF- Fabric, sand-sprinkling is recommended into the uncured FRS-CF to promote a better adhesion of FRS-FP.



For detailed information, please refer to the Installation Manual and the Technical Datasheet of FRS-FP Fire Protection Coating.

Complementary Products

Clean and safe construction sites, the easy handling of our materials with accessories and easy-application properties of our products were always anchored in our corporate philosophy. The complementary products were developed to achieve work safety and work efficiency when working with our products

1. Cleaning Agent

The acetone-based universal cleaning agent is a product component of the C-Fiber Force Strengthening System. It was developed together with the FRS-L-S and FRS-L-H CFRP laminates and it was tested according to the EAD160086 and EAD160095. The cleaning agent FRS-CA is the first choice when it comes to the adequate cleaning of the CFRP laminates prior to application. The cleaning agent is offered as a spray to guarantee the easiest handling at the construction site. The cleaning agent FRS-CA is also universally applicable for the sufficient cleaning of contaminated tools.

Cleaning Agent FRS-CA

66



2. Adhesive Application Device

The detailed installation manual of the externally bonded FRS-L-S and FRS-L-H is described in the corresponding documents. The epoxy mortar FRS-CS used for the installation needs to be scraped on the roughened concrete surface. In the next step, the epoxy mortar FRS-CS needs to be applied on the surface of the FRS-L-S or FRS-L-H CFRP laminate. With the use of the adhesion application device FRS-AD, a roof-shaped epoxy layer in the recommended amount can easily and efficiently be applied on the CFRP laminate surface.

Adhesive Application Device FRS-AD

68

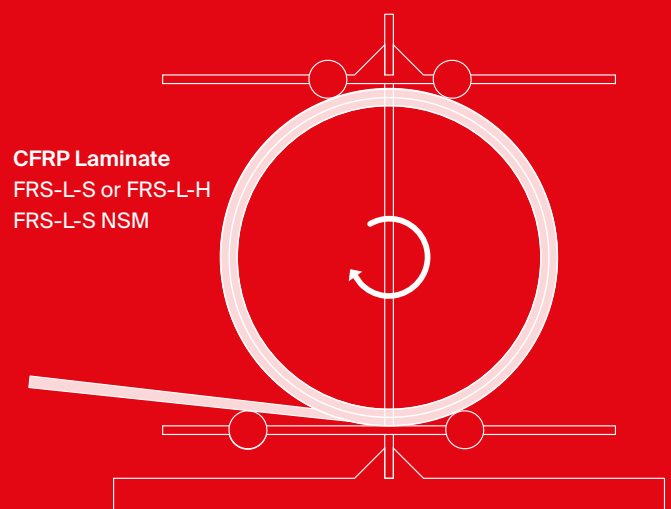


3. Laminate Coiler

The CFRP laminate coils are under constant tension due to their flexural stiffness. This is a normal and well-known phenomenon. The unfolding of the CFRP coils should be, therefore, made carefully if it is done by hand using adequate safety equipment. Alternatively, our compact, discountable laminate coiler can be used as an efficient tool to unroll the desired length from CFRP coil. The coil is constantly held against uncontrolled unfolding. The laminate coiler device FRS-LC is suitable for all fischer CFRP laminate product variants.

Laminate Coiler FRS-LC

70





Cleaning Agent FRS-CA

Universal cleaning agent for the FRS-L-S and FRS-L-H CFRP Laminate and tools

2



Applications

- Universal cleaning agent
- Cleaning of FRS-L-S and FRS-L-H laminates prior to application with a cleaning tissue to remove carbon dust, oil, etc.
- Suited to remove organic impurities such as epoxy based repair mortars and adhesives

Advantages

- High cleaning power
- Traceless evaporation

Functioning

Solvent based cleaning agent removes dirt and residues especially of organic nature.

Certificates

System component of the fischer C-Fiber Force strengthening system with ETA (ETA-24/0281)



Building materials

- CFRP laminates
- Steel and metal surfaces

For use with:

FRS-L-S, FRS-L-H
CFRP Laminates

26



Near Surface Mounted
FRS-L-S NSM
CFRP Laminates

30



Product range and approvals

Universal cleaning agent FRS-CA



FRS-CA

Item	Item no.	Approvals			Shelf life	Storage condition	Delivery form	Content	Sales unit
		ETA	ICC	EN 1504	[months]	[°C]			[pcs.]
FRS-CA	562137	●	–	–	48	5 – 40	Aerosol can	500 ml	1

Adhesive application device FRS-AD

Adhesive application device for user-friendly, fast and economical application of the Epoxy Mortar FRS-CS on all externally bonded CFRP Laminate product geometries

2



Applications

Waste free, fast application of FRS-CS Epoxy Mortar on FRS-L-S and FRS-L-H CFRP laminates

Advantages

- Precise and economical dosage of the epoxy mortar to reduce waste
- Adapted for geometries of FRS-L-S and FRS-L-H
- Clean construction site
- Fast application of CFRP laminates
- Robust design
- Multiple use after cleaning with FRS-CA

Functioning

- The Epoxy Mortar FRS-CS is filled into the container
- The CFRP is pulled through the adhesive application device
- After pulling the CFRP laminate through the device, a roof-shaped Epoxy Mortar FRS-CS is applied on the CFRP Surface with the intended quantity
- Note that the applying the Epoxy Mortar FRS-CS directly on the concrete surface by scraping is still essential and required

For use with:

FRS-L-S, FRS-L-H
CFRP Laminates

26



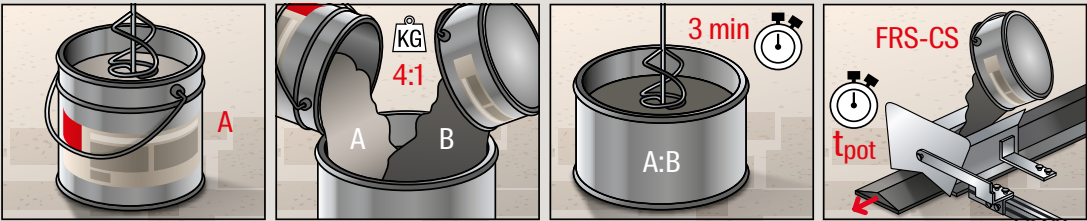
FRS-CS
Epoxy Mortar

33



Adhesive application device FRS-AD			
Item	Item no.	Suitable for laminates	Sales unit
			[pcs.]
FRS-AD	572379	FRS-L-S 50x1,2 FRS-L-H 50x1,2 FRS-L-S 75x1,2 FRS-L-H 75x1,2 FRS-L-S 100x1,2 FRS-L-H 100x1,2 FRS-L-S 50x1,4 FRS-L-H 50x1,4 FRS-L-S 75x1,4 FRS-L-H 75x1,4 FRS-L-S 100x1,4 FRS-L-H 100x1,4	1

Installation steps



For the detailed installation instructions please refer to the Technical Datasheet (TDS) of FRS-CS.

Laminate Coiler FRS-LC

Product available from January 2025

Device for a controlled and safe unwinding of CFRP laminates

2



Applications

Uncoiling and cutting of FRS-L-S, FRS-L-H and FRS-L-S NSM CFRP laminates

Advantages

- Designed for all versions of FRS-L-S, FRS-L-H and FRS-L-S NSM CFRP laminates
- Enables swift, economical and safe cutting of CFRP laminates to length on site or in the warehouse
- Prevents uncontrolled unwinding of strained coils under tension when opened
- Lightweight and with low space requirement

For use with:

Externally Bonded FRS-L-S and FRS-L-H CFRP Laminates

26



Near Surface Mounted FRS-L-S NSM CFRP Laminates

30



Laminate coiler FRS-LC			
	Item no.	Suitable for laminates	Sales unit
Item			[pcs.]
FRS-LC	572381	FRS-L-S 50x1,2 FRS-L-H 50x1,2 FRS-L-S 75x1,2 FRS-L-H 75x1,2 FRS-L-S 100x1,2 FRS-L-H 100x1,2 FRS-L-S 50x1,4 FRS-L-H 50x1,4 FRS-L-S 75x1,4 FRS-L-H 75x1,4 FRS-L-S 100x1,4 FRS-L-H 100x1,4	1

Strengthening with concrete overlay & bridge cap anchors

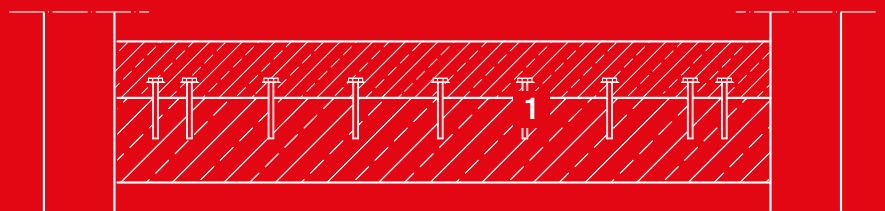
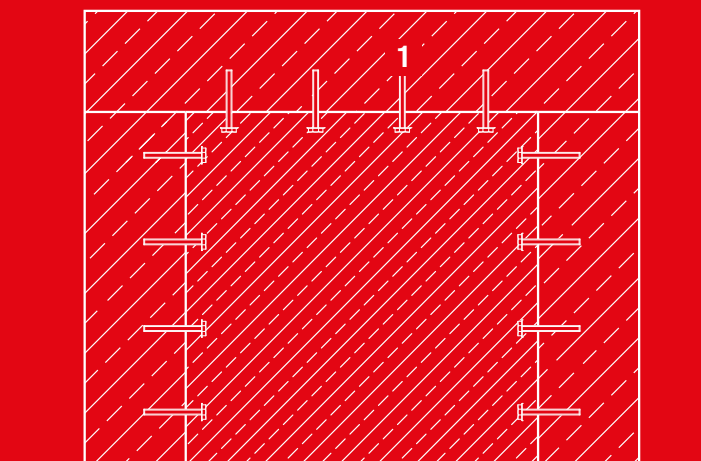
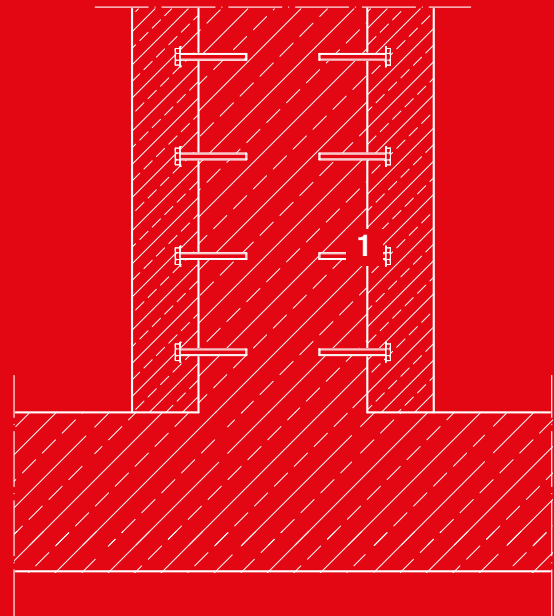
Shear connectors

The structural performance of existing reinforced concrete members can be improved by an additional concrete layer. In a typical application, the additional new concrete layer increases the internal leverarm of the cross-section, leading to an increased flexural resistance. Due to external loads on the structural member, shear stresses develop in the new and existing concrete interface, which need to be safely transferred via concrete-concrete shear connectors. The shear resistance between the new and old concrete interface comprises the following working principles: aggregate interlock, shear friction, dowel action and concrete strut resistance. Please note the scope of the corresponding technical assessments and approvals before use. Some applications might require engineering judgement and experience when the intended use is not explicitly covered by the valid design codes or assessment documents.

The UltraCut FBS II is high performance concrete screw with state-of-the-art approvals for the use as single-point fastener. It also has a European Technical Assessment (ETA) for the safe use as concrete-concrete shear connector in concrete overlay strengthening applications. The concrete-concrete shear connector FCC is used in conjunction with either the FIS SB or FIS EM Plus and its safe use as concrete-concrete shear connector is regulated in the German National Approval (ABZ). Both products are partially embedded in the existing concrete, whereas the protruding part is cast into the new concrete monolithically.

Both shear connectors come in various length and diameters for perfect adjustment to the thickness of the concrete layer and the level of shear forces present at the interface.

Concrete screw UltraCut FBS II 8-14	74
Concrete-concrete shear connector FCC	80
Bridge cap anchor FCC-B	82

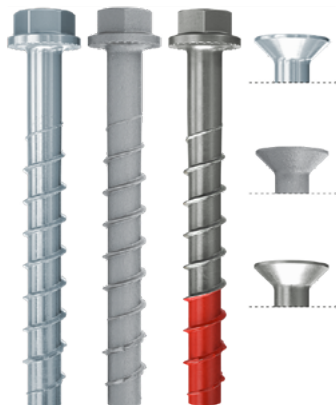




Concrete screw UltraCut FBS II 8-14

The high-performance concrete screw for absolute installation ease

2



Banisters



Inclined supports

Applications

- Guard rails
- Consoles/base plates
- Metal profiles
- Steel constructions
- Façades
- Protection barriers
- Results/beam anchors
- Shuttering props (only FBS II zinc-plated steel)
- Temporary anchoring, e.g. of building site equipment (only FBS II zinc-plated steel)
- Concrete-concrete connections (e.g. strengthening of bridges, parking garages or renovation of buildings)

Advantages

- With up to 3 embedment depths, the UltraCut FBS II allows for the same screw to be used for different component thicknesses.
- Unique saw-tooth geometry cuts quickly into the concrete – also in multiple use and reinforced concrete.
- The performance categories seismic C1 and C2 ensure that the strictest of safety standards and earthquake specifications can be fulfilled.
- In comparison to the usually available systems (with mortar) for the reinforcement of existing concrete structures,

the ETA-certified FBS II system with the optional setten tool SC-ST saves time and costs.

- The high coating quality of the FBS II CP is proved through the salt spray chamber test over 2,000h.
- For the zinc-plated steel version the checking gauge allows for reuse covered by the approval.
- The specially hardened red tip of the stainless steel R version provides faster and more secure installation.

Certificates



ETA-17/0740, in cracked concrete
ETA-15/0352, in concrete
ETA-20/0134, in masonry
ETA-20/0321, for strengthening of existing concrete structures by concrete overlay



Building materials

Approved for:

- Concrete C20/25 to C50/60, cracked and non-cracked
- Strengthening of existing concrete structures with top layer concrete

Also suitable for:

- Concrete C12/15
- Solid building materials
- Masonry with dense structure

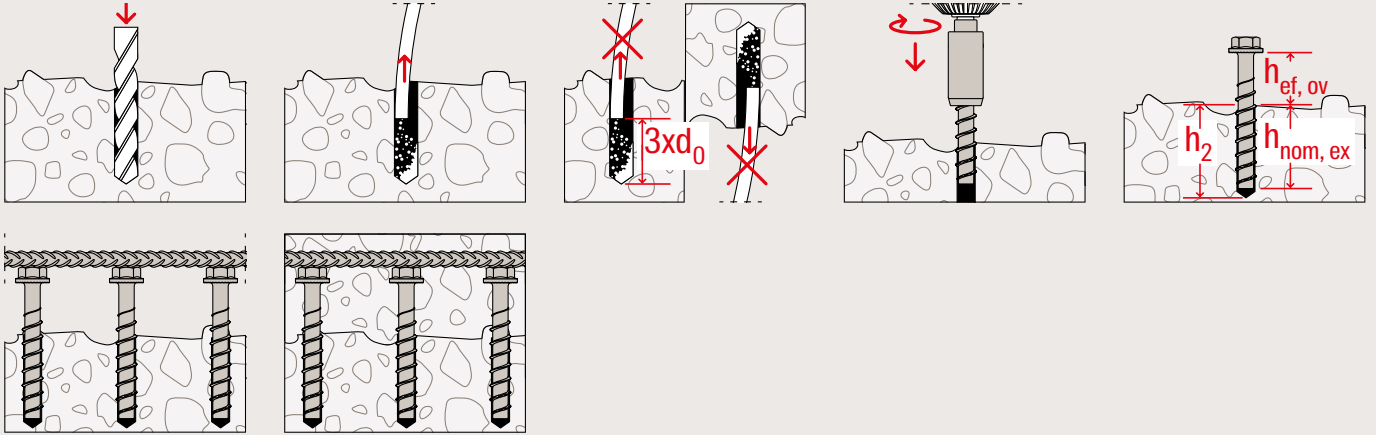
Versions

- Zinc-plated steel
- Stainless steel R
- Corrosion protection coating (CP)

Functioning

- The UltraCut FBS II is recommended for the push-through installation.
- Drill holes do not need to be cleaned during vertical installation (ceiling and floor). For floor fixings the hole must be drilled 3xdrill hole diameter deeper.
- The approved adjustment for the concrete screws allows the screw to be unscrewed twice for a total length of 20 mm, to place maximum 10 mm packing below the base plates or to align the attached part.
- We recommend using the fischer impact wrench FSS 1BV with a suitable impact screwdriver socket or an internal torx drive.
- The screw is installed correctly when the screw head sits flush on the fixture (visual setting control).
- For the installation of restructuring of existing concrete structures by concrete overlay, the setting tool SC-ST can be used for a faster installation.

Installation UltraCut FBS II (concrete-concrete connection)



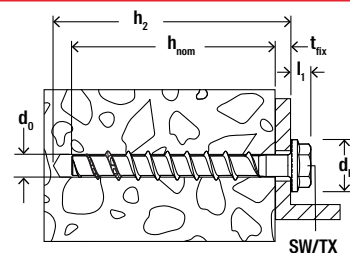
Technical data

Concrete screw UltraCut FBS II US

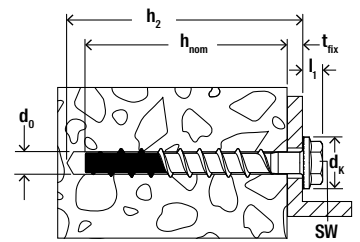


UltraCut FBS II US

UltraCut FBS II US CP



	Zinc-plated steel	Corrosion protection coating	Approval	Drill hole diameter	Min. drill hole depth for through fixings	Screw	Screw-in depth with fixture thickness	Screw-in depth with fixture thickness	Screw-in depth with fixture thickness	Drive	Sales unit
Item	Item no.	Item no.	ETA	d_0 [mm]	h_2 [mm]	$d_s \times l_s$ [mm]	h_{nom1} / t_{fix} [mm]	h_{nom2} / t_{fix} [mm]	h_{nom3} / t_{fix} [mm]		[pcs]
FBS II 8x55 5/- US TX	536851	557781	●	8	65	10.0 x 55	50 / 5	–	–	TX40 / SW 13	50
FBS II 8x70 20/5 US TX	536852	557782	●	8	80	10.0 x 70	50 / 20	–	65 / 5	TX40 / SW 13	50
FBS II 8x80 30/15 US TX	536853	557783	●	8	90	10.0 x 80	50 / 30	–	65 / 15	TX40 / SW 13	50
FBS II 8x90 40/25 US TX	536854	557784	●	8	100	10.0 x 90	50 / 40	–	65 / 25	TX40 / SW 13	50
FBS II 8x100 50/35 US TX	536855	557785	●	8	110	10.0 x 100	50 / 50	–	65 / 35	TX40 / SW 13	50
FBS II 8x110 60/45 US TX	536856	–	●	8	120	10.0 x 110	50 / 60	–	65 / 45	TX40 / SW 13	50
FBS II 8x130 80/65 US TX	536857	–	●	8	140	10.0 x 130	50 / 80	–	65 / 65	TX40 / SW 13	50
FBS II 8x150 100/85 US TX	558219	–	●	8	160	10.0 x 150	50 / 100	–	65 / 95	TX40 / SW 13	50
FBS II 8x170 120/105 US TX	558220	–	●	8	180	10.0 x 60	50 / 120	–	65 / 105	TX40 / SW 13	50
FBS II 8x190 140/125 US TX	558221	–	●	8	200	10.0 x 190	50 / 140	–	65 / 125	TX40 / SW 13	50
FBS II 10x60 5/- US	536858	557786	●	10	70	12.0 x 60	55 / 5	–	–	SW 15	50
FBS II 10x70 15/5/- US	536859	557787	●	10	80	12.0 x 70	55 / 15	65 / 5	–	SW 15	50
FBS II 10x80 25/15/- US	536860	557788	●	10	90	12.0 x 80	55 / 25	65 / 15	–	SW 15	50
FBS II 10x90 35/25/5 US	536861	557789	●	10	100	12.0 x 90	55 / 35	65 / 25	85 / 5	SW 15	50
FBS II 10x100 45/35/15 US	536862	557790	●	10	110	12.0 x 100	55 / 45	65 / 35	85 / 15	SW 15	50
FBS II 10x120 65/55/35 US	536863	557791	●	10	130	12.0 x 120	55 / 65	65 / 55	85 / 35	SW 15	50
FBS II 10x140 85/75/55 US	536864	557792	●	10	150	12.0 x 140	55 / 85	65 / 75	85 / 55	SW 15	50
FBS II 10x160 105/95/75 US	536865	557793	●	10	170	12.0 x 160	55 / 105	65 / 95	85 / 75	SW 15	50
FBS II 10x200 145/135/115 US	536866	–	●	10	210	12.0 x 200	55 / 145	65 / 135	85 / 115	SW 15	20
FBS II 10x230 175/165/145 US	536867	–	●	10	240	12.0 x 230	55 / 175	65 / 165	85 / 145	SW 15	20
FBS II 10x260 205/195/175 US	536868	–	●	10	270	12.0 x 260	55 / 205	65 / 95	85 / 175	SW 15	20
FBS II 10x280 225/215/195 US	558222	–	●	10	290	12.0 x 280	55 / 225	65 / 215	85 / 195	SW 15	20
FBS II 12x70 10/- US	536869	–	●	12	80	14.0 x 70	60 / 10	–	–	SW 17	20
FBS II 12x85 25/10/- US	536870	557794	●	12	95	14.0 x 85	60 / 25	75 / 10	–	SW 17	20
FBS II 12x110 50/35/10 US	536871	557795	●	12	120	14.0 x 110	60 / 50	75 / 35	100 / 10	SW 17	20
FBS II 12x130 70/55/30 US	536872	–	●	12	140	14.0 x 130	60 / 70	75 / 55	100 / 30	SW 17	20
FBS II 12x150 90/75/50 US	536873	–	●	12	160	14.0 x 150	60 / 90	75 / 75	100 / 50	SW 17	20
FBS II 12x170 110/95/70 US	558223	–	●	12	180	14.0 x 170	60 / 110	75 / 95	100 / 70	SW 17	20
FBS II 12x190 130/115/90 US	558224	–	●	12	200	14.0 x 190	60 / 130	75 / 115	100 / 90	SW 17	20
FBS II 12x210 150/135/110 US	558225	–	●	12	220	14.0 x 210	60 / 150	75 / 135	100 / 110	SW 17	20
FBS II 14x75 10/- US	536874	557796	●	14	90	16.0 x 75	65 / 10	–	–	SW 21	20
FBS II 14x95 30/10/- US	536875	557797	●	14	110	16.0 x 95	65 / 30	85 / 10	–	SW 21	20
FBS II 14x100 35/15/- US	536876	557798	●	14	115	16.0 x 100	65 / 35	85 / 15	–	SW 21	20
FBS II 14x125 60/40/10 US	536877	557799	●	14	140	16.0 x 125	65 / 60	85 / 40	85 / 5	SW 21	10
FBS II 14x150 85/65/35 US	536878	–	●	14	165	16.0 x 150	65 / 85	85 / 65	115 / 35	SW 21	10
FBS II 14x180 115/85/65 US	558226	–	●	14	192	16.0 x 180	65 / 115	85 / 95	115 / 65	SW 21	10
FBS II 14x210 145/125/95 US	558227	–	●	14	225	16.0 x 210	65 / 145	85 / 125	115 / 95	SW 21	10
FBS II 14x240 175/155/125 US	558228	–	●	14	255	16.0 x 240	65 / 175	85 / 155	115 / 125	SW 21	10



Technical data

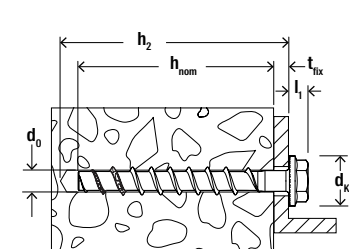
Concrete screw UltraCut FBS II US R



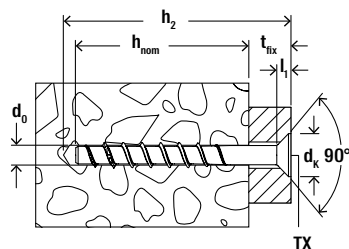
Ultracut FBS II US R hexagon
head with moulded washer
stainless steel R

	Stainless steel	Approval	Drill diameter	Min. drill hole depth for through fixings	Screw length	Screw-in depth with fixture thickness	Screw-in depth with fixture thickness	Screw-in depth with fixture thickness	Drive	Sales unit
Item	Item no.	ETA	d_0 [mm]	h_2 [mm]	l_s [mm]	h_{nom1} / t_{fix} [mm]	h_{nom2} / t_{fix} [mm]	h_{nom3} / t_{fix} [mm]		[pcs]
FBS II 8x60 10/- US	543565	●	8	70	60	50 / 10	–	–	SW 13	50
FBS II 8x70 20/5 US	543566	●	8	80	70	50 / 20	–	65 / 5	SW 13	50
FBS II 8x80 30/15 US	543567	●	8	90	80	50 / 30	–	65 / 15	SW 13	50
FBS II 8x90 40/25 US	543568	●	8	100	90	50 / 40	–	65 / 25	SW 13	50
FBS II 8x100 50/35 US	558239	●	8	110	100	50 / 50	–	65 / 35	SW 13	50
FBS II 8x120 70/55 US	558240	●	8	130	120	50 / 70	–	65 / 55	SW 13	50
FBS II 8x140 90/75 US	558241	●	8	150	140	50 / 90	–	65 / 75	SW 13	50
FBS II 8x160 110/95 US	558242	●	8	170	160	50 / 110	–	65 / 95	SW 13	50
FBS II 10x60 5/-/- US	543569	●	10	70	60	55 / 5	–	–	SW 15	50
FBS II 10x70 15/5/- US	543570	●	10	80	70	55 / 15	65 / 5	–	SW 15	50
FBS II 10x80 25/15/- US	543571	●	10	90	80	55 / 25	65 / 15	–	SW 15	50
FBS II 10x90 35/25/5 US	543572	●	10	100	90	55 / 35	65 / 25	85 / 5	SW 15	50
FBS II 10x100 45/35/15 US	543573	●	10	110	100	55 / 45	65 / 35	85 / 15	SW 15	50
FBS II 10x120 65/55/35 US	543574	●	10	130	120	55 / 65	65 / 55	85 / 35	SW 15	50
FBS II 10x140 85/75/55 US	558243	●	10	150	140	55 / 85	65 / 75	85 / 55	SW 15	50
FBS II 10x160 105/95/75 US	558244	●	10	170	160	55 / 105	65 / 95	85 / 75	SW 15	50
FBS II 12x70 10/-/- US	543575	●	12	80	70	55 / 85	–	–	SW 17	20
FBS II 12x85 25/10/- US	543576	●	12	95	85	60 / 25	75 / 10	–	SW 17	20
FBS II 12x110 50/35/10 US	543577	●	12	120	110	60 / 50	75 / 35	100 / 10	SW 17	20
FBS II 12x130 70/55/30 US	543578	●	12	140	130	60 / 70	75 / 55	100 / 30	SW 17	20
FBS II 12x160 100/85/60 US	558245	●	12	170	160	60 / 100	75 / 95	100 / 60	SW 17	20

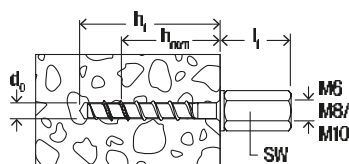
2 Installation data – concrete C20/25-C50/60



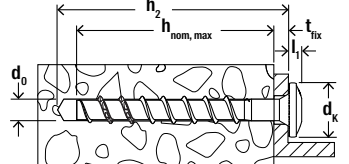
Type US



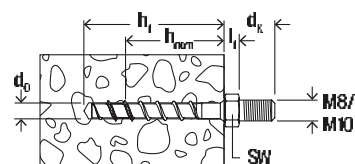
Type SK



Type I



Type P / Typ LP



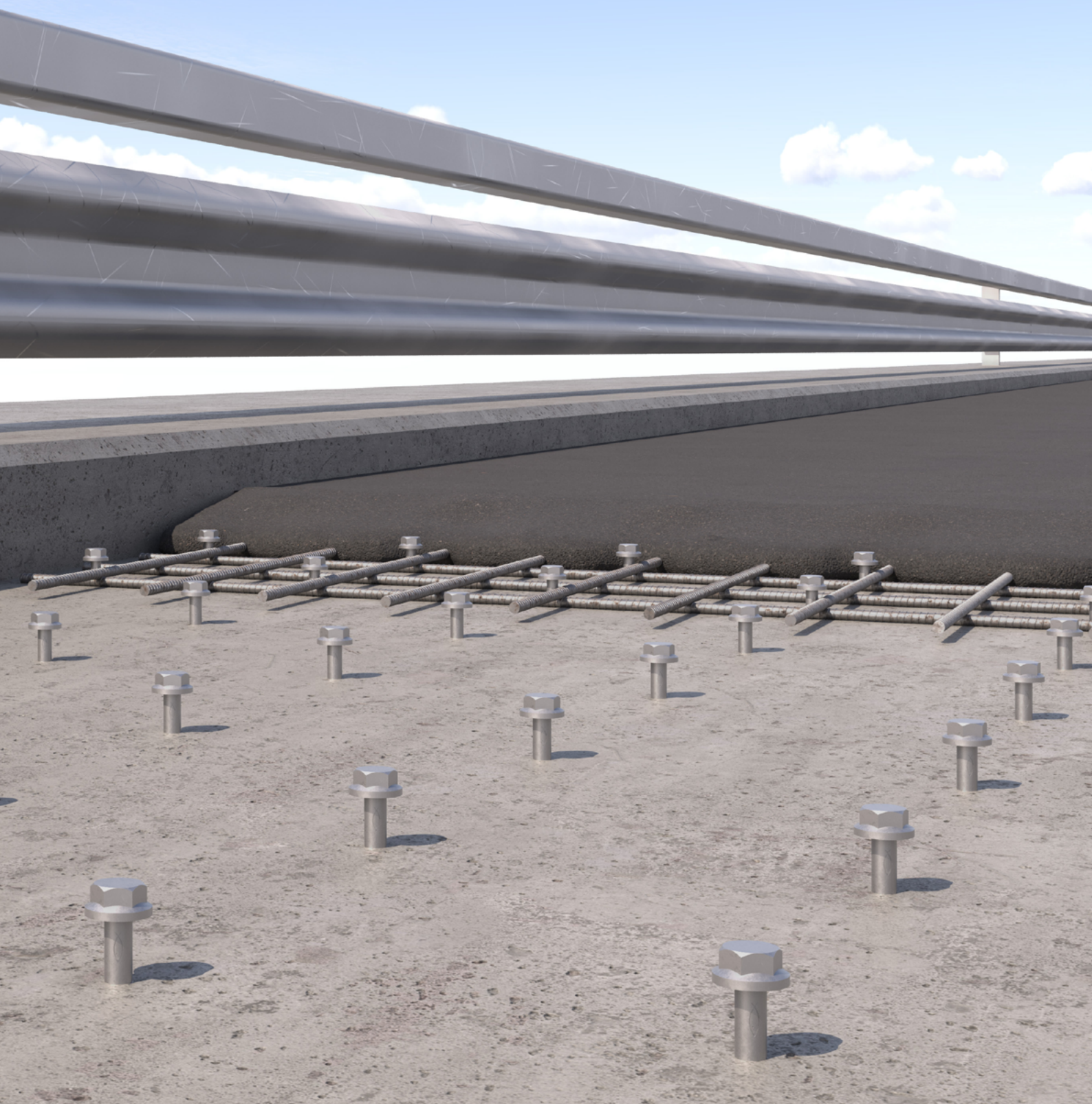
Type M8 / M10

UltraCut		FBS II 8		FBS II 10		FBS II 6				FBS II M8/M10	FBS II 6 I, M8/M10, M6
l_f	[mm]	SK	SK R	SK	SK R	SK	P	LP	US		
d_k	[mm]	6,0	7,0	7,0	7,0	6,0	3,9	3,6	6,2	3,6/5	15/16
		20,0	23,0	23,0	25,0	13,5	14,4	17,5	17,0	37,0/32	-
Concrete screw UltraCut FBS II 6-14 gvz / R						6	8	10	12	14	
Drill hole diameter		d_0	[mm]			6	8	10	12	14	
Nominal screw-in depth		$h_{nom 1}$	[mm]			25 - 55	50	55	60	65	
		$h_{nom 2}$	[mm]			25 - 55	-	65	75	85	
		$h_{nom 3}$	[mm]			25 - 55	65	85	100	115	
Drill hole depth (push-through installation)		$h_2 \geq$	[mm]			$l + 10$	$l + 10$	$l + 10$	$l + 10$	$l + 15$	
Clearance hole diameter		d_f	[mm]			≤ 8	10,6 - 12	12,8 - 14	14,8 - 16	16,9 - 18	
Maximum torque for installation with impact screw driver in concrete ³⁾		$t_{imp, max gvz}$	[Nm]			450 ¹⁾	600	650	650	650	
		$t_{imp, max R}$	[Nm]			-	450	450	650	-	
Width across flat		SW				10 ²⁾	13	15	17	21	
Drive		TX				T30	T40 (SK u. US)	T50 (SK)	-	-	

1) Screw-in depth < 35 mm 80 Nm

2) SW 13 for FBS II ... M10 and FBS II ... M8/M10 I

3) The values apply to concrete strength of approx. 40 N/mm², for other concrete strength classes the values may differ. The conversion of nominal output into effective tightening torque varies from machine to machine - always therefore use torque control.



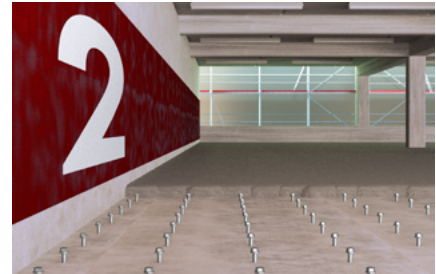
Concrete-concrete shear connector FCC

The approved system for building renovation

2



Upgrade of bridges



Reinforcement of ceilings

Applications

- Bridge repairs
- Increasing load capacity of bridges
- Increasing loads of ceilings during conversion, for example
- Reinforcement of foundations, piers, columns and walls
- Renovation of car park ceilings following corrosion damage

Advantages

- Due to its geometry and ease of installation, FCC is the rapid and economic alternative compared to the conventional installation method with bent iron.
- Dimensioning of the anchorage is possible thanks to the building approval. Thus, the system offers maximum security.
- Variable anchoring depths allow for ideal adaptation to the load to be applied, and ensure an optimised installation time and use of materials.
- Depending on site conditions, the FCC can be anchored, in compliance with the approval, with the injection mortars FIS SB or FIS EM Plus.
- In conjunction with FIS EM Plus, FCC is also approved for use in diamond-drilled drill holes.

Certificates



Building materials

- Approved for:
- Concrete C20/25 to C50/60, cracked and non-cracked
 - Fixing in old concrete B 25 to B 55

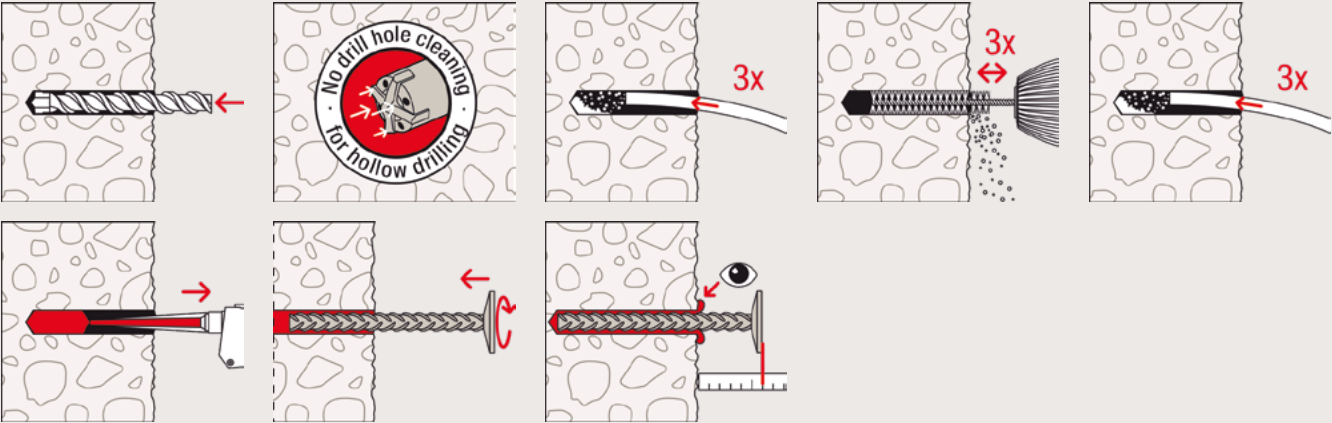
Versions

- Zinc-plated concrete steel bar B500B

Functioning

- The system consists of injection mortar (FIS SB or FIS EM Plus) and the concrete-concrete shear connector FCC.
- The mortar is injected bubble-free from the drill hole base.
- The mortar adheres the drill hole wall to the shear connector FCC.
- The shear connector is set manually, by lightly rotating it until it reaches the drill hole base.
- The tensile and shear forces arising in the joints between the old and new concrete are absorbed by the FCC-H and safely redirected.

Installation in concrete with FIS SB or FIS EM Plus and FCC-H



Technical data

Concrete-concrete shear connector FCC



FCC-H

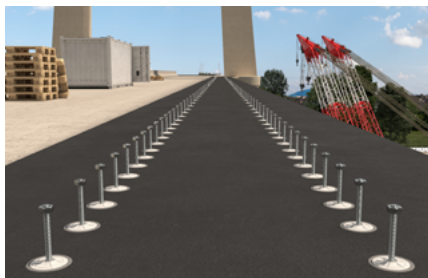
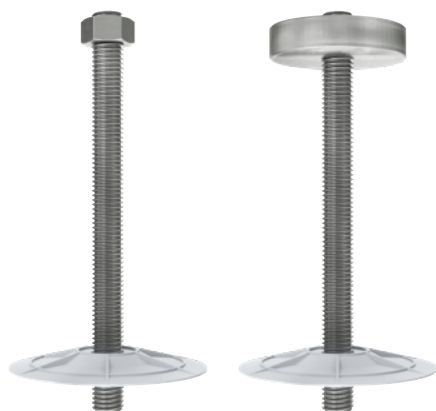
		Approval	Drill hole diameter	Rebar diameter	Anchor length	Min. / standard anchorage depth	Min. / standard fill quantity e.g. FIS SB	Sales unit
	Item no.		d ₀ [mm]	[mm]	[mm]	[mm]	[scale units]	[pcs]
Item		DIBt						
FCC-H 10 x 180	520081	●	12	10	180	60/120	2/4	100
FCC-H 12 x 230	520082*	●	14	12	230	70/155	3/7	50
FCC-H 14 x 290	520083*	●	18	14	290	75/195	6/14	50
FCC-H 16 x 360	520085*	●	20	16	360	80/240	7/20	25

* Delivery time on request.

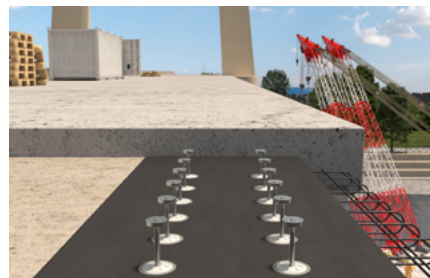
Bridge cap anchor FCC-B

Approved system for post-installed bridge edge beam fixings.

2



Bridge cap anchor with nut



Bridge cap anchor with head plate

Applications

- Anchoring of bridge caps

Advantages

- The fischer bridge cap anchor FCC-B is approved for anchoring in reinforced and unreinforced concrete of strength class from C20/25 and maximum C50/60 according to DIN EN 206-1.
- The FCC-B can be used with the fischer injection mortars FIS EM Plus or FIS SB with maximum flexibility in the installation.
- The approved sealing washer ensures

secure sealing of the penetrated sealing membrane.

- Safe design of the anchoring and fast documentation directly on site is supported by the design tool and the fischer PRO App.
- With the wide range of anchors in diameters M16 to M24, the system offers the right solution for every project.

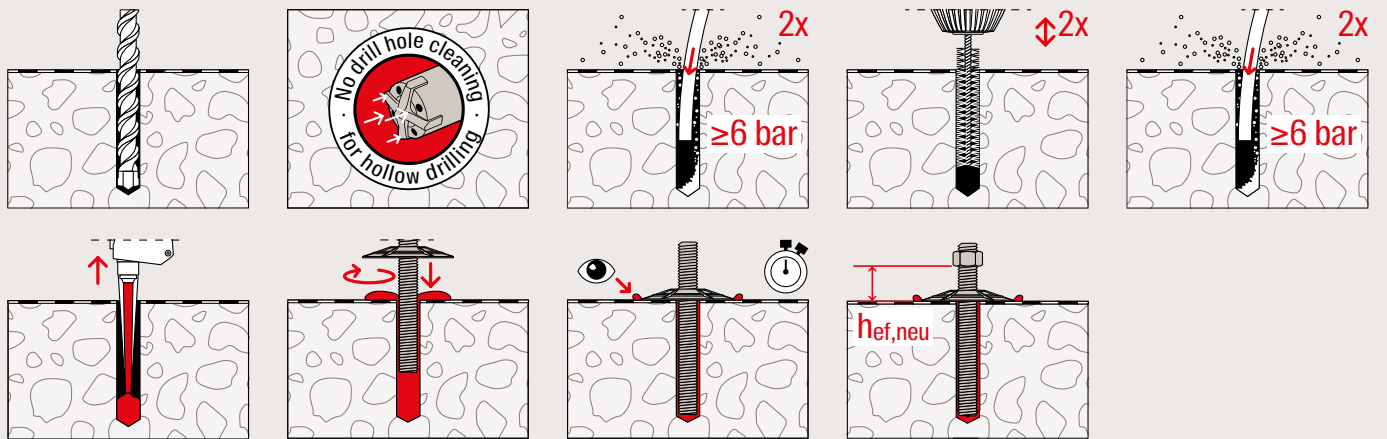
Building materials

- Concrete C20/25 to C50/60, cracked and non-cracked

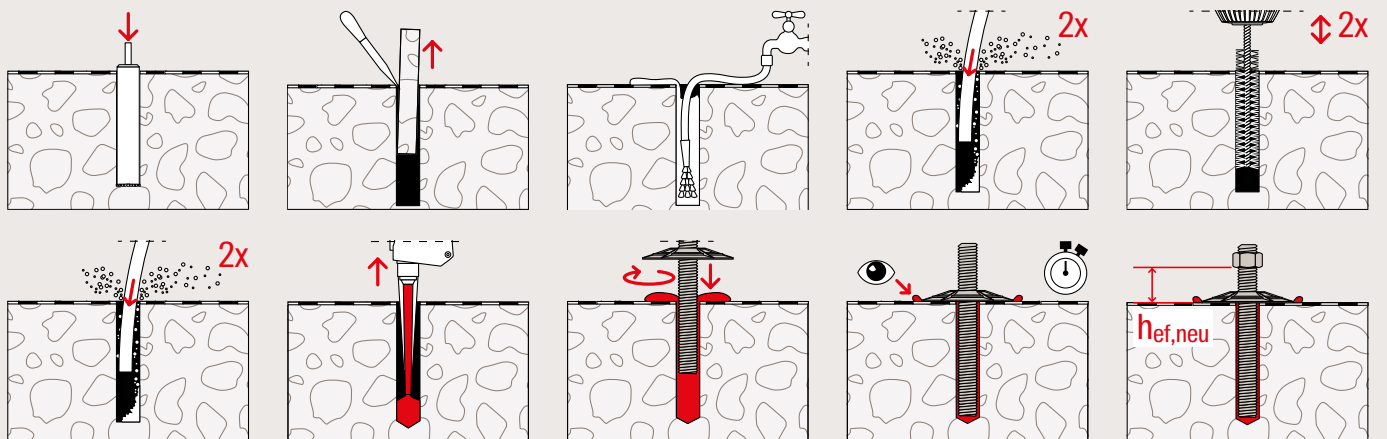
Functioning

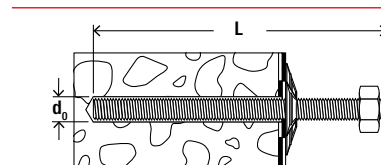
- The system consists of the fischer injection mortars FIS EM Plus or FIS SB and the FCC-B bridge cap anchor.
- The bridge cap anchor is installed by hand with a slight rotating movement down to the bottom of the drill hole.
- The injection mortar connects the threaded rod to the concrete via bond stress.
- The enclosed sealing washer is bonded with the injection mortar, therefore seals the penetration in the sealing membrane.
- The connection between the existing and new concrete is realized by the headed bolt and the corresponding nut or head plate.

Installation with hammer drill with FIS EM Plus and FIS SB



Installation with diamond drill with FIS EM Plus





Technical data

2

Bridge cap anchor FCC-B



FCC-B

Item	Item no.	Drill diameter d_0 [mm]	Length l [mm]	Contents	Sales unit [pcs]
FCC-B M16 x 250 R	569827	18	250	10 x FIS A M16 x 250 R 10 x FCC-SD 12/16 10 x nut M16	10
FCC-B M16 x 300 R	569828	18	300	10 x FIS A M16 x 300 R 10 x FCC-SD 12/16 10 x nut M16	10
FCC-B M20 x 245 R	569829	22	245	10 x FIS A M20 x 245 R 10 x FCC-SD 20/24 10 x nut M20	10
FCC-B M20 x 290 R	569830	22	290	10 x FIS A M20 x 290 R 10 x FCC-SD 20/24 10 x nut M20	10
FCC-B M24 x 290 R	569831	28	290	5 x FIS A M24 x 290 R 5 x FCC-SD 20/24 5 x nut M24	5
FCC-B M24 x 380 R	569832	28	380	5 x FIS A M24 x 380 R 5 x FCC-SD 20/24 5 x nut M24	5

Further sizes on request.

Technical data

Head plate FCC-HP



FCC-HP

Item	Item no.	Diameter d [mm]	Height H [mm]	Sales unit [pcs]
FCC-HP M16 R	569764	48	14.8	10
FCC-HP M20 R	569765	50	18	10
FCC-HP M24 R	569766	70	21.5	5

Technical data

Sealing washer FCC-SD



FCC-SD

	Item no.	External-Ø d [mm]	Height H [mm]	Contents	Sales unit [pcs]
Item					
FCC-SD 12/16	569495	74	9.1	50 x Sealing washer FCC-SD 12/16	50
FCC-SD 20/24	569496	102	9.8	50 x Sealing washer FCC-SD 20/24	50

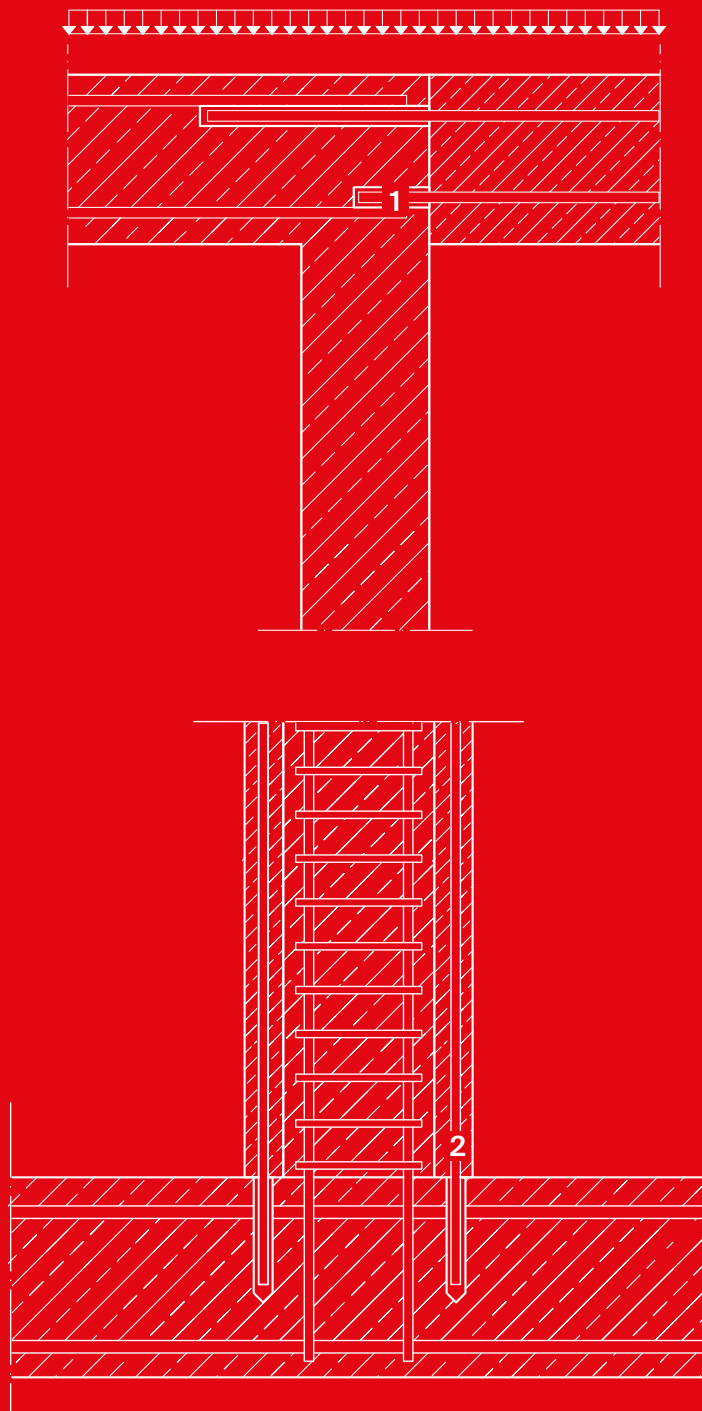
Post-installed reinforcing bars

The post-installed rebar technology realizes versatile and safe connections of new and additional reinforcement within a reinforced concrete structure. Typical applications include overlap joints for rebar connections of slabs and beams; overlap joints in column-to-foundation structural details; end anchoring of slabs and beams into existing walls or columns. We offer a wide range of injection systems, both on epoxy as well as on vinyl ester basis and our products have state-of-the-art technical assessments.

Several strengthening applications also require the application of post-installed rebars. In this catalogue, you will find selected injection systems from our core product range, that can be used to realize safe and reliable post-installed rebar connections.

Superbond-System FIS SB	88
Epoxy Mortar FIS EM Plus	93
Epoxy Mortar FIS EB II	98
Injection Mortar FIS V Plus	101
Injection Mortar FIS VL	112
Injection Mortar FIS RC II	118

- 1 Post-installed rebars
FIS EM Plus, FIS RB,
FIS V, FIS V Plus,
FIS SB, FIS EB, FIS VL
- 2 Concrete jacketing
Post-installed rebars
FIS EM Plus, FIS RB,
FIS V, FIS V Plus,
FIS SB, FIS EB, FIS VL





Retrospective structural changes often lead to the change in the static system for which the existing reinforcement is not designed.

By means of the post-installed reinforcement technology, the performance of structural elements can be upgraded in various ways.

Enhance the cross-section of RC columns with longitudinal rebars, shear connectors and stirrups followed by subsequent monolithic concreting, which results in the increase of the flexural and axial capacity of the column, as well as the punching shear resistance of the concrete slab.

Post-installed longitudinal rebars and subsequent concreting may also be a good solution to improve the flexural capacity of RC beams.

Our injection systems FIS EM Plus, FIS RC II, FIS SB, FIS V Plus, FIS EP are suitable and approved for realization of post-installed rebar connections, as well as for the use as single-point fasteners with state-of-the-art assessments.

Superbond-system FSB

The concrete all-rounder

2



Steel girders



Bridges for traffic signs

Applications

- Heavy steel constructions
- Silo installations
- Tall shelving
- Sound barriers
- Guard rails
- Staircases
- Reinforcing steel (only FIS SB)
- Overhead installations

Advantages

- The Superbond system is a combined capsule and injection system for cracked and non-cracked concrete. The injection mortar FIS SB and resin capsule RSB perform the same as each other at the same anchorage depth. This gives the installer maximum flexibility.
- Variable anchorage depths from $4 \times d_s$ to $20 \times d_s$ enable ideal adaptation to the load to be applied, and thus ensure an optimised installation time and use of

materials.

- Maximum application temperatures of up to $+150^\circ\text{C}$ open up new areas of use for bonded anchors.
- Superbond is even approved for installation at frosty temperatures of -30°C .
- The approval-compliant use for seismic applications (performance category C1, C2) ensures safety even in extreme conditions.

Certificates



ETA-12/0258, in concrete
ETA-13/0651, for post-installed rebar connections
ETA-19/0501, for post-installed fasteners in concrete



Building materials

Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked and non-cracked

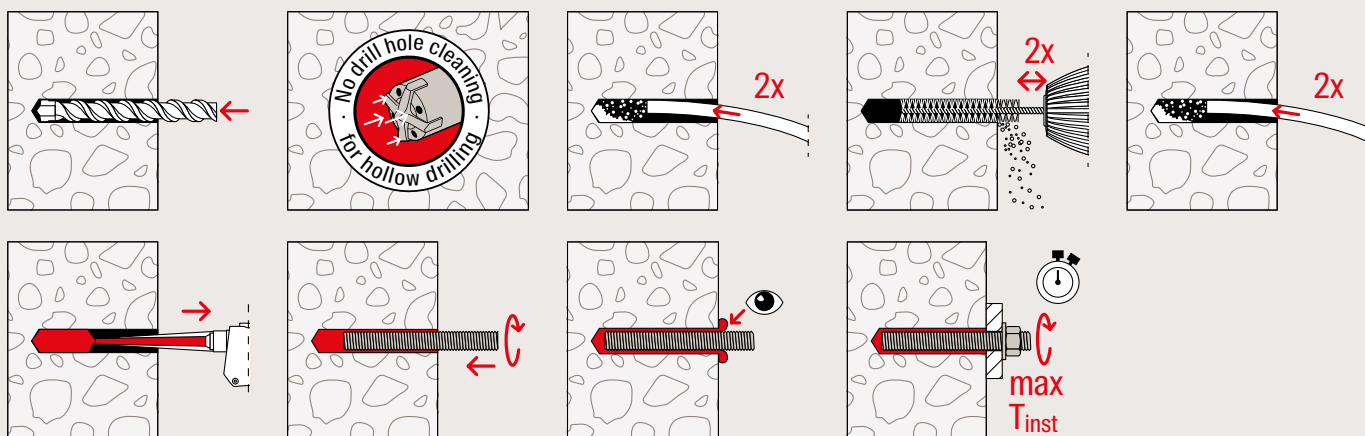
Also suitable for:

- Natural stone with dense structure

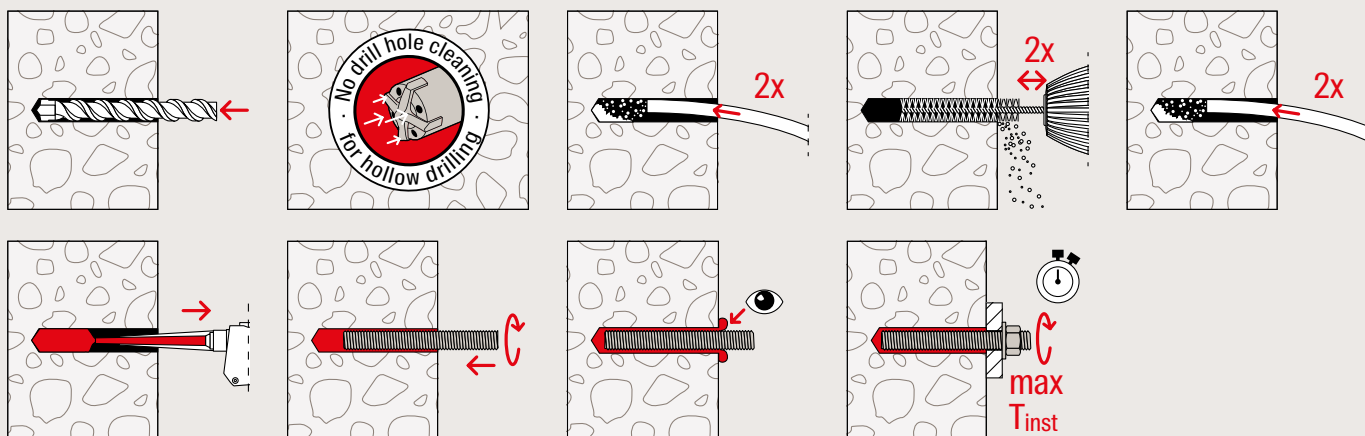
Functioning

- Superbond is a bonded anchor system based on a vinylester hybrid with silane technology.
- The threaded rod FIS A can only be set with injection mortar FIS SB (Standard and HIGH SPEED); the threaded rod RGM with oblique edge can be optionally set with injection mortar FIS SB (Standard and HIGH SPEED) or resin capsule RSB.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer or destruction of the capsule during the setting procedure.
- The mortar bonds the entire surface of the fastening element with the drill hole wall and seals the drill hole.

Installation in concrete with FIS SB and FIS A



Installation in concrete with FIS SB and RG M



Technical data

Injection mortar FIS SB



FIS SB 390 S

FIS SB High Speed 390 S

FIS SB 585 S

FIS MR Plus

FIS UMR

Item	Item no.	Approval		Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	ICC				
FIS SB 390 S	519451	●	●	DE, FR, NL	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	520555	●	●	CS, RO, SK	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	520557	●	●	BG, DE, SL, SR	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	520559	●	●	DA, FI, NO, SV	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	518831	●	●	EN, ES, PT	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	520595	●	●	HU, PL, RU	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 390 S	519450	●	●	DE, EN, IT	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB HIGH SPEED 390 S	523300	●	●	DE	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS SB 585 S	562065	●	●	DE, FR, NL	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1
FIS SB 585 S	520526	●	●	DE, EN, IT	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1
FIS SB 585 S	519452	●	●	EN, ES, PT	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1
FIS MR Plus	545853	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10
FIS UMR	520593	–	–	–	–	10 x static mixer FIS UMR for 585 & 1500 ml cartridges	10

Technical data

Injection mortar FIS SB



FIS SB 390 S HWK big

FIS SB 390 S in bucket

Item	Item no.	Approval		Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	ICC				
FIS SB 390 S HWK big	520573	●	●	DE, EN, IT	180	20 x cartridge 390 ml, 20 x static mixer FIS MR Plus	1
FIS SB 390 S HWK big	540252	●	●	EN, ES, PT	180	20 x cartridge 390 ml, 40 x FIS MR Plus	1
FIS SB 390 S in bucket	540750	●	●	EN, ES, PT	180	18 x cartridge 390 ml, 36 x FIS MR Plus	1

Curing times

FIS SB Temperature in anchoring base [°C]	Maximum processing time FIS SB t_{work} [min.]	Maximum processing time FIS SB High Speed t_{work} [min.]	Minimum curing time FIS SB t_{cure}		Minimum curing time FIS SB High Speed t_{cure}	
			[hrs.]	[min.]	[hrs.]	[min.]
> -20 – -15	-	60	-	-	24	-
> -15 – -10	60	30	36	-	8	-
> -10 – -5	30	15	24	-	-	180
> -5 – 0	20	10	8	-	-	120
> +0 – +5	13	5	4	-	-	60
> +5 – +10	9	3	-	120	-	45
> +10 – +20	5	2	-	60	-	30
> +20 – +30	4	1	-	45	-	15
> +30 – +40	2	-	-	30	-	-

1) Minimum cartridge temperature +5°C

Loads

Superbond-System: Injection mortar FIS SB with internal threaded anchor RG M I

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-12/0258 has to be considered.

Type	Screw material ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation-torque $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
RG M8 I	5.8	90	120	10	8.1	5.3	55	55	9.0	5.3	55	55
	8.8	90	120	10	8.1	8.3	55	55	13.8	8.3	55	55
	R-70	90	120	10	8.1	5.9	55	55	9.9	5.9	55	55
RG M10 I	5.8	90	130	20	10.8	8.3	65	65	13.8	8.3	65	65
	8.8	90	130	20	10.8	13.3	65	65	20.0	13.3	65	65
	R-70	90	130	20	10.8	9.3	65	65	15.7	9.3	65	65
RG M12 I	5.8	125	170	40	16.8	12.1	75	75	20.5	12.1	75	75
	8.8	125	170	40	16.8	19.3	75	75	32.4	19.3	75	75
	R-70	125	170	40	16.8	13.5	75	75	22.5	13.5	75	75
RG M16 I	5.8	160	210	80	26.3	22.4	95	95	37.6	22.4	95	95
	8.8	160	210	80	26.3	30.9	95	95	47.4	30.9	95	95
	R-70	160	210	80	26.3	25.1	95	95	42.0	25.1	95	95
RG M20 I	5.8	200	260	120	41.9	35.4	125	125	58.6	35.4	125	125
	8.8	200	260	120	41.9	51.4	125	125	66.3	51.4	125	125
	R-70	200	260	120	41.9	39.4	125	125	65.7	39.4	125	125

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_f = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Loads

Superbond-System: Injection mortar FIS SB with threaded rod FIS A or RG M

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.

For the design the complete current assessment ETA-12/0258 has to be considered.

Type	Material/ surface ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation- torque $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
FIS A M 8	5.8	60	100	10	4.3	6.3	40	40	8.6	6.3	40	40
	5.8	80	110	10	5.7	6.3	40	40	9.0	6.3	40	40
	5.8	160	190	10	9.0	6.3	40	40	9.0	6.3	40	40
	R-70	60	100	10	4.3	6.0	40	40	8.6	6.0	40	40
	R-70	80	110	10	5.7	6.0	40	40	9.9	6.0	40	40
	R-70	160	190	10	9.9	6.0	40	40	9.9	6.0	40	40
FIS A M 10	5.8	60	100	20	5.8	9.7	45	45	10.8	9.7	45	45
	5.8	90	120	20	8.8	9.7	45	45	13.8	9.7	45	45
	5.8	200	230	20	13.8	9.7	45	45	13.8	9.7	45	45
	R-70	60	100	20	5.8	9.2	45	45	10.8	9.2	45	45
	R-70	90	120	20	8.8	9.2	45	45	15.7	9.2	45	45
	R-70	200	230	20	15.7	9.2	45	45	15.7	9.2	45	45
FIS A M 12	5.8	70	100	40	9.4	14.3	55	55	13.7	14.3	55	55
	5.8	110	140	40	14.8	14.3	55	55	20.5	14.3	55	55
	5.8	240	270	40	20.5	14.3	55	55	20.5	14.3	55	55
	R-70	70	100	40	9.4	13.7	55	55	13.7	13.7	55	55
	R-70	110	140	40	14.8	13.7	55	55	22.5	13.7	55	55
	R-70	240	270	40	22.5	13.7	55	55	22.5	13.7	55	55
FIS A M 16	5.8	80	120	60	11.7	23.5	65	65	16.8	26.9	65	65
	5.8	125	170	60	22.4	26.9	65	65	32.7	26.9	65	65
	5.8	320	360	60	37.6	26.9	65	65	37.6	26.9	65	65
	R-70	80	120	60	11.7	23.5	65	65	16.8	25.2	65	65
	R-70	125	170	60	22.4	25.2	65	65	32.7	25.2	65	65
	R-70	320	360	60	42.0	25.2	65	65	42.0	25.2	65	65
FIS A M 20	5.8	90	140	120	14.0	28.0	85	85	20.0	40.0	85	85
	5.8	170	220	120	36.3	42.3	85	85	51.9	42.3	85	85
	5.8	400	450	120	58.6	42.3	85	85	58.6	42.3	85	85
	R-70	90	140	120	14.0	28.0	85	85	20.0	39.4	85	85
	R-70	170	220	120	36.3	39.4	85	85	51.9	39.4	85	85
	R-70	400	450	120	65.7	39.4	85	85	65.7	39.4	85	85
FIS A M 24	5.8	96	160	150	15.4	30.8	105	105	22.0	44.1	105	105
	5.8	210	270	150	49.9	60.6	105	105	71.3	60.6	105	105
	5.8	480	540	150	84.3	60.6	105	105	84.3	60.6	105	105
	R-70	96	160	150	15.4	30.8	105	105	22.0	44.1	105	105
	R-70	210	270	150	49.9	56.8	105	105	71.3	56.8	105	105
	R-70	480	540	150	94.3	56.8	105	105	94.3	56.8	105	105
FIS A M 30	5.8	120	190	300	21.6	43.1	140	140	30.8	61.6	140	140
	5.8	280	350	300	76.8	96.0	140	140	109.8	96.0	140	140
	5.8	600	670	300	133.8	96.0	140	140	133.8	96.0	140	140
	R-70	120	190	300	21.6	43.1	140	140	30.8	61.6	140	140
	R-70	280	350	300	76.8	90.2	140	140	109.8	90.2	140	140
	R-70	600	670	300	150.1	90.2	140	140	150.1	90.2	140	140

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Epoxy mortar FIS EM Plus

The powerful injection mortar for rebar connections and cracked concrete



Rail fastenings



Rebar connections

Applications

- Post-installed rebar connections
- Jointers for concrete layers
- Rim beam anchorings
- Seismic applications
- Anchorings in diamond-drilled or in water-filled drill holes
- Heavy steel constructions
- Silo installations
- Tall shelving
- Sound barriers
- Temporary or removable fixings (with internal threaded anchor RG M I)
- Anchorings in sealing surfaces according to WRL (Water Resources Law)

Advantages

- The ETA assessment guarantees a service life of 100 years. The expert report of IEA Stuttgart even confirms a working life up to 120 years and thus underlines the reliability and durability of the FIS EM Plus.
- The optimised formulation of the epoxy resin mortar FIS EM Plus leads to improved load values in cracked and non-cracked concrete.
- The mortar can be used for rebar connections from diameter 8 to 40, including seismic applications.

- With the threaded rod FIS A, the loads to be applied can be designed variably by selecting the anchorage depth. The mortar is approved for diamond drilled and water-filled drillholes as well as seismic applications and thus offers safety under extreme conditions.
- For practical use on the building site, FIS EM Plus can be processed at low temperatures down to -5°C.

Certificates



ETA-17/0979, in concrete
ETA-17/1056, for post-installed rebar connections

ICC-ES for cracked and uncracked concrete, post-installed rebar connection



Building materials

Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked and non-cracked
- Sealing surfaces according WRL (Water Resources Law)
- Glued laminated or glued solid timber of spruce (Picea abies), fir (Abies alba) or pine (Pinus sylvestris)

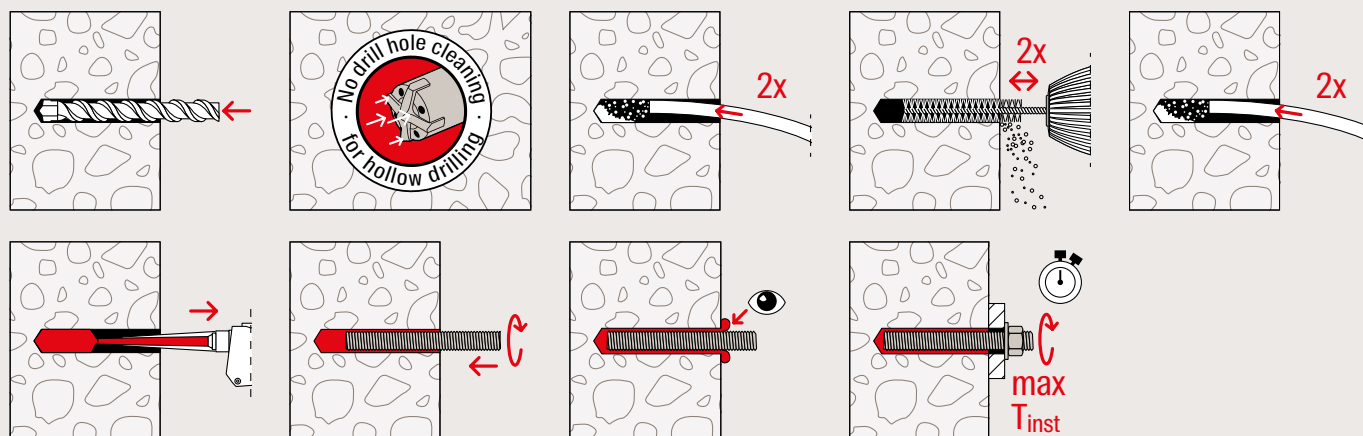
Also suitable for:

- Natural stone with dense structure

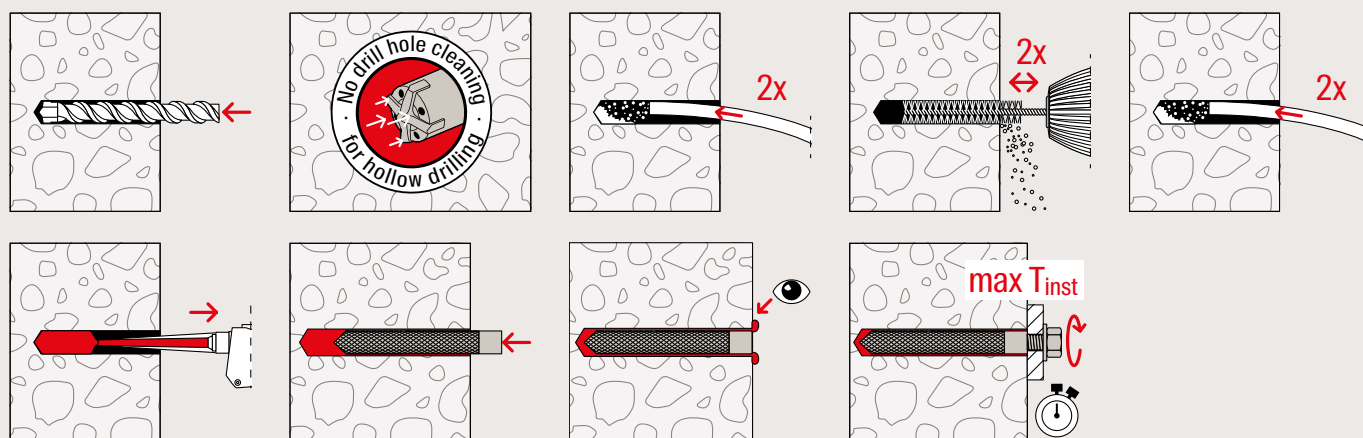
Functioning

- The epoxy mortar FIS EM Plus combined with the FIS A anchor rod, is suitable for pre-positioned and push-through installation and with the internal threaded anchor RG M I for pre-positioned installation.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The mortar is injected bubble-free from the drill hole base.
- The mortar bonds the entire surface of the anchor with the drill hole wall and seals off the drill hole.

Installation in concrete with FIS EM Plus and FIS A / RG M



Installation in concrete with FIS EM Plus and RG M I



Technical data

Epoxy mortar FIS EM Plus



FIS EM Plus 390 S		FIS EM Plus 585 S			FIS EM Plus 1500 S		FIS MR Plus	FIS UMR	
		Approval			Languages on the cartridge	Scale unit	Contents	Sales unit	
	Item no.	ETA	DIBt	ICC					
Item								[pcs]	
FIS EM Plus 390 S	544154	●	●	●	EN, FR, NL	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1	
FIS EM Plus 390 S	544176	●	●	●	CS, RO, SK	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1	
FIS EM Plus 390 S	544155	●	●	●	AR, EN, ZH	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1	
FIS EM Plus 390 S	544159	●	●	●	KK, RU, UK	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1	
FIS EM Plus 390 S	567987	●	●	●	EL, HU, KO	180	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1	
FIS EM Plus 585 S	544165	●	●	●	CS, KO, PL, SK	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1	
FIS EM Plus 585 S	544166	●	●	●	EL, EN, ES, PT	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1	
FIS EM Plus 585 S	567989	●	●	●	DE, FR, NL	270	1 x cartridge 585 ml, 2 x static mixer FIS UMR	1	
FIS EM Plus 585 S	544175	●	●	●	EN, KO, ZH	270	1 x cartridge 585 ml, 1 x FIS UMR, 1 x extension tube Ø 9 x 250 mm	1	
FIS EM Plus 1500 S	544167	●	●	●	DE, EN, ES, FR, IT	670	1 x cartridge 1500 ml, 2 x static mixer FIS UMR	1	
FIS MR Plus	545853	–	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10	
FIS UMR	520593	–	–	–	–	–	10 x static mixer FIS UMR for 585 & 1500 ml cartridges	10	

Technical data

Epoxy mortar FIS EM Plus



FIS EM Plus 390 S HWK big

FIS EM Plus in bucket

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS EM Plus 390 S in bucket	544172 ¹⁾	●	●	●	AR, EN, ZH	180	20 x cartridge 390 ml, 20 x static mixer FIS MR Plus	1
FIS EM Plus 390 S HWK big	544156 ¹⁾	●	●	●	EN, FR, KO	180	20 x cartridge 390 ml, 20 x static mixer FIS MR Plus	1

¹⁾ Dangerous goods - no express shipping possible.

Curing times

FIS EM Plus Temperature in anchoring base [°C]	Maximum processing time t _{work} [min.]	Minimum curing time ¹⁾ t _{cure} [hrs.]
-5 – 0	240	200
> 0 – +5	150	90
> +5 – +10	120	40
> -10 – +20	30	18
> +20 – +30	14	10
> +30 – +40	7	5

¹⁾ In wet concrete or water filled holes the curing times must be doubled.

Loads

Injection system FIS EM Plus with threaded rod FIS A resp. RG M

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.

For the design the complete current assessment ETA-17/0979 has to be considered.

Type	Material/ surface ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation- torque $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
FIS A M 8	5.8	60	100	10	5.4	6.3	40	40	9.0	6.3	40	40
	5.8	80	110	10	7.2	6.3	40	40	9.0	6.3	40	40
	5.8	160	190	10	9.0	6.3	40	40	9.0	6.3	40	40
	R-70	60	100	10	5.4	6.0	40	40	9.9	6.0	40	40
	R-70	80	110	10	7.2	6.0	40	40	9.9	6.0	40	40
	R-70	160	190	10	9.9	6.0	40	40	9.9	6.0	40	40
FIS A M 10	5.8	60	100	20	6.7	9.7	45	45	10.9	9.7	45	45
	5.8	90	120	20	10.1	9.7	45	45	13.8	9.7	45	45
	5.8	200	230	20	13.8	9.7	45	45	13.8	9.7	45	45
	R-70	60	100	20	6.7	9.2	45	45	10.9	9.2	45	45
	R-70	90	120	20	10.1	9.2	45	45	15.7	9.2	45	45
	R-70	200	230	20	15.7	9.2	45	45	15.7	9.2	45	45
FIS A M 12	5.8	70	100	40	9.6	14.3	55	45	13.7	14.3	55	45
	5.8	110	140	40	17.8	14.3	55	45	20.5	14.3	55	45
	5.8	240	270	40	20.5	14.3	55	45	20.5	14.3	55	45
	R-70	70	100	40	9.6	13.7	55	45	13.7	13.7	55	45
	R-70	110	140	40	17.8	13.7	55	45	22.5	13.7	55	45
	R-70	240	270	40	22.5	13.7	55	45	22.5	13.7	55	45
FIS A M 16	5.8	80	120	60	11.7	23.5	65	50	16.8	26.9	65	50
	5.8	125	170	60	22.9	26.9	65	50	32.7	26.9	65	50
	5.8	320	360	60	37.6	26.9	65	50	37.6	26.9	65	50
	R-70	80	120	60	11.7	23.5	65	50	16.8	25.2	65	50
	R-70	125	170	60	22.9	25.2	65	50	32.7	25.2	65	50
	R-70	320	360	60	42.0	25.2	65	50	42.0	25.2	65	50
FIS A M 20	5.8	90	140	120	14.0	28.0	85	55	20.0	40.0	85	55
	5.8	170	220	120	36.3	42.3	85	55	51.9	42.3	85	55
	5.8	400	450	120	58.6	42.3	85	55	58.6	42.3	85	55
	R-70	90	140	120	14.0	28.0	85	55	20.0	39.4	85	55
	R-70	170	220	120	36.3	39.4	85	55	51.9	39.4	85	55
	R-70	400	450	120	65.7	39.4	85	55	65.7	39.4	85	55
FIS A M 24	5.8	96	160	150	15.4	30.8	105	60	22.0	44.1	105	60
	5.8	210	270	150	49.9	60.6	105	60	71.3	60.6	105	60
	5.8	480	540	150	84.3	60.6	105	60	84.3	60.6	105	60
	R-70	96	160	150	15.4	30.8	105	60	22.0	44.1	105	60
	R-70	210	270	150	49.9	56.8	105	60	71.3	56.8	105	60
	R-70	480	540	150	94.3	56.8	105	60	97.3	56.8	105	60
FIS A M 30	5.8	120	190	300	21.6	43.1	140	80	30.8	61.6	140	80
	5.8	280	350	300	76.8	96.0	140	80	109.8	96.0	140	80
	5.8	600	670	300	133.8	96.0	140	80	133.8	96.0	140	80
	R-70	120	190	300	21.6	43.1	140	80	30.8	61.6	140	80
	R-70	280	350	300	76.8	90.2	140	80	109.8	90.2	140	80
	R-70	600	670	300	150.1	90.2	140	80	150.1	90.2	140	80

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 72 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Loads

Injection system FIS EM Plus with internal threaded anchor RG M I

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-17/0979 has to be considered.

Type	Screw material ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation-torque $T_{inst,max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
RG M8 I	5.8	90	120	10	9.0	5.3	55	55	9.0	5.3	55	55
	8.8	90	120	10	11.3	8.3	55	55	13.8	8.3	55	55
	R-70	90	120	10	9.9	5.9	55	55	9.9	5.9	55	55
RG M10 I	5.8	90	130	20	12.9	8.3	65	65	13.8	8.3	65	65
	8.8	90	130	20	12.9	13.3	65	65	20.0	13.3	65	65
	R-70	90	130	20	12.9	9.3	65	65	15.7	9.3	65	65
RG M12 I	5.8	125	170	40	20.2	12.1	75	75	20.5	12.1	75	75
	8.8	125	170	40	20.2	19.3	75	75	32.4	19.3	75	75
	R-70	125	170	40	20.2	13.5	75	75	22.5	13.5	75	75
RG M16 I	5.8	160	210	80	33.2	22.4	95	95	37.6	22.4	95	95
	8.8	160	210	80	33.2	30.9	95	95	47.4	30.9	95	95
	R-70	160	210	80	33.2	25.1	95	95	42.0	25.1	95	95
RG M20 I	5.8	200	260	120	46.4	35.4	125	125	58.6	35.4	125	125
	8.8	200	260	120	46.4	51.4	125	125	66.3	51.4	125	125
	R-70	200	260	120	46.4	39.4	125	125	66.7	39.4	125	125

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_f = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 72 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

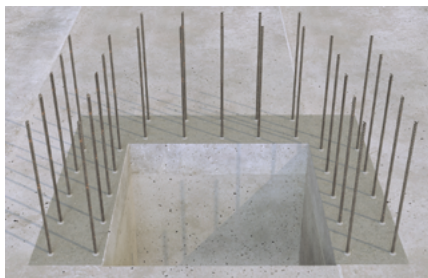
³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Epoxy mortar FIS EB II

The Epoxy mortar for standard applications in concrete

2



Post-installed rebar connections



Tall shelving

Applications

- Heavy steel constructions
- Consoles
- Silo installations
- Tall shelving
- Post-installed rebar connections

Advantages

- The injection mortar FIS EB II has ETA assessments for anchorings in cracked concrete and for post-installed rebar connections.
- Due to the seismic approval for performance category C1 and C2, the FIS EB II can be safely used in earthquake regions.
- FIS EB II is the reliable system for fixing heavy loads indoors and outdoors.
- Due to the variable anchoring depths, the epoxy resin mortar is very versatile.
- The long processing time of FIS EB II is particularly suitable for applications in large and deep drillholes.

Certificates



ETA-21/0469, for cracked concrete
ETA-21/0470, for post-installed rebar connections



Building materials

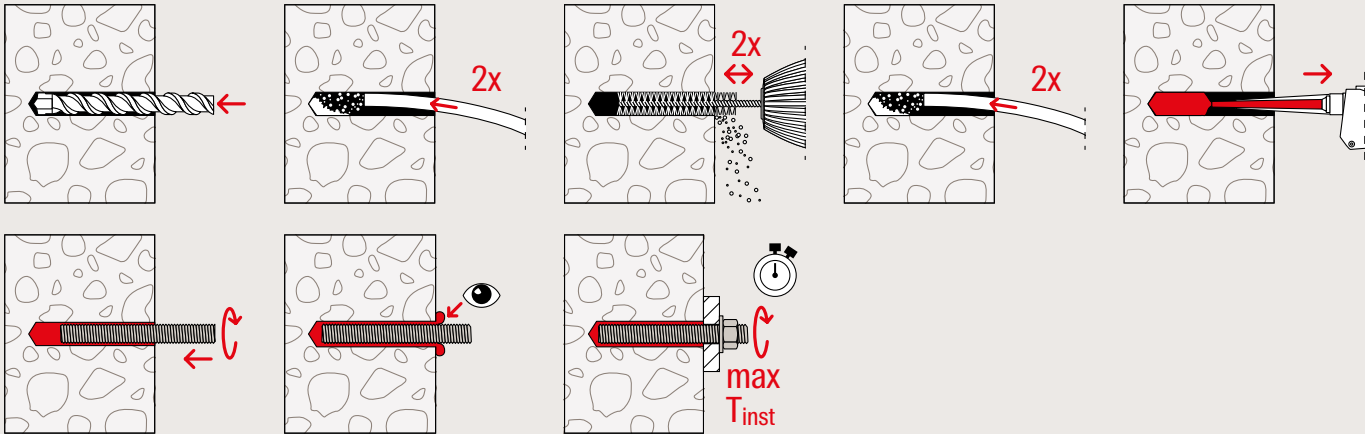
Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked and non-cracked

Functioning

- The epoxy mortar FIS EB II in combination with the anchor rod FIS A and RG M is suitable for pre-positioned and push-through installation.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The mortar is injected bubble-free from the drill hole base.
- The mortar bonds the entire surface of the anchor rod with the drill hole wall and seals off the drill hole.
- The anchor rod is set manually by slightly rotating it until it reaches the drill hole base.

Installation in concrete with FIS EB II and FIS A / RG M



Technical data

Epoxy mortar FIS EB II						
FIS EB II 390 S	FIS EB II 585 S	FIS EB II 390 S in bucket	FIS MR Plus	FIS UMR		
	Item no.	Approval ETA	Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
FIS EB II 390 S	562629	●	EN, ES, PT	190	1 x cartridge 390 ml, 2 x static mixer FIS MR Plus	1
FIS EB II 390 S in bucket	563265	●	EN, ES, PT	190	20 x cartridge 390 ml, 20 x static mixer FIS MR Plus	1
FIS EB II 585 S	562632	●	EN, ES, PT	270	1 x cartridge 585 ml, 2 x FIS UMR	1
FIS MR Plus	545853	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10
FIS UMR	520593	–	–	–	10 x static mixer FIS UMR for 585 & 1500 ml cartridges	10

Processing and curing times

FIS EB II Temperatures at anchoring base [°C]	Maximum processing time t _{work} [min.]	Minimum curing time t _{cure} [hrs.]
+5 – +10	180	96
> +10 – +15	90	60
> +15 – +20	60	36
> +20 – +30	30	24
> +30 – +40	15	12

Loads

2

Injection system FIS EB II with threaded rod FIS A resp. RG M

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.

For the design the complete current assessment ETA-21/0469 of 25.07.2023 has to be considered.

Type	Material / surface ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation torque $T_{inst, max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
FIS A M 8	5.8	60	100	10	3.6	6.3	40	40	5.4	6.3	40	40
	5.8	80	110	10	4.8	6.3	40	40	7.2	6.3	40	40
	5.8	160	190	10	9.0	6.3	40	40	9.0	6.3	40	40
	R-70	60	100	10	3.6	6.0	40	40	5.4	6.0	40	40
	R-70	80	110	10	4.8	6.0	40	40	7.2	6.0	40	40
	R-70	160	190	10	9.6	6.0	40	40	9.9	6.0	40	40
FIS A M 10	5.8	60	100	20	4.5	9.7	45	45	6.7	9.7	45	45
	5.8	90	120	20	6.7	9.7	45	45	10.1	9.7	45	45
	5.8	200	230	20	13.8	9.7	45	45	13.8	9.7	45	45
	R-70	60	100	20	4.5	9.2	45	45	6.7	9.2	45	45
	R-70	90	120	20	6.7	9.2	45	45	10.1	9.2	45	45
	R-70	200	230	20	15.0	9.2	45	45	15.7	9.2	45	45
FIS A M 12	5.8	70	100	40	6.3	14.3	55	55	9.4	14.3	55	55
	5.8	110	140	40	9.9	14.3	55	55	14.8	14.3	55	55
	5.8	240	270	40	20.5	14.3	55	55	20.5	14.3	55	55
	R-70	70	100	40	6.3	13.7	55	55	9.4	13.7	55	55
	R-70	110	140	40	9.9	13.7	55	55	14.8	13.7	55	55
	R-70	240	270	40	21.5	13.7	55	55	22.5	13.7	55	55
FIS A M 16	5.8	80	120	60	8.8	21.1	65	65	14.0	26.9	65	65
	5.8	125	170	60	13.7	26.9	65	65	22.4	26.9	65	65
	5.8	320	360	60	35.1	26.9	65	65	37.6	26.9	65	65
	R-70	80	120	60	8.8	21.1	65	65	14.0	25.2	65	65
	R-70	125	170	60	13.7	25.2	65	65	22.4	25.2	65	65
	R-70	320	360	60	35.1	25.2	65	65	42.0	25.2	65	65
FIS A M 20	5.8	90	140	120	11.7	28.0	85	85	16.7	40.0	85	85
	5.8	170	220	120	23.3	42.3	85	85	38.1	42.3	85	85
	5.8	400	450	120	54.9	42.3	85	85	58.6	42.3	85	85
	R-70	90	140	120	11.7	28.0	85	85	16.7	39.4	85	85
	R-70	170	220	120	23.3	39.4	85	85	38.1	39.4	85	85
	R-70	400	450	120	54.9	39.4	85	85	65.7	39.4	85	85
FIS A M 24	5.8	96	160	150	12.9	30.8	105	105	18.4	44.1	105	105
	5.8	210	270	150	34.6	60.6	105	105	53.4	60.6	105	105
	5.8	480	540	150	79.0	60.6	105	105	84.3	60.6	105	105
	R-70	96	160	150	12.9	30.8	105	105	18.4	44.1	105	105
	R-70	210	270	150	34.6	56.8	105	105	53.4	56.8	105	105
	R-70	480	540	150	79.0	56.8	105	105	94.3	56.8	105	105
FIS A M 30	5.8	120	190	300	18.0	43.1	140	140	25.7	61.6	140	140
	5.8	280	350	300	52.4	96.0	140	140	78.5	96.0	140	140
	5.8	600	670	300	112.2	96.0	140	140	133.8	96.0	140	140
	R-70	120	190	300	18.0	43.1	140	140	25.7	61.6	140	140
	R-70	280	350	300	52.4	90.2	140	140	78.5	90.2	140	140
	R-70	600	670	300	112.2	90.2	140	140	150.1	90.2	140	140

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 72 °C). Higher loads are possible at lower temperatures. Drill hole cleaning as per specification in the ETA. The factor Ψ_{sul} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

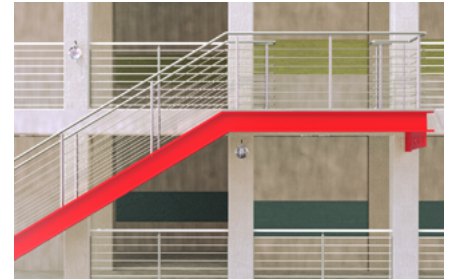
⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Injection mortar FIS V Plus

The powerful universal mortar for concrete and masonry



Rescue ladders



Steel constructions

Applications

- Steelwork constructions
- Timber constructions
- Guard rails
- Façades
- Staircases
- Steel brackets
- Machines
- Masts
- Awnings
- Canopies
- Gates
- Consoles
- Pipelines
- Gratings
- Satellite antennas

Advantages

- The FIS V Plus injection mortar has numerous system approvals, such as in cracked and non-cracked concrete, masonry and for special applications.
- The ETA assessment for a service life of 100 years offers permanent safety for all applications.
- The approved use in water-filled drill holes enables a wide range of applications, even under harsh environmental conditions.
- FIS VW Plus High Speed has a significantly shorter curing time than FISV Plus, thus also ensuring swift work progress even at low temperatures.
- Due to the possible installation temperature of -10° to 40°C the universal mortar can be applied all year long.
- FIS VS Plus Low Speed with extended gelling time prevents premature curing of the mortar at higher temperatures and is ideally suited to large drill hole depths.
- The extensive range of accessories is ideally suited to the FIS V Plus injection mortar family, increases the great flexibility of the system and thus allows for a broad range of applications.

Certificates



ETA-20/0729, in masonry
ETA-20/0603, in concrete
ETA-20/0728, for post-installed rebar connections



Building materials

Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked and non-cracked
- Hollow blocks made from lightweight concrete
- Hollow blocks made from concrete
- Vertically perforated brick
- Perforated sand-lime brick
- Solid sand-lime brick
- Aerated concrete
- Solid brick

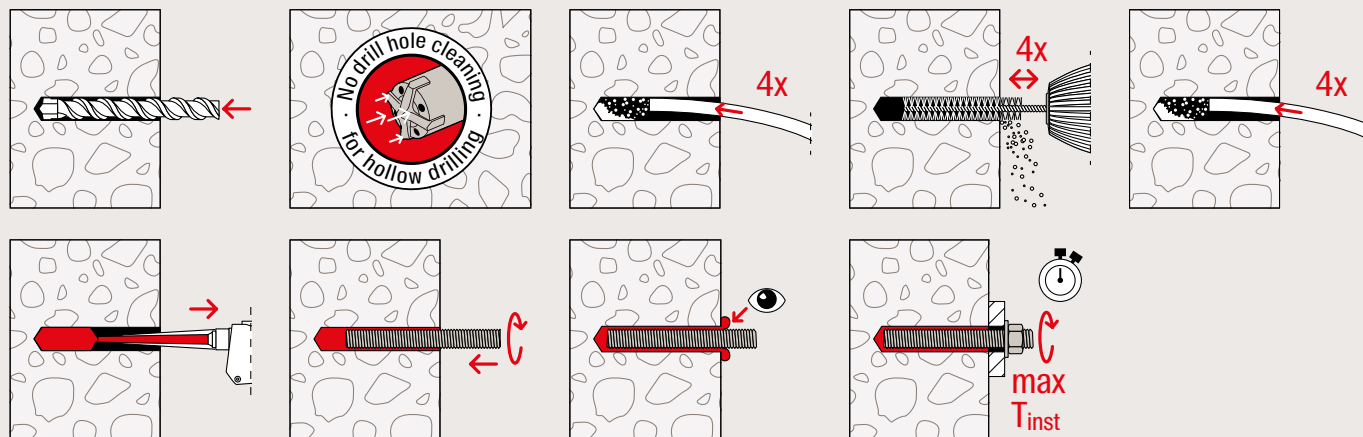
Approved for:

- Rebar connections
- Remedial wall tie VBS 8
- Weather facing reconstruction system FWS II
- Stand-off installation TherMax

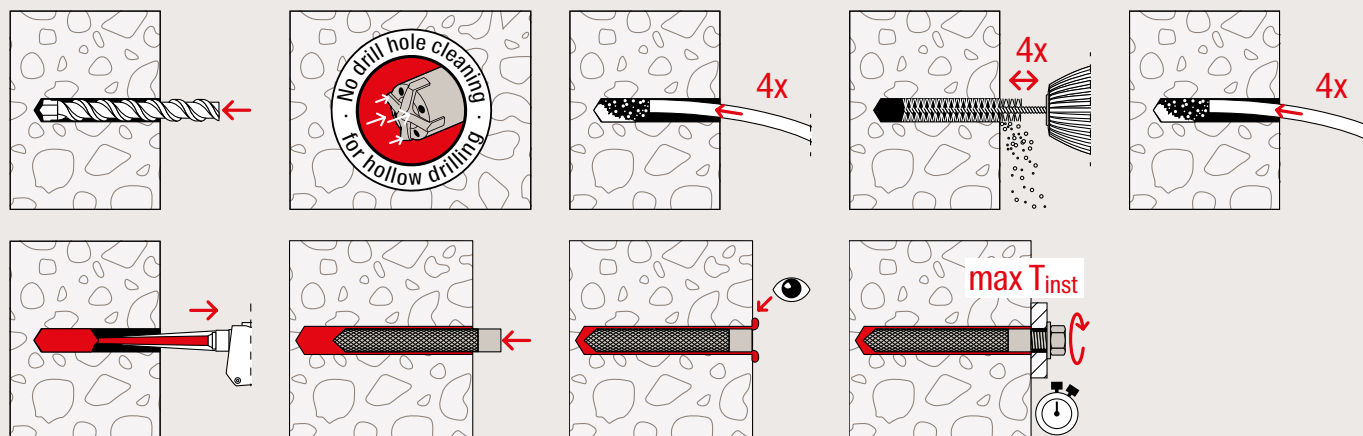
Functioning

- FIS V Plus is a 2-component injection mortar based on a vinyl ester hybrid concept.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The mortar is extruded bubble free from the drill hole base.
- The mortar bonds the entire surface of the anchor with the drill hole wall and seals the drill hole.
- The injection cartridges are quick and easy to use with the fischer dispensers.
- Partially used cartridges can be reused by changing the static mixer.

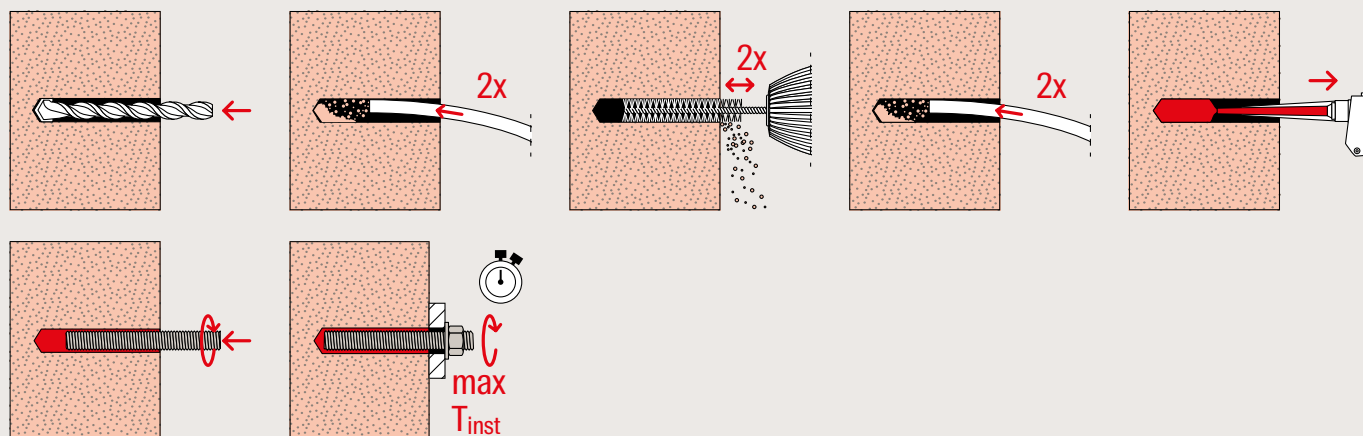
Installation in concrete with FIS V Plus and FIS A / RG M



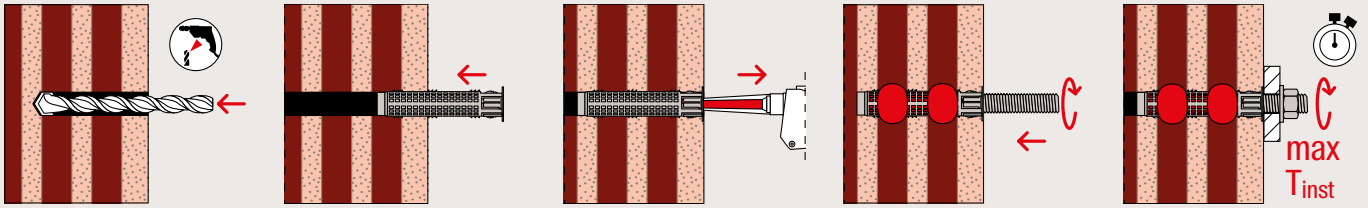
Installation in concrete with FIS V Plus and RG M I



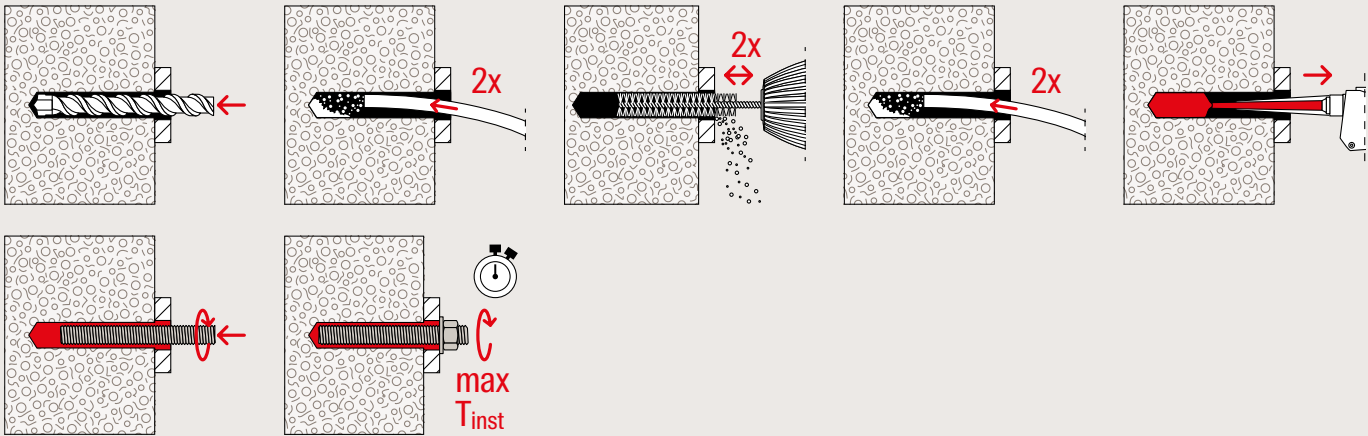
Installation in solid brick with FIS V Plus and FIS A



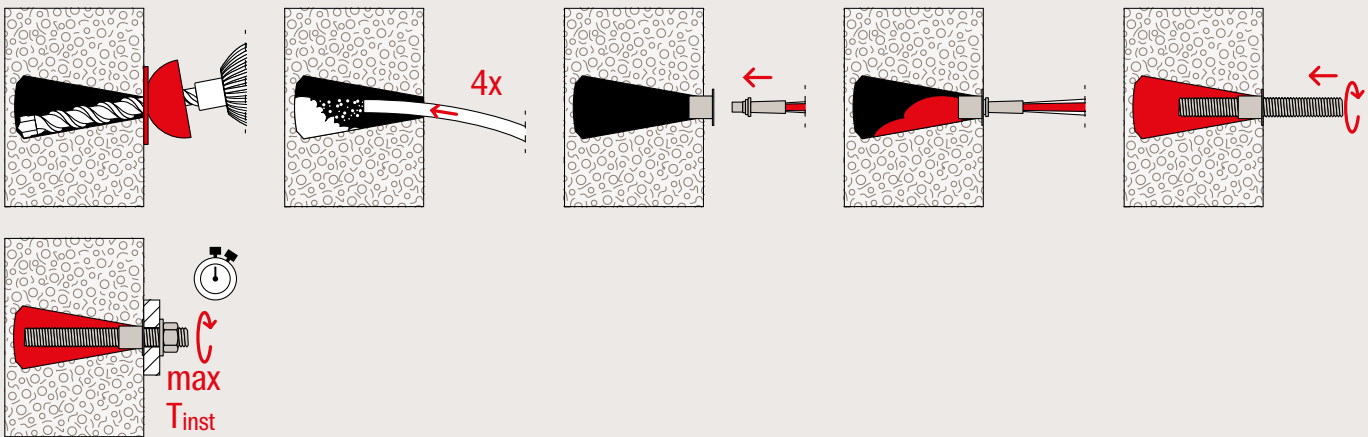
Installation in hollow blocks with FIS V Plus and FIS HK + FIS A



Installation in aerated concrete with FIS V Plus and FIS A / RG M



Installation in undercut drill hole in aerated concrete with FIS V Plus and FIS A / RG M



Technical data

Injection mortar FIS V Plus 300 T



FIS V Plus 300 T

FIS MR Plus

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 300 T	563281	●	●	●	DE	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 300 T	563282	●	●	●	DE, EN, IT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 300 T	563292	●	●	●	EN, ES, PT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 300 T	569074	●	●	●	DA, FI, NO, SV	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS V Plus 300 T	569254	●	●	●	AR, EN, FR	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 300 T	563279	●	●	●	DE, FR, NL	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS VS Plus 300 T	563278	●	●	●	ES, PT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS VS Plus 300 T	563290	●	●	●	EL, HU, PL, RO	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS VS Plus 300 T	563291	●	●	●	FR	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS VS Plus 300 T	563280	●	●	●	EN, ES, PT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 300 T	563286	●	●	●	DA, FI, NO, SV	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus with transparent clip	1
FIS VW Plus 300 T	563287	●	●	●	CS, HU, PL, RU	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 300 T	563293	●	●	●	DE, EN, HU, IT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS MR Plus	545853	–	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10

Technical data

Injection mortar FIS V Plus



FIS V Plus 360 S

FIS MR Plus

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 360 S	558744	●	●	●	EN	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558745	●	●	●	DE	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558746	●	●	●	EN, ES, PT	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558747	●	●	●	AR, EN, ZH	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558753	●	●	●	IT, PL, RO	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558752	●	●	●	DE, FR, NL	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558754	●	●	●	AR, EL, TR	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558755	●	●	●	DA, FI, NO, SV	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558758	●	●	●	EN, ES, PT (Americas)	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558760	●	●	●	KK, RU, UK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558762	●	●	●	CS, HU, SK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	560635	●	●	●	AR, EN, FR	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 360 S	561055	●	●	●	EN, PL, UK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS MR Plus	545853	–	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10

Technical data

Injection mortar FIS VS Plus



FIS VS Plus 360 S

FIS MR Plus

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS VS Plus 360 S	558750	●	●	●	EN, ES, PT	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VS Plus 360 S	558749	●	●	●	JA, KO, ZH	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VS Plus 360 S	561057	●	●	●	EN, PL, UK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS MR Plus	545853	–	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10

Technical data

Injection mortar FIS VW Plus



FIS VW Plus 360 S

FIS MR Plus

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS VW Plus 360 S	569072	●	●	●	DA, FI, NO, SV	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	558759	●	●	●	DE	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	558764	●	●	●	EN, HU	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	558765	●	●	●	DE, FR, NL	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	558768	●	●	●	CS, HU, SK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	558767	●	●	●	KK, RU, UK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 360 S	562602	●	●	●	EN, PL, UK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS MR Plus	545853	–	–	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10

Technical data

Injection mortar FIS V Plus HWK K



FIS V Plus 360 S HWK K

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 300 T HWK small	563283	●	●	●	DE, FR, NL	150	10 x cartridge 300 ml, 20 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK small	558770	●	●	●	DE	180	10 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK small	558769	●	●	●	DE, FR, NL	180	10 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK small	558771	●	●	●	CS, HU, SK	180	10 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1

Technical data

Injection mortar FIS V Plus HWK G



FIS V Plus 360 S HWK G

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 300 T HWK big	563294	●	●	●	DE, FR, NL	150	20 x cartridge 300 ml, 40 x FIS MR Plus	1
FIS V Plus 360 S HWK big	558748	●	●	●	AR, EN, ZH	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK big	558756	●	●	●	DE	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK big	558757	●	●	●	DE, FR, NL	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1
FIS V Plus 360 S HWK big	560637	●	●	●	AR, EN, FR	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1

Technical data

Injection mortar FIS VW Plus HWK G

FIS VW Plus 360 S (DE)
HWK G

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS VW Plus 360 S HWK big	558766	●	●	●	DE	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1

Technical data

Injection mortar FIS V Plus



FIS V Plus 360 S

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 360 S	558743	●	●	●	EN	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	20
FIS V Plus 360 S	558751	●	●	●	AR, EN, ZH	180	20 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558763	●	●	●	DE, FR, NL	180	20 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS V Plus 360 S	558772	●	●	●	KK, RU, UK	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1
FIS V Plus 360 S	560636	●	●	●	AR, EN, FR	180	20 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS VS Plus 360 S	562601	●	●	●	IT, PL, RO	180	20 x cartridge 360 ml, 20 x static mixer FIS MR Plus	1
FIS VS Plus 360 S	562603	●	●	●	EN, ES, PT	180	20 x cartridge 360 ml, 40 x static mixer FIS MR Plus	1

Technical data

FIS V Plus 360 S HWK big + FIS DM S Pro



FIS V Plus 360 S HWK big +
FIS DM S Pro

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 360 S Set	558773	●	●	●	IT, PL, RO	180	12 x cartridge 360 ml, 24 x static mixer FIS MR Plus, 1 x dispenser FIS DM S Pro	1
FIS V Plus 360 S Set	558775	●	●	●	EN, ES, PT	180	12 x cartridge 360 ml, 24 x static mixer FIS MR Plus, 1 x dispenser FIS DM S Pro	1
FIS V Plus 360 S Set	560032	●	●	●	DE, FR, NL	180	12 x cartridge 360 ml, 24 x static mixer FIS MR Plus, 1 x dispenser FIS DM S Pro	1
FIS V Plus 360 S Set	560033	●	●	●	CS, HU, SK	180	12 x cartridge 360 ml, 24 x static mixer FIS MR Plus, 1 x dispenser FIS DM S Pro	1

Technical data

Injection mortar FIS V Plus 380 + 410



FIS VW Plus 380 C

FIS V Plus 410 C

FIS V Plus 410 C in bucket

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS VW Plus 380 C	558785	●	●	●	CS, PL, SK	190	1 x cartridge 380 ml, 2 x static mixer FIS MR Plus	1
FIS VW Plus 410 C	569342	●	●	●	DE, FR, IT	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 410 C	558780	●	●	●	DE, EN, IT	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 410 C	558784	●	●	●	EN, ES, PT (Americas)	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS V Plus 410 C in bucket	558782	●	●	●	DE, EN, IT	200	16 x cartridge 410 ml, 32 x static mixer FIS MR Plus	1
FIS V Plus 410 C in bucket	558783	●	●	●	EN, RU, TR	200	16 x cartridge 410 ml, 32 x static mixer FIS MR Plus	1
FIS V Plus 410 C HWK big	558781	●	●	●	DE, EN, IT	200	20 x cartridge 410 ml, 40 x static mixer FIS MR Plus	1

Technical data

Injection mortar FIS V Plus 825 S



FIS V Plus 825 S

Item	Item no.	Approval			Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
		ETA	DIBt	ICC				
FIS V Plus 825 S	567511	●	●	●	DE, EN, FR, IT, NL	415	1 x cartridge 825 ml, 2 x static mixer FIS JMR 825	1
FIS V Plus 825 S	567512	●	●	●	EN, ES, FR, PT, TR	415	1 x cartridge 825 ml, 2 x static mixer FIS JMR 825	1
FIS V Plus 825 S	567513	●	●	●	CS, EN, PL, RU, SK	415	1 x cartridge 825 ml, 2 x static mixer FIS JMR 825	1

Technical data

Injection mortar FIS V Plus



2

Thermosafe case FIS V Plus

Item	Item no.	Approval			Contents	Sales unit [pcs]
		ETA	DIBt	ICC		
FIS V Plus 360 S Thermosafe	558950	●	●	●	6 x cartridge 360 ml, 12 x static mixer FIS MR Plus, 1 x brush set, 1 x blow-out pump, 1 x dispenser FIS DM S Pro	1

Curing times

FIS VW Plus High Speed FIS V Plus FIS VS Plus Low Speed									
Temperature at anchoring base [°C]	Maximum processing time t_{work}			Minimum curing time $t_{cure}^{1)}$					
	FIS VW Plus High Speed [min.]	FIS V Plus [min.]	FIS VS Plus Low Speed [min.]	FIS VW Plus High Speed [hrs.]	[min.]	FIS V Plus [hrs.]	[min.]	FIS VS Plus Low Speed [hrs.]	[min.]
-10 – -5 ²⁾	–	–	–	12	–	–	–	–	–
> -5 – 0 ²⁾	5	–	–	3	–	24	–	–	–
> 0 – +5 ²⁾	5	13	–	3	–	3	–	6	–
> +5 – +10	3	9	20	–	50	–	90	3	–
> +10 – +20	1	5	10	–	50	–	60	2	–
> +20 – +30	–	4	6	–	–	–	45	–	60
> +30 – +40	–	2	4	–	–	–	35	–	30

1) In wet concrete or water filled holes the curing times must be doubled.

2) Minimal cartridge temperature +5 °C

Loads

Injection system FIS V Plus with internal threaded anchor RG M I

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-20/0603 has to be considered.

Type	Screw Material ³⁾	Effective anchor- age depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installa- tion torque $T_{inst, max}$ [Nm]	Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
RG M 8 I	5.8	90	120	10	9.0	5.3	55	55
	8.8	90	120	10	13.8	8.3	55	55
	R-70	90	120	10	9.9	5.9	55	55
RG M 10 I	5.8	90	130	20	13.8	8.3	65	65
	8.8	90	130	20	20.0	13.3	65	65
	R-70	90	130	20	15.7	9.3	65	65
RG M 12 I	5.8	125	170	40	20.5	12.1	75	75
	8.8	125	170	40	32.0	19.3	75	75
	R-70	125	170	40	22.5	13.5	75	75
RG M 16 I	5.8	160	210	80	37.6	22.4	95	95
	8.8	160	210	80	47.4	30.9	95	95
	R-70	160	210	80	42.0	25.1	95	95
RG M 20 I	5.8	200	260	120	58.6	35.4	125	125
	8.8	200	260	120	66.3	51.4	125	125
	R-70	200	260	120	65.7	39.4	125	125

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_f = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Loads

Injection system FIS V Plus with threaded rod FIS A resp. RG M

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-20/0603 has to be considered.

Type	Material / surface ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation torque $T_{inst, max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
FIS A M 8	5.8	60	100	10	3.9	6.3	40	40	9.0	6.3	40	40
	5.8	80	110	10	5.3	6.3	40	40	9.0	6.3	40	40
	5.8	160	190	10	9.0	6.3	40	40	9.0	6.3	40	40
	R-70	60	100	10	3.9	6.0	40	40	9.9	6.0	40	40
	R-70	80	110	10	5.3	6.0	40	40	9.9	6.0	40	40
	R-70	160	190	10	9.9	6.0	40	40	9.9	6.0	40	40
FIS A M 10	5.8	60	100	20	5.4	9.7	45	45	10.9	9.7	45	45
	5.8	90	120	20	8.1	9.7	45	45	13.8	9.7	45	45
	5.8	200	230	20	13.8	9.7	45	45	13.8	9.7	45	45
	R-70	60	100	20	5.4	9.2	45	45	10.9	9.2	45	45
	R-70	90	120	20	8.1	9.2	45	45	15.7	9.2	45	45
	R-70	200	230	20	15.7	9.2	45	45	15.7	9.2	45	45
FIS A M 12	5.8	70	100	40	8.2	14.3	55	45	13.7	14.3	55	45
	5.8	110	140	40	12.8	14.3	55	45	20.5	14.3	55	45
	5.8	240	270	40	20.5	14.3	55	45	20.5	14.3	55	45
	R-70	70	100	40	8.2	13.7	55	45	13.7	13.7	55	45
	R-70	110	140	40	12.8	13.7	55	45	22.5	13.7	55	45
	R-70	240	270	40	22.5	13.7	55	45	22.5	13.7	55	45
FIS A M 16	5.8	80	120	60	11.5	23.0	65	50	16.8	26.9	65	50
	5.8	125	170	60	18.0	26.9	65	50	32.7	26.9	65	50
	5.8	320	360	60	37.6	26.9	65	50	37.6	26.9	65	50
	R-70	80	120	60	11.5	23.0	65	50	16.8	25.2	65	50
	R-70	125	170	60	18.0	25.2	65	50	32.7	25.2	65	50
	R-70	320	360	60	42.0	25.2	65	50	42.0	25.2	65	50
FIS A M 20	5.8	90	140	120	14.0	28.0	85	55	20.0	40.0	85	55
	5.8	170	220	120	28.0	42.3	85	55	51.9	42.3	85	55
	5.8	400	450	120	58.6	42.3	85	55	58.6	42.3	85	55
	R-70	90	140	120	14.0	28.0	85	55	20.0	39.4	85	55
	R-70	170	220	120	28.0	39.4	85	55	51.9	39.4	85	55
	R-70	400	450	120	65.7	39.4	85	55	65.7	39.4	85	55
FIS A M 24	5.8	96	160	150	15.4	30.8	105	60	22.0	44.1	105	60
	5.8	210	270	150	37.7	60.6	105	60	71.3	60.6	105	60
	5.8	480	540	150	84.3	60.6	105	60	84.3	60.6	105	60
	R-70	96	160	150	15.4	30.8	105	60	22.0	44.1	105	60
	R-70	210	270	150	37.7	56.8	105	60	71.3	56.8	105	60
	R-70	480	540	150	86.2	56.8	105	60	94.3	56.8	105	60
FIS A M 30	5.8	120	190	300	21.6	43.1	140	80	30.8	61.6	140	80
	5.8	280	350	300	56.5	96.0	140	80	109.8	96.0	140	80
	5.8	600	670	300	121.2	96.0	140	80	133.8	96.0	140	80
	R-70	120	190	300	21.6	43.1	140	80	30.8	61.6	140	80
	R-70	280	350	300	56.5	90.2	140	80	109.8	90.2	140	80
	R-70	600	670	300	121.2	90.2	140	80	150.1	90.2	140	80

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Loads

Injection system FIS V Plus with threaded rod FIS A in solid and perforated masonry

Permissible loads^{1,2)} for a single anchor in masonry for pre-positioned installation.

For the design the complete current assessment ETA-20/0729 has to be considered.

Type	Compressive brick strength f_b [N/mm ²]	Brick raw density ρ [kg/dm ³]	Minimum brick dimensions ³⁾ (L x W x H) [mm]	Effective anchor- age depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation torque $T_{inst,max}$ [Nm]	Permissible tensile load ⁴⁾ N_{perm} [kN]	Permissible shear load ⁴⁾ V_{perm} [kN]	Minimum spacing ⁵⁾ $s_{min} \parallel / s_{min \perp}$ [mm]	Characteristic resp. minimum edge distance ⁶⁾ $c_{cr} = c_{min}$ [mm]
Solid brick Mz, NF, acc. to EN 771-1										
M6	≥ 12	≥ 1.8	240 x 115 x 71	≥ 50	115	4	1.14	0.71	240 / 75	100
M8	≥ 12	≥ 1.8	240 x 115 x 71	≥ 50	115	10	1.14	0.71	240 / 75	100
M10	≥ 12	≥ 1.8	240 x 115 x 71	80	115	10	1.42	1.14	240 / 75	100
M10	≥ 12	≥ 1.8	240 x 115 x 71	200	240	10	3.43	2.43	240 / 75	100
M12	≥ 12	≥ 1.8	240 x 115 x 71	80	115	10	1.57	1.14	240 / 75	100
M12	≥ 12	≥ 1.8	240 x 115 x 71	200	240	10	2.29	3.28	240 / 75	100
Solid sand-lime brick KS, acc. to EN 771-2										
M6	≥ 12	≥ 1.8	240 x 115 x 71	50	115	3	1.14	0.42	80 / 150	60
M6	≥ 12	≥ 1.8	240 x 115 x 71	100	115	3	1.57	0.89	80 / 300	60
M8	≥ 12	≥ 1.8	240 x 115 x 71	50	115	5	1.14	0.42	80 / 150	60
M8	≥ 12	≥ 1.8	240 x 115 x 71	100	115	5	2.29	0.89	80 / 300	60
M10	≥ 12	≥ 1.8	240 x 115 x 71	100	115	15	1.57	0.57	80 / 300	60
M10	≥ 12	≥ 1.8	240 x 115 x 71	200	240	15	3.42	0.57	80 / 600	60
M12	≥ 12	≥ 1.8	240 x 115 x 71	100	115	15	1.28	0.57	80 / 300	60
M12	≥ 12	≥ 1.8	240 x 115 x 71	200	240	15	3.42	0.57	80 / 600	60
M16	≥ 12	≥ 1.8	240 x 115 x 71	100	115	25	1.57	0.57	80 / 300	60
M16	≥ 12	≥ 1.8	240 x 115 x 71	200	240	25	3.42	0.57	80 / 600	60
Vertically perforated brick Hlz, acc. to EN 771-3³⁾										
M6 / M8 with FIS H 12 x 85 K	≥ 12	≥ 1.0	370 x 240 x 237	85	240	2	0.34	0.43	100 / 100	100
M8 / M10 with FIS H 16 x 130 K	≥ 12	≥ 1.0	370 x 240 x 237	130	240	2	0.86	0.57	100 / 100	100
M12 / M16 with FIS H 20 x 130 K	≥ 12	≥ 1.0	370 x 240 x 237	130	240	2	1.14	0.57	100 / 100	100
Perforated sand-lime brick KSL, acc. to EN 771-2³⁾										
M6 / M8 with FIS H 12 x 85 K	≥ 12	≥ 1.4	240 x 175 x 113	85	175	2	0.71	0.71	100 / 115	60
M8 / M10 with FIS H 16 x 130 K	≥ 12	≥ 1.4	240 x 175 x 113	130	175	2	1.00	1.29	100 / 115	80
M12 / M16 with FIS H 20 x 85 K	≥ 12	≥ 1.4	240 x 175 x 113	85	175	2	1.00	1.14	100 / 115	80
Lightweight concrete hollow block Hbl, acc. EN 771-3³⁾										
M6 / M8 with FIS H 12 x 85 K	≥ 2	≥ 1.0	362 x 240 x 240	85	240	2	0.43	0.26	100 / 240	60
M6 / M8 with FIS H 12 x 85 K	≥ 4	≥ 1.0	362 x 240 x 240	85	240	2	0.86	0.57	100 / 240	60
M8 / M10 with FIS H 16 x 85 K	≥ 2	≥ 1.0	362 x 240 x 240	85	240	2	0.43	0.26	100 / 240	60
M8 / M10 with FIS H 16 x 85 K	≥ 4	≥ 1.0	362 x 240 x 240	85	240	2	0.86	0.57	100 / 240	60
M12 / M16 with FIS H 20 x 200 K	≥ 2	≥ 1.0	362 x 240 x 240	200	240	2	0.71	0.26	100 / 240	60
M12 / M16 with FIS H 20 x 200 K	≥ 4	≥ 1.0	362 x 240 x 240	200	240	2	1.57	0.57	100 / 240	60
Aerated concrete acc. to EN 771-4⁶⁾										
M8	≥ 2	≥ 0.35	-	100	130	1	0.54	0.43	250 / 250	100
M8	≥ 4	≥ 0.50	-	200	230	8	1.07	0.71	80 / 80	100
M10	≥ 2	≥ 0.35	-	100	130	2	0.54	0.43	250 / 250	100
M10	≥ 4	≥ 0.50	-	200	230	12	1.79	0.71	80 / 80	100
M12	≥ 2	≥ 0.35	-	100	130	2	0.71	0.54	250 / 250	100
M12	≥ 4	≥ 0.50	-	200	230	16	1.79	0.71	80 / 80	100
M16	≥ 2	≥ 0.35	-	100	130	2	0.71	0.43	250 / 250	100
M16	≥ 4	≥ 0.50	-	200	230	20	1.79	0.71	80 / 80	100

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. Load values are valid for zinc-plated steel, stainless steel R and highly corrosion-resistant steel HCR. In perforated bricks and hollow blocks threaded rod FIS A in combination with anchor sleeve FIS H K.

²⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to 50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

³⁾ More information about, e.g. hole patterns, assortment of anchor sleeves FIS H K see assessment.

⁴⁾ In the case of combinations of tensile and shear loads, bending moments and reduced edge and axial spacings (anchor groups), the design must be carried out in accordance with the provisions of the complete assessment.

⁵⁾ Minimum feasible spacing resp. edge distance. Details as well as to the distances to joints see assessment.

⁶⁾ Cylindrical drill hole.

Injection mortar FIS VL

The solid injection mortar for standard applications in cracked concrete and masonry

2



High-bay warehouses

Applications

- Steelwork constructions
- Timber constructions
- Guard rails
- Façades
- Staircases
- Steel brackets
- Machines
- Masts
- Awnings
- Canopies
- Gates
- Consoles
- Pipelines
- Gratings
- Satellite antennas

Advantages

- The FIS VL is approved for use in cracked concrete and masonry, and achieves a high load-bearing capacity in these conditions.
- The temperature resistance of the FIS VL injection mortar of -40 °C to +120 °C allows for a solid load level even when

subjected to high temperature demands, thus providing great flexibility.

- FIS VL HIGH SPEED has a significantly shorter curing time than FIS VL, thus also ensuring swift work progress even at low temperatures.

Certificates



ETA-10/0352, in concrete
ETA-15/0263, in masonry
ETA-15/0539, for post-in-
stalled rebar connections

Building materials

Approved for anchorings in:

- Concrete C20/25 to C50/60, cracked
- Hollow blocks made from lightweight concrete
- Vertically perforated brick
- Perforated sand-lime brick
- Solid sand-lime brick
- Solid brick
- Rebar connections
- Aerated concrete

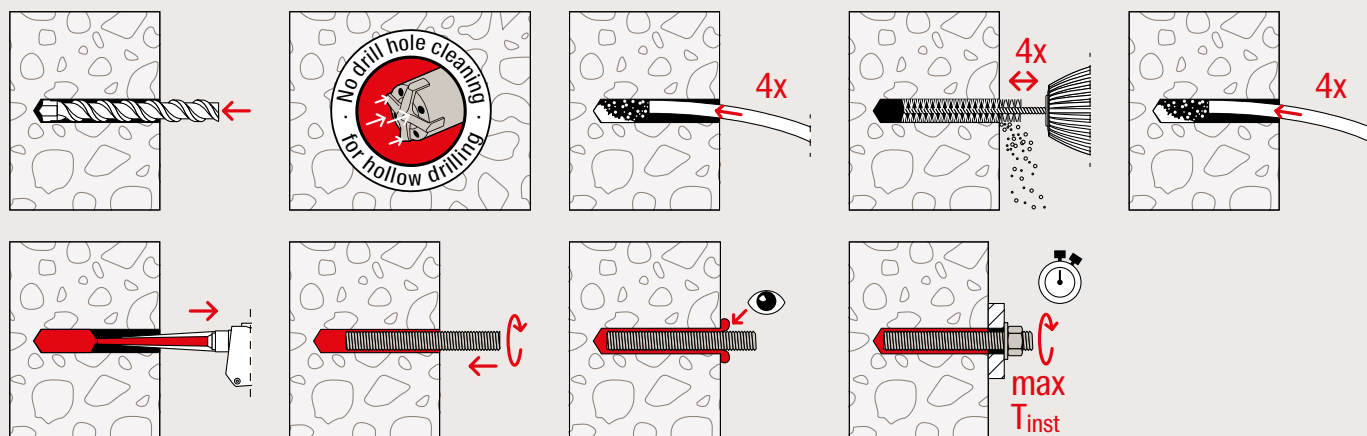
Also suitable for:

- Concrete C12/15
- Hollow blocks made from concrete

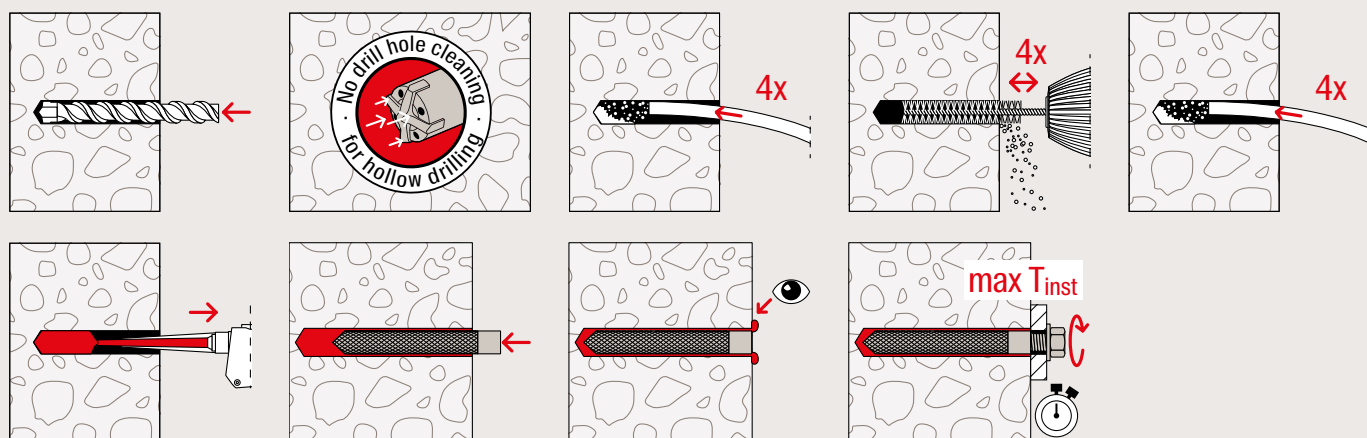
Functioning

- The FIS VL is a 2-component injection mortar based on vinyl ester.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion through the static mixer.
- The mortar is extruded bubble free from the drill hole base.
- The mortar bonds the entire surface of the anchor with the drill hole wall and seals the drill hole.
- The injection mortar FIS VL 150 C and 300 T can be applied without a special tool using a standard dispenser.
- Partially used cartridges can be reused by changing the static mixer.

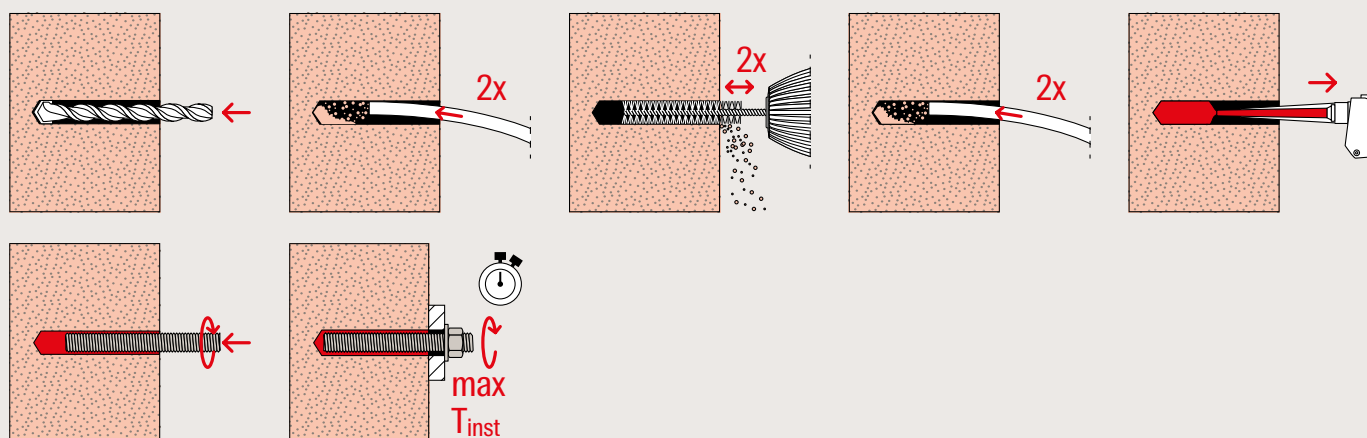
Installation in concrete with FIS VL and FIS A / RG M



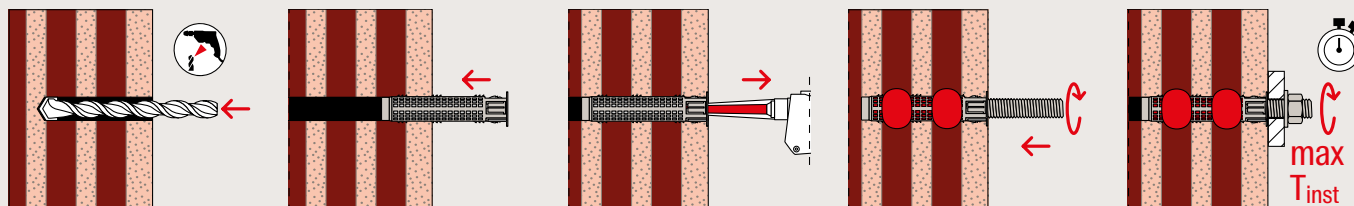
Installation in concrete with FIS VL and RG M I



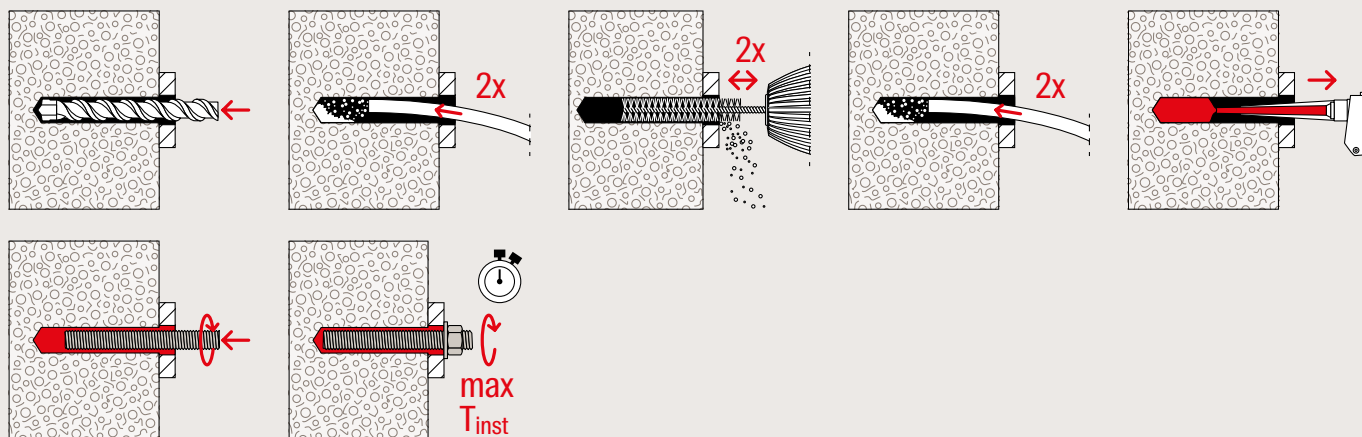
Installation in solid brick with FIS VL and FIS A / RG M







Installation in hollow blocks with FIS VL and FIS HK + FIS A / RG M



Installation in aerated concrete with FIS VL and FIS A / RG M



Technical data

Injection mortar FIS VL						
   						
FIS VL 300 T	FIS VL 360 S	FIS VL 410 C	FIS MR Plus			
Item	Item no.	Ap- pro- val ETA	Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
FIS VL 300 T	519557	● DE	DE	150	1 cartridge 300 ml, 2 x Static mixer FIS MR Plus	1
FIS VL 300 T electro	519558	● DE	DE	150	1 cartridge 300 ml, 2 x Static mixer FIS MR Plus	1
FIS VL 300 T	539461	● EN, ES, PT	EN, ES, PT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VL 300 T	537149	● EN, ES, PT	EN, ES, PT	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VL 300 T with clip	538583	● CS, HU, SK	CS, HU, SK	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VL 300 T	540983	● ET, LT, LV, PL	ET, LT, LV, PL	150	1 x cartridge 300 ml, 2 x static mixer FIS MR Plus	1
FIS VL 300 T in bucket	539462	● EN, ES, PT	EN, ES, PT	150	20 x cartridge 300 ml, 40 x FIS MR Plus	1
FIS VL 300 T HIGH SPEED	571912	● DE	DE	150	1 cartridge 300 ml, 2 x Static mixer FIS MR Plus	1
FIS VL 300 T HIGH SPEED with clip	538585	● CS, SK	CS, SK	150	1 x cartridge 380 ml, 2 x static mixer FIS MR Plus	1
FIS VL 360 S	519556	● DE	DE	180	1 cartridge 360 ml, 2 x Static mixer FIS MR Plus	1
FIS VL 360 S	558795	● AR, EL, EN	AR, EL, EN	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS VL 410 C	539463	● EL, EN, ES, PT	EL, EN, ES, PT	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS VL 410 C	538584	● CS, SK	CS, SK	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS VL 410 C HIGH SPEED	538586	● CS, SK	CS, SK	200	1 x cartridge 410 ml, 1 x FIS MR Plus	1
FIS VL 410 C	540986	● EN, PL, UK	EN, PL, UK	200	1 x cartridge 410 ml, 2 x static mixer FIS MR Plus	1
FIS VL 410 C in bucket	538549	● EN, TR	EN, TR	200	16 x cartridge 410 ml, 32 x static mixer FIS MR Plus	1
FIS VL 410 C in bucket	539464	● EL, EN, ES, PT	EL, EN, ES, PT	200	16 x cartridge 410 ml, 32 x static mixer FIS MR Plus	1
FIS VL 300 T HWK big	538589	● CS, SK	CS, SK	150	20 x cartridge 300 ml, 40 x FIS MR Plus	1
FIS VL 410 C HWK big	538590	● CS, SK	CS, SK	200	16 x cartridge 410 ml, 32 x static mixer FIS MR Plus	1
FIS MR Plus	545853	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10

Curing times

FIS VL High Speed FIS VL						
Temperature at anchoring base [°C]	Maximum processing time t_{work}		Minimum curing time $t_{cure}^{1)}$			
	FIS VL High Speed [min.]	FIS VL [min.]	FIS VL High Speed [hrs.]	[min.]	FIS VL [hrs.]	[min.]
-10 – -5 ²⁾	–	–	12	–	–	–
> -5 – 0 ²⁾	5	–	3	–	24	–
> 0 – +5 ²⁾	5	13	3	–	3	–
> +5 – +10	3	9	–	50	–	90
> +10 – +20	1	5	–	30	–	60
> +20 – +30	–	4	–	–	–	45
> +30 – +40	–	2	–	–	–	35

1) In wet concrete or water filled holes the curing times must be doubled.

2) Minimal cartridge temperature +5 °C

Loads

Injection system FIS VL with threaded rod FIS A in solid and perforated masonry

Permissible loads¹⁾²⁾ for a single anchor in masonry for pre-positioned installation.

For the design the complete current assessment ETA-15/0263 has to be considered.

	Compressive brick strength	Brick raw density	Minimum brick dimensions ³⁾	Effective anchor depth	Minimum member thickness	Maximum installation torque	Permissible tensile load ⁴⁾	Permissible shear load ⁴⁾	Minimum spacing ⁵⁾	Characteristic resp. minimum edge distance ⁵⁾
Type	f_b [N/mm ²]	ρ [kg/dm ³]	(L x B x H) [mm]	h_{ef} [mm]	h_{min} [mm]	$T_{inst,max}$ [Nm]	N_{perm} [kN]	V_{perm} [kN]	$s_{min} \parallel / s_{min \perp}$ [mm]	$c_{cr} = c_{min}$ [mm]
Solid sand-lime brick KS, acc. to EN 771-2										
M8	≥ 12	≥ 1.8	240 x 115 x 71	≥ 50	115	5	1.14	0.43	80 / 150	60
M8	≥ 12	≥ 1.8	240 x 115 x 71	100	240	5	2.29	0.86	80 / 300	60
M10	≥ 12	≥ 1.8	240 x 115 x 71	100	240	15	1.57	0.57	80 / 300	60
M10	≥ 12	≥ 1.8	240 x 115 x 71	200	240	15	3.43	0.57	80 / 600	60
M12	≥ 12	≥ 1.8	240 x 115 x 71	100	240	15	1.29	0.57	80 / 300	60
M12	≥ 12	≥ 1.8	240 x 115 x 71	200	240	15	3.43	0.57	80 / 300	60
Perforated sand-lime brick KSL, acc. to EN 771-2³⁾										
M8 with FIS H 12 x 85 K	≥ 12	≥ 1.4	240 x 175 x 113	85	175	2	0.71	0.71	100 / 115	60
M8 / M10 with FIS H 16 x 85 K	≥ 12	≥ 1.4	240 x 175 x 113	85	175	2	0.86	1.29	100 / 115	80
M12 with FIS H 20 x 85 K	≥ 12	≥ 1.4	240 x 175 x 113	85	175	2	0.86	1.29	100 / 115	80
M8 / M10 with FIS H 16 x 130 K	≥ 12	≥ 1.4	240 x 175 x 113	130	175	2	0.86	1.29	100 / 115	80
Vertically perforated brick Hlz, acc. to EN 771-1³⁾										
M8 with FIS H 12 x 85 K	≥ 10	≥ 0.9	240 x 175 x 113	85	175	2	1.14	1.14	240 / 115	100
M8 / M10 with FIS H 16 x 85 K	≥ 10	≥ 0.9	240 x 175 x 113	85	175	2	1.00	1.57	240 / 115	100
M12 with FIS H 20 x 85 K	≥ 10	≥ 0.9	240 x 175 x 113	85	175	2	1.43	1.71	240 / 115	100
M8 / M10 with FIS H 16 x 130 K	≥ 10	≥ 0.9	240 x 175 x 113	130	175	2	1.43	1.57	240 / 115	100
M12 with FIS H 20 x 130 K	≥ 10	≥ 0.9	240 x 175 x 113	130	175	2	1.43	1.71	240 / 115	100
Aerated concrete acc. to EN 771-4⁶⁾										
M8	≥ 2	≥ 0.35	–	≥ 100	130	1	0.54	0.43	250 / 250	100
M8	≥ 4	≥ 0.50	–	200	230	8	1.07	0.71	80 / 80	100
M10	≥ 2	≥ 0.35	–	≥ 100	130	2	0.54	0.43	250 / 250	100
M10	≥ 4	≥ 0.50	–	200	230	12	1.79	0.71	80 / 80	100
M12	≥ 2	≥ 0.35	–	≥ 100	130	2	0.71	0.54	250 / 250	100
M12	≥ 4	≥ 0.50	–	200	230	16	1.79	0.71	80 / 80	100

¹⁾ The required partial safety factors for material resistance as well as a partial safety factor for load actions of $\gamma_f = 1.4$ are considered. Load values are valid for zinc-plated steel, stainless steel R and highly corrosion-resistant steel HCR. In perforated bricks and hollow blocks threaded rod FIS A in combination with anchor sleeve FIS H K.

²⁾ The given loads are valid for installation and use of fixations in dry masonry - use category d/d - for temperatures in the substrate up to 50 °C (resp. short term up to 80 °C) and drill hole cleaning according to assessment. The given brick types in combination with the permissible loads are an extract of the assessment.

³⁾ More information about, e.g. hole patterns, assortment of anchor sleeves FIS H K see assessment.

⁴⁾ In the case of combinations of tensile and shear loads, bending moments and reduced edge and axial spacings (anchor groups), the design must be carried out in accordance with the provisions of the complete assessment.

⁵⁾ Minimum feasible spacing resp. edge distance. Details as well as to the distances to joints see assessment.

⁶⁾ Cylindrical drill hole.

Loads

Injection system FIS VL with threaded rod FIS A resp. RG M

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-10/0352 has to be considered.

Type	Material / surface ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum installation torque $T_{inst, max}$ [Nm]	Cracked concrete				Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads				Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]	$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
FIS A M 8	5.8	60	100	10	-	-	-	-	6.6	6.3	40	40
	5.8	80	110	10	-	-	-	-	8.8	6.3	40	40
	5.8	160	190	10	-	-	-	-	9.0	6.3	40	40
	R-70	60	100	10	-	-	-	-	6.6	6.0	40	40
	R-70	80	110	10	-	-	-	-	8.8	6.0	40	40
	R-70	160	190	10	-	-	-	-	13.8	6.0	40	40
FIS A M 10	5.8	60	100	20	4.5	9.7	45	45	8.2	9.7	45	45
	5.8	90	120	20	6.7	9.7	45	45	12.3	9.7	45	45
	5.8	200	230	20	13.8	9.7	45	45	13.8	9.7	45	45
	R-70	60	100	20	4.5	9.2	45	45	8.2	9.2	45	45
	R-70	90	120	20	6.7	9.2	45	45	12.3	9.2	45	45
	R-70	200	230	20	15.0	9.2	45	45	15.7	9.2	45	45
FIS A M 12	5.8	70	100	40	6.3	14.3	55	55	11.4	14.3	55	55
	5.8	110	140	40	9.9	14.3	55	55	18.1	14.3	55	55
	5.8	240	270	40	20.5	14.3	55	55	20.5	14.3	55	55
	R-70	70	100	40	6.3	13.7	55	55	11.4	13.7	55	55
	R-70	110	140	40	9.9	13.7	55	55	18.1	13.7	55	55
	R-70	240	270	40	21.5	13.7	55	55	22.5	13.7	55	55
FIS A M 16	5.8	80	120	60	9.6	23.0	65	65	14.0	26.9	65	65
	5.8	125	170	60	15.0	26.9	65	65	24.9	26.9	65	65
	5.8	320	360	60	37.6	26.9	65	65	37.6	26.9	65	65
	R-70	80	120	60	9.6	23.0	65	65	14.0	25.2	65	65
	R-70	125	170	60	15.0	25.2	65	65	24.9	25.2	65	65
	R-70	320	360	60	38.3	25.2	65	65	42.0	25.2	65	65
FIS A M 20	5.8	90	140	120	11.7	28.0	85	85	16.7	40.0	85	85
	5.8	170	220	120	23.3	42.3	85	85	40.3	42.3	85	85
	5.8	400	450	120	54.9	42.3	85	85	58.6	42.3	85	85
	R-70	90	140	120	11.7	28.0	85	85	16.7	39.4	85	85
	R-70	170	220	120	23.3	39.4	85	85	40.3	39.4	85	85
	R-70	400	450	120	54.9	39.4	85	85	65.7	39.4	85	85
FIS A M 24	5.8	96	160	150	-	-	-	-	18.4	44.1	105	105
	5.8	210	270	150	-	-	-	-	56.5	60.6	105	105
	5.8	480	540	150	-	-	-	-	84.3	60.6	105	105
	R-70	96	160	150	-	-	-	-	18.4	44.1	105	105
	R-70	210	270	150	-	-	-	-	56.5	56.8	105	105
	R-70	480	540	150	-	-	-	-	94.3	56.8	105	105
FIS A M 30	5.8	120	190	300	-	-	-	-	25.7	61.6	140	140
	5.8	280	350	300	-	-	-	-	89.0	96.0	140	140
	5.8	600	670	300	-	-	-	-	133.8	96.0	140	140
	R-70	120	190	300	-	-	-	-	25.7	61.6	140	140
	R-70	280	350	300	-	-	-	-	89.0	90.2	140	140
	R-70	600	670	300	-	-	-	-	150.1	90.2	140	140

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_L = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (guz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

Loads

Injection system FIS VL with internal threaded anchor RG M I

Permissible loads of a single anchor^{1) 2)} in normal concrete of strength class C20/25.
For the design the complete current assessment ETA-10/0352 has to be considered.

Type	Screw Material ³⁾	Effective anchorage depth h_{ef} [mm]	Minimum member thickness h_{min} [mm]	Maximum Installation torque $T_{inst, max}$ [Nm]	Non-cracked concrete			
					Permissible tension (N_{perm}) and shear loads (V_{perm}); minimum spacing (s_{min}) and edge distances (c_{min}) with reduced loads			
					$N_{perm}^{4)}$ [kN]	$V_{perm}^{4)}$ [kN]	$s_{min}^{4)}$ [mm]	$c_{min}^{4)}$ [mm]
RG M 8 I	5.8	90	120	10	9.0	5.3	55	55
	8.8	90	120	10	13.8	8.3	55	55
	R-70	90	120	10	9.9	5.9	55	55
RG M 10 I	5.8	90	130	20	13.8	8.3	65	65
	8.8	90	130	20	16.7	13.3	65	65
	R-70	90	130	20	15.7	9.3	65	65
RG M 12 I	5.8	125	170	40	20.5	12.1	75	75
	8.8	125	170	40	26.6	19.3	75	75
	R-70	125	170	40	22.5	13.5	75	75
RG M 16 I	5.8	160	210	80	37.6	22.4	95	95
	8.8	160	210	80	39.5	30.9	95	95
	R-70	160	210	80	39.5	25.1	95	95
RG M 20 I	5.8	200	260	120	55.2	35.4	125	125
	8.8	200	260	120	55.2	42.9	125	125
	R-70	200	260	120	55.2	39.4	125	125

¹⁾ Design according to EN 1992-4:2018 (for static resp. quasi-static loads). The partial safety factors for material resistance as regulated in the ETA as well as a partial safety factor for load actions of $\gamma_f = 1.4$ are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ and an edge distance $c \geq 1.5 \times h_{ef}$. Accurate data see ETA.

²⁾ The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 80 °C). Drill hole cleaning as per specification in the ETA. The factor Ψ_{sus} for sustained load was taken into account with 1.0.

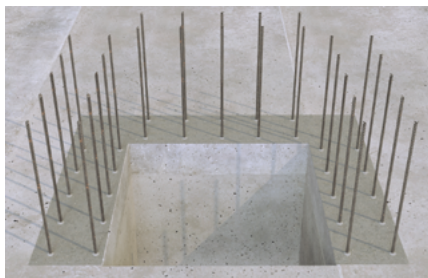
³⁾ Further steel grades, versions and technical data see ETA, e.g. for dry internal conditions, galvanised steel (gvz); for damp interiors and for outdoor use, stainless steel (R).

⁴⁾ In the case of combinations of tension and shear loads, bending moments with reduced or minimum spacing and edge distances (anchor groups), the design must be carried out in accordance with the provisions of the complete ETA and the provisions of the EN 1992-4:2018. We recommend using our anchor design software C-FIX.

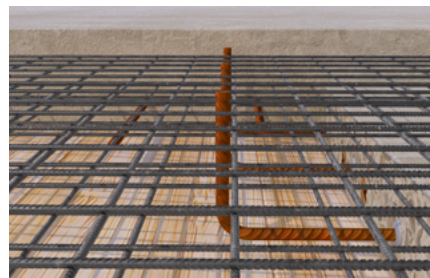
Injection mortar FIS RC II

The cost-efficient injection mortar for post-installed rebar connections

2



Post-installed rebar connections



Post-installed rebar connections

Applications

- Post-installed rebar connections

Advantages

- The European Technical Assessment (ETA) permits post-installed rebar connection with rebars from Ø 8–40 mm and embedment depths up to 2 m including seismic applications.
- The short processing and curing times ensure fast working progress.
- Processing in different substrate tem-

peratures from -10°C to +40°C allows universal use.

- The injection mortar Rebar Connect FIS RC II allows flexible application with hollow or hammer drills.
- In addition, the FIS RC II is approved for post-installed rebar connections with a service life of 100 years.

Certificates



ETA-22/0501, for use in concrete
ETA-22/0502, for post-installed rebar connections



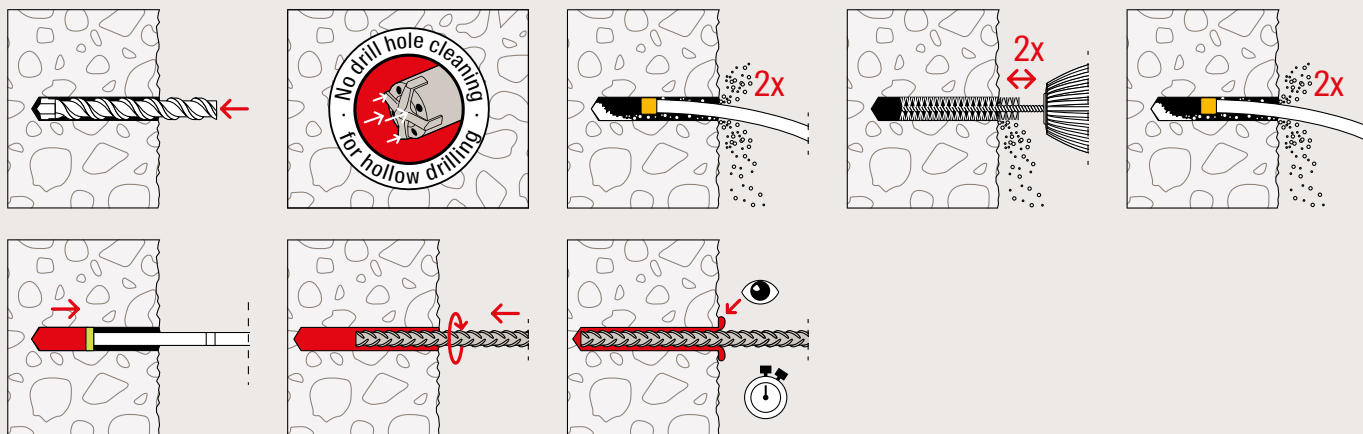
Building materials

- Concrete C12/15 to C50/60, cracked and non-cracked

Functioning

- Resin and hardener are stored in two separate chambers and are only mixed and activated in the static mixer when the injection cartridge is ejected.
- In combination with the suitable hollow drill, there is no need for drill hole cleaning.
- The injection cartridges can be applied quickly and with minimum effort using the fischer dispenser.
- The reinforcement bar is set by hand with a slight rotating movement down to the bottom of the drill hole.
- The mortar fully bonds the reinforcement bar to the drill hole wall and seals the borehole.
- Opened cartridges can be reused by changing static mixers.

Installation in concrete with FIS RC II in hammer drilled holes



Technical data

Injection mortar FIS RC II



		Ap- prov- al	Languages on the cartridge	Scale unit	Contents	Sales unit
Item	Item no.	ETA				[pcs]
FIS RC II 360 S	567517	●	DE, EN, IT	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 360 S	567518	●	EN, ES, PT	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 360 S	567519	●	EN, PL, RU	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 360 S	567520	●	DE, FR, NL	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 360 S	567521	●	DA, FI, NO, SV	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 360 S	567524	●	CS, GR, HU, SK	180	1 x cartridge 360 ml, 2 x static mixer FIS MR Plus	1
FIS RC II 825 S	567514	●	DE, EN, FR, IT, NL	415	1 x cartridge 825 ml, 2 x FIS JMR 825	1
FIS RC II 825 S	567515	●	EN, ES, FR, PT, TR	415	1 x cartridge 825 ml, 2 x FIS JMR 825	1
FIS RC II 825 S	567516	●	CS, EN, PL, RU, SK	415	1 x cartridge 825 ml, 2 x FIS JMR 825	1
FIS RC II 825 S	567523	●	DA, FI, NO, SV	415	1 x cartridge 825 ml, 2 x FIS JMR 825	1
FIS MR Plus	545853	–	–	–	10 x static mixer FIS MR Plus for all cartridge sizes from 100 ml to 410 ml	10
FIS JMR 825	567522	–	–	–	12 x static mixer FIS JMR 825 for 825 ml cartridges	12

Curing times

FIS RC II			
Temperature at anchoring base [°C]	Maximum processing time $t_{work}^{1)}$ [min.]	Minimum curing time $t_{cure}^{2)}$ [Std.]	[Min.]
-10 – 0	20 ³⁾	12	–
> 0 – 5	13 ³⁾	3	–
> 5 – 10	9 ³⁾	–	90
> 10 – 20	5	–	60
> 20 – 30	4	–	45
> 30 – 40	2 ⁴⁾	–	35

1) Maximum time from the beginning of the injection to rebar / fischer rebar anchor FRA setting and positioning.

2) For wet concrete the curing time must be doubled.

3) If the temperature in the concrete falls below 10 °C the cartridge must be warmed up to +15 °C.

4) If the temperature in the concrete exceeds 30 °C the cartridge must be cooled down to +15 °C up to 20 °C.

Loads

2

Rebar anchor FRA with injection systems FIS EM Plus, FIS SB, FIS V Plus, FIS VS Plus LOW SPEED and FIS RC II in accordance with rebar theory

Design resistances and permissible loads^{1) 2)} of single, post-installed Rebar anchor in cracked or non-cracked normal concrete of the strength class C20/25³⁾.

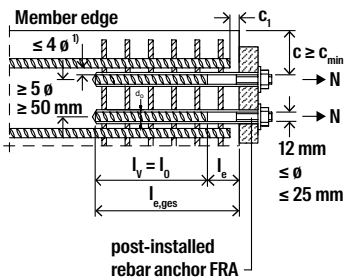
Type	Basic value for anchorage length $l_{b,reqd}^{4)}$ [mm]	Maximum anchorage depth $l_{v,max}$ [mm]	Maximum embedment depth $l_{e,ges,max}$ [mm]	Maximum Installation torque T_{inst} [Nm]	Maximum design resistance for axial tension load $N_{Rd,s}^{5)}$ [kN]	Maximum permissible tension load $N_{perm,s}^{5)}$ [kN]
FRA 12/900 M12	567	800	900	≤ 50	49.2	35.1
FRA 16/1100 M16	756	1000	1100	≤ 100	87.4	62.4
FRA 20/1400 M20	945	1300	1400	≤ 150	136.6	97.6

For planning and design the complete European Technical Assessments ETA-17/1056 (FIS EM Plus), ETA-13/0651 (FIS SB), ETA-20/0728 (FIS V Plus resp. FIS VS Plus LOW SPEED) or ETA-22/0502 (FIS RC II) have to be considered. For determination of the installation parameters (minimum concrete cover distances, etc.) as well as required transverse reinforcement see EN 1992-1-1 and general installation rules of the assessments.

- ¹⁾ The partial safety factors for resistance taken from the European standard EN 1992-1-1 as well as a partial safety factor for action of $\gamma_L = 1.4$ are considered.
- ²⁾ With FIS EM Plus, FIS SB, FIS V Plus, FIS V Plus LOW SPEED and FIS RC II post-installed Rebar anchors are approved in dry or wet concrete with temperatures up to +50 °C (resp. short term up to +80 °C) and drill hole cleaning in accordance with ETA.
- ³⁾ The ETAs for FIS EM Plus, FIS SB, FIS V Plus, FIS V Plus LOW SPEED and FIS RC II permit post-installed rebar connections in concrete C12/15 up to C50/60. The above mentioned basic value for anchorage length changes depending on the relevant concrete strength class.
- ⁴⁾ Basic value of the anchorage length in accordance with EN 1992-1-1, section 8.4.3 for concrete strength class C20/25 and good bond conditions.
- ⁵⁾ For utilisation of the full steel capacity.

General rules of construction

- The Rebar anchor FRA is permitted to transfer tension loads in direction of the axis of the rebar only.
- l_v and l_o is according to approval.
- According to approval it has to be proved that sufficient transverse reinforcement is available.



¹⁾ If the clear distance of the lapped bars is larger than $4 \times \varnothing$, EC2 must be applied.

- c Concrete cover of the post-installed rebar anchor
- c_1 Concrete cover of the front side of the existing rebar
- l_e Concrete cover above the welding
- c_{min} Minimum concrete cover acc. to approval
- \varnothing Diameter of the post-installed rebar anchor
- l_o Lap length
- l_v Effective anchorage depth of the rebar anchor
- $l_{e,ges}$ Embedment depth of the rebar anchor
- d_0 Nominal drill diameter

Loads

Injection systems FIS EM Plus, FIS SB, FIS V Plus, FIS VS Plus LOW SPEED or FIS RC II with reinforcing steel B500B⁵⁾ in accordance with rebar theory

Design resistances and permissible loads^{1) 6)} of single, post-installed rebars in cracked or non-cracked normal concrete of the strength class C20/25²⁾.

Reinforcing steel B500B fyk / fuk 500 / 540 N/mm ²	Basic value for the anchorage length for FIS EM Plus	Basic value for the anchorage length for FIS SB	Basic value for the anchorage length for FIS V Plus FIS VS Plus LOW SPEED	Basic value for the anchorage length for FIS RC II	Maximum anchorage depth	Maximum design resistance for axial tensile load	Maximum permissible tensile load
Type	$l_{b,reqd}^{4)}$ [mm]	$l_{b,reqd}^{4)}$ [mm]	$l_{b,reqd}^{4)}$ [mm]		$l_{v,max}$ [mm]	$N_{Rd,s}^{3)}$ [kN]	$N_{zul,s}^{3)}$ [kN]
Ø 8 mm	378	378	378	378	1800 (3000) ⁸⁾	21.9	15.6
Ø 10 mm	473	473	473	473	1800 (3000) ⁸⁾	34.1	24.4
Ø 12 mm	567	567	567	567	1800 (3000) ⁸⁾	49.2	35.1
Ø 14 mm	662	662	662	662	1800 (3000) ⁸⁾	66.9	47.8
Ø 16 mm	756	756	756	756	1800 (3000) ⁸⁾	87.4	62.4
Ø 20 mm	945	945	945	945	1800 (3000) ⁸⁾	136.6	97.6
Ø 22 mm	1040	–	–	1040	2000 (1800) ⁷⁾	165.3	118.1
Ø 24 mm	1134	–	–	1134	2000 (1800) ⁷⁾	196.7	140.5
Ø 25 mm	1181	1181	1181	1181	2000 (3000) ⁸⁾	213.4	152.4
Ø 26 mm	1229	–	–	–	2000	230.8	164.9
Ø 28 mm	1323	1323	1323	1323	2000 (3000) ⁸⁾	267.7	191.2
Ø 30 mm	1418	–	–	1418	2000	307.3	219.5
Ø 32 mm	1512	1512	–	1512	2000 (3000) ⁸⁾ (1500) ⁹⁾	349.7	249.8
Ø 34 mm	1607	–	–	–	2000	394.7	282.0
Ø 36 mm	1701	–	–	–	2000	442.6	316.1
Ø 40 mm	1890	–	–	–	2000	546.4	390.3

For planning and design the complete European Technical Assessments ETA-17/1056 (FIS EM Plus), ETA-13/0651 (FIS SB), ETA-20/0728 (FIS V Plus and FIS VS Plus LOW SPEED) or ETA-22/0502 (FIS RC II) have to be considered. For determination of the installation parameters (minimum concrete cover distances, etc.) as well as required transverse reinforcement see EN 1992-1-1 and general installation rules of the assessments.

¹⁾ The partial safety factors for resistance taken from the European standard EN 1992-1-1 as well as a partial safety factor for action of $\gamma_L = 1.4$ are considered.

²⁾ The ETAs for FIS EM Plus, FIS SB, FIS V Plus, FIS V Plus LOW SPEED and FIS RC II permit post-installed rebar connections in concrete C12/15 up to C50/60. The above mentioned basic value for anchorage length changes depending on the relevant concrete strength class.

³⁾ When utilising the full steel load capacity.

⁴⁾ Basic value of the anchorage length in accordance with EN 1992-1-1, section 8.4.3 for concrete strength class C20/25 and good bond conditions.

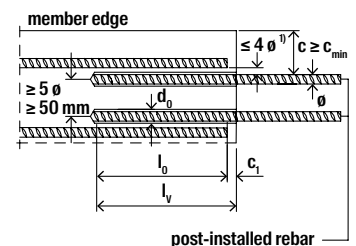
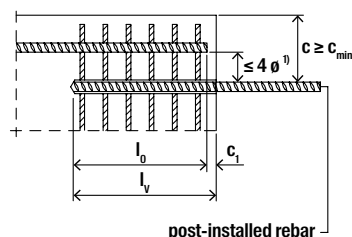
⁵⁾ All reinforcing steels with characteristic yield strength $f_{yk} = 400 - 600 \text{ N/mm}^2$ in accordance with EN 1992-1-1 Annex C, Table C.1 and C.2N. The above-mentioned basic value for the anchorage length as well as maximum steel resistance (see footnote 3) will change accordingly.

⁶⁾ With FIS EM Plus, FIS SB, FIS V Plus, FIS VS Plus LOW SPEED or FIS RC II post-installed rebars are approved in dry or wet concrete with temperatures up to +50 °C (resp. short term up to +80 °C) and drill hole cleaning in accordance with ETA.

⁷⁾ Only FIS RC II.

⁸⁾ Values in brackets apply for FIS SB.

⁹⁾ FIS RC II at installation temperature $T_i > 0^\circ\text{C}$.



¹⁾ If the clear distance of the lapped bars is larger than $4 \times \phi$, EC2 must be applied.



3

Basics – good to know

Content



Assessments	124
Engineering judgement request form	125

Assessments.

International technical assessments: ETA and ICC-ES.

Our products are qualified according to different international and national assessment documents. The application scope and the listed products of the ETA and ICC-ES approvals are summarised

for a better overview. We continuously extend the scope of the approvals and obtain further national assessments. Please always note the scope of the valid assessments.

	System Approvals		
Applications	<div><p>European Technical Assessment (ETA-24/0281): "fischer C-Fiber Force Strengthening System for the strengthening of concrete elements by near surface mounted CFRP strips and externally bonded CFRP strips"</p></div> <div><p>ICC-ES Evaluation Report (ESR-4774): "fischer C-Fiber Force Strengthening System for the strengthening of concrete members with Externally Bonded CFRP Laminates and carbon fibre fabrics"</p></div>		
Concrete slabs	Flexural strengthening	●	●
Concrete beam	Flexural strengthening	●	●
	Shear strengthening	–	●
Concrete wall	Torsion	–	●
	Flexural strengthening	●	●
Concrete columns	Axial strengthening (confinement)	–	●
Listed products in the approval	–	<ul style="list-style-type: none">Externally Bonded CFRP Laminates FRS-L-S and FRS-L-HNear Surface Mounted CFRP Laminates FRS-L-S NSMEpoxy Mortar FRS-CS, FRS-CS 585 S for the application of CFRP LaminatesEpoxy Repair Mortar FRS-PC 11 for concrete patching and surface levellingBonding Agent FRS-BA for adequate adhesion between old substrate and repair mortarCleaning Agent FRS-CA for cleaning of CFRP Laminates	<ul style="list-style-type: none">Externally Bonded CFRP Laminates FRS-L-S and FRS-L-HEpoxy Mortar FRS-CS, FRS-CS 585 S for the application of CFRP LaminatesCarbon Fibre Fabric FRS-W U300 & FRS-W U600Saturating Resin FRS-CF for the application of carbon fibre fabricFire Protection FRS-FP protective coating against fire and smoke development
Evaluation	–	EAD 160086-01-0301	Acceptance Criteria AC125

Design standards & guidelines.



USA / International:
ACI 440.2R-17: Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures



Germany
DAFSTB Guideline: Strengthening of concrete structures with bonded reinforcement, 2012



Europe / International
EOTA TR 066: Design and requirements for construction works of post-installed shear connection for two concrete layers



International
Fib Bulletin 90: Externally applied FRP reinforcement for concrete structures



Switzerland
SIA 166:2004 Bonded reinforcement



Italy
CNR-DT 200 R1/2012: Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Existing Structures



UK
TR 055: Design guidance for strengthening concrete structures using fibre composite materials (Concrete Society, 2012)



China
GB Code 50367-2013: Design code for strengthening concrete structures

Engineering judgement request form.

Project name:	Requested by:
Consultant:	Company:
Contractor:	E-Mail:
Contact:	Phone:
Email:	Supplier:
Phone:	fischer Engineer:

3

Requirements

☐ Expert opinion available

Type of construction (e.g. infrastructure, building construction, bridge)	Type of element (e.g. beam, floor, joint, column)
Age of building	Special conditions like high alkali-resistance
Existing damages (e.g. visible cracks, corrosion, concrete spalling)	
Environment (e.g. indoor, outdoor, heavy traffic, sea water, waste water)	
Base material (material parameters if possible: e.g. elastic modulus, compressive strength, exposure class)	
Goal of retrofitting (e.g. changed requirements, different loads, fixing existing damage)	

Special conditions/comments/drawings/standards



4

Services

Content

Engineering support	128
REINFORCE-FIX design software	129
FIXperience design software	130
Material customization	131
Structural member testing	132



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- Interactive utilization bar for the different failure modes
- Documentation with transparent calculation steps, including dynamically changing stress-strain diagrams for ULS and SLS verifications.
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- Iterative, precise determination of the neutral axis of the cross-sections
- Realistic estimate of materials and quantities
- Continuous development to include more and more guidelines & standards

DESIGN CASES ACCORDING TO:

ACI 440.2R

- Flexural strengthening with CFRP laminates and CF fabrics for concrete slabs, rectangular beams and T-beams
- Shear strengthening with CF fabrics for rectangular beams and T-beams
- Combined flexural and shear strengthening

DAfStb VL

- Flexural strengthening with CFRP laminates for concrete slabs, rectangular beams and T-beams
- Shear strengthening with steel plates for rectangular beams and T-beams
- Combined flexural and shear strengthening

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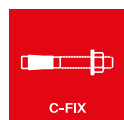


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MORTAR-FIX

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WOOD-FIX

For the calculation of on-rafter insulation systems and joints in structural timber engineering.



RAIL-FIX

For the design of fixings for railings on reinforced concrete slabs and staircases.



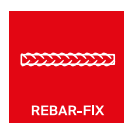
INSTALL-FIX

For the design and dimensioning of MEP installation systems.



FACADE-FIX

For the design of façade fixings with timber sub-structure.



REBAR-FIX

For the design of post-installed rebars in reinforced concrete.



CHANNEL-FIX

For the design of cast-in channels and inserts.



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Higher initial viscosity, reduced or increased pot-life, different color tone?
Upon customer request, we are able to adjust the chemical formulation of our epoxy-based products!

We have developed our extensive product portfolio for building restoration based on our many years of experience with chemical products. The resulting products' performance meets even the highest requirements. The product range is broad and fits almost all common requirements for structural strengthening with different methods. Nevertheless, we continue to work on improving our products even further. One of our philosophies is to be very close to our customers. That is why it is important to us to respond to special customer requests, such as adapting the color of a product to the existing substrate or adjusting the pot life or viscosity to cope with special needs on the construction sites.

For challenging projects in particular, the requirements for the products used can be very specific and do not always have to match the market standard. It is important for planners and contractors to have a partner who supports them in their challenge and helps to ensure that the project will lead to a great success. This is where fischer always provides its customers with exceptional support and outstanding technical solutions.

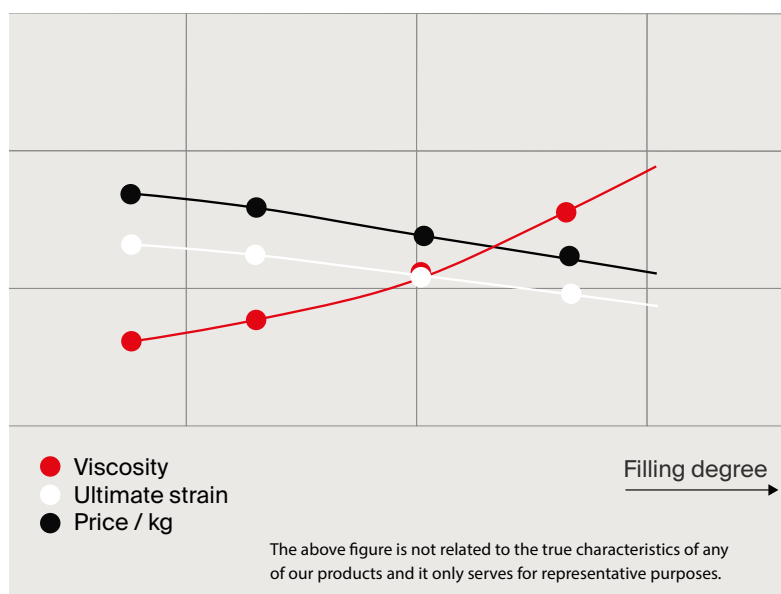
Our excessive knowledge in the chemical development allows us to respond to and fulfill such customer requests. We are able to characterize mechanical, chemical and rheological properties of the adjusted chemical formulations, according to a vast number of national and international standards. The results of the experiments can be thoroughly documented and given to the customer for further evaluation and final acceptance.

Our experts are looking forward to discuss with you the technical possibilities and the economic feasibility of such requests, to provide you with the best technical solution.

Note that our products lie beyond the validity scope of the corresponding technical assessments and approvals, once the chemical formulation has been changed. The final acceptance and application of refined chemical products are therefore the duty of the responsible structural engineer.



4



Our testing capabilities in our chemical laboratory

- Pot-life
- Viscosity (Brookfield, Rheometer)
- Glas transition temperature (DSC, DMA)
- Hardening time at different temperatures
- Mechanical properties (compressive strength, tensile strength, adhesive tensile strength on e.g. concrete surface, flexural strength, E-Modul, etc.)
- Sustained load tests under ambient and harsh environmental conditions
- Shrinkage properties
- Infrared spectroscopy
- ...and many more!

Competent partner for structural member testing.

Technical support towards an engineering solution.

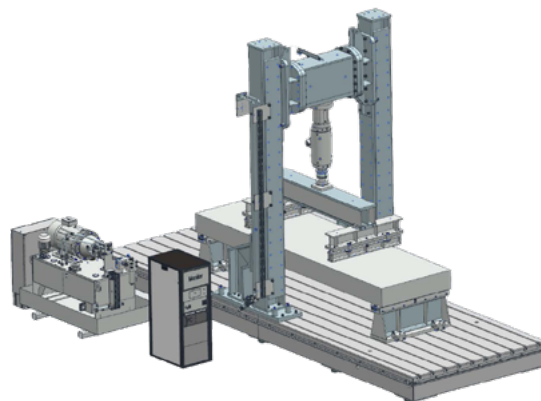
Large-scale structural member testing

4

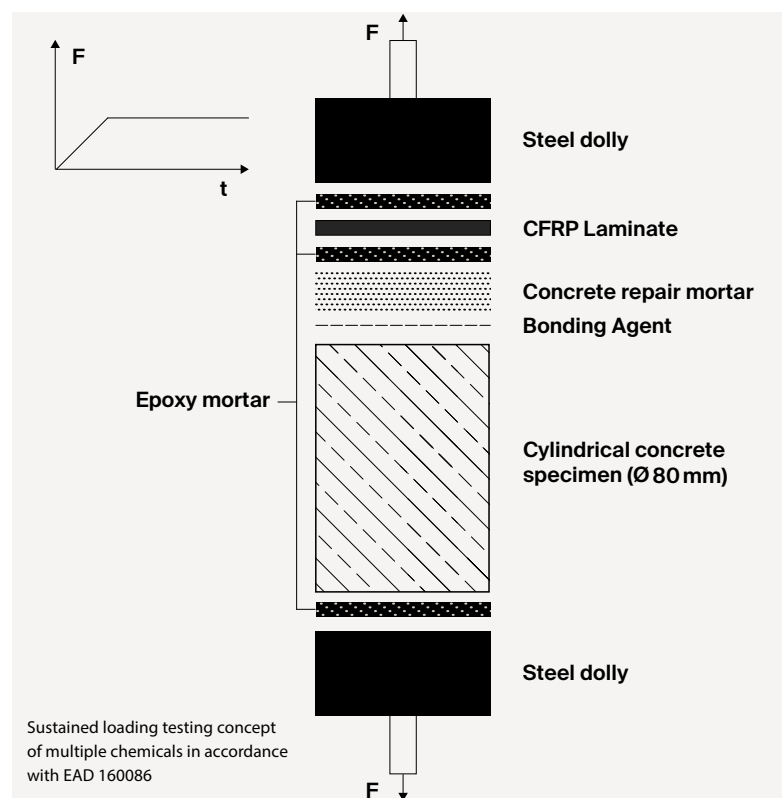
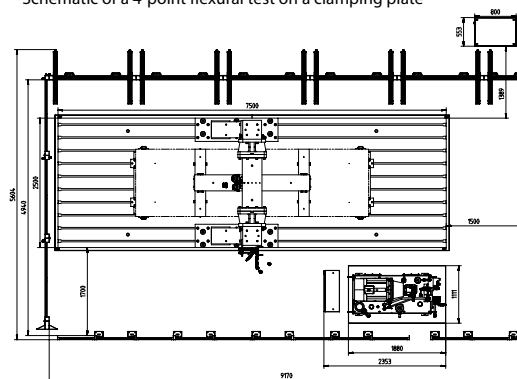
Strengthening applications beyond the scope of the technical assessments? The safe use of our structural strengthening products and the durability of our strengthening solutions are our utmost interest. Structural engineers often face multiple challenges when designing strengthening products in demanding applications and on base materials, that are neither captured in the corresponding technical assessments & approvals, nor regulated in the current design codes and guidelines. In such cases, solutions based on engineering judgement are required to ensure the safety and durability of the strengthening application. We can realize your ideas by executing structural member tests to validate the design assumptions and to verify the structural response of strengthened members under different conditions.

In our well-equipped testing laboratory at fischer, we can accommodate large-scale structural member tests, including short- and long-term loading tests in accordance with the current valid qualification guidelines e.g. AC125, EAD 160086, EN 1504 and even beyond upon request. We have a strong, international network of accredited test laboratories and technical experts and look forward to fulfilling your request. From the planning and preparation of the test campaign to the execution and documentation of the experiments, and the non-binding consultancy on the evaluation of the test results, our competent experts will be on your side to support your project.

If you have an inquiry for us, you are welcome to get in touch with the known fischer technical contacts in your national company or contact us via structuralretrofitting@fischer.de. We look forward to your inquiry!

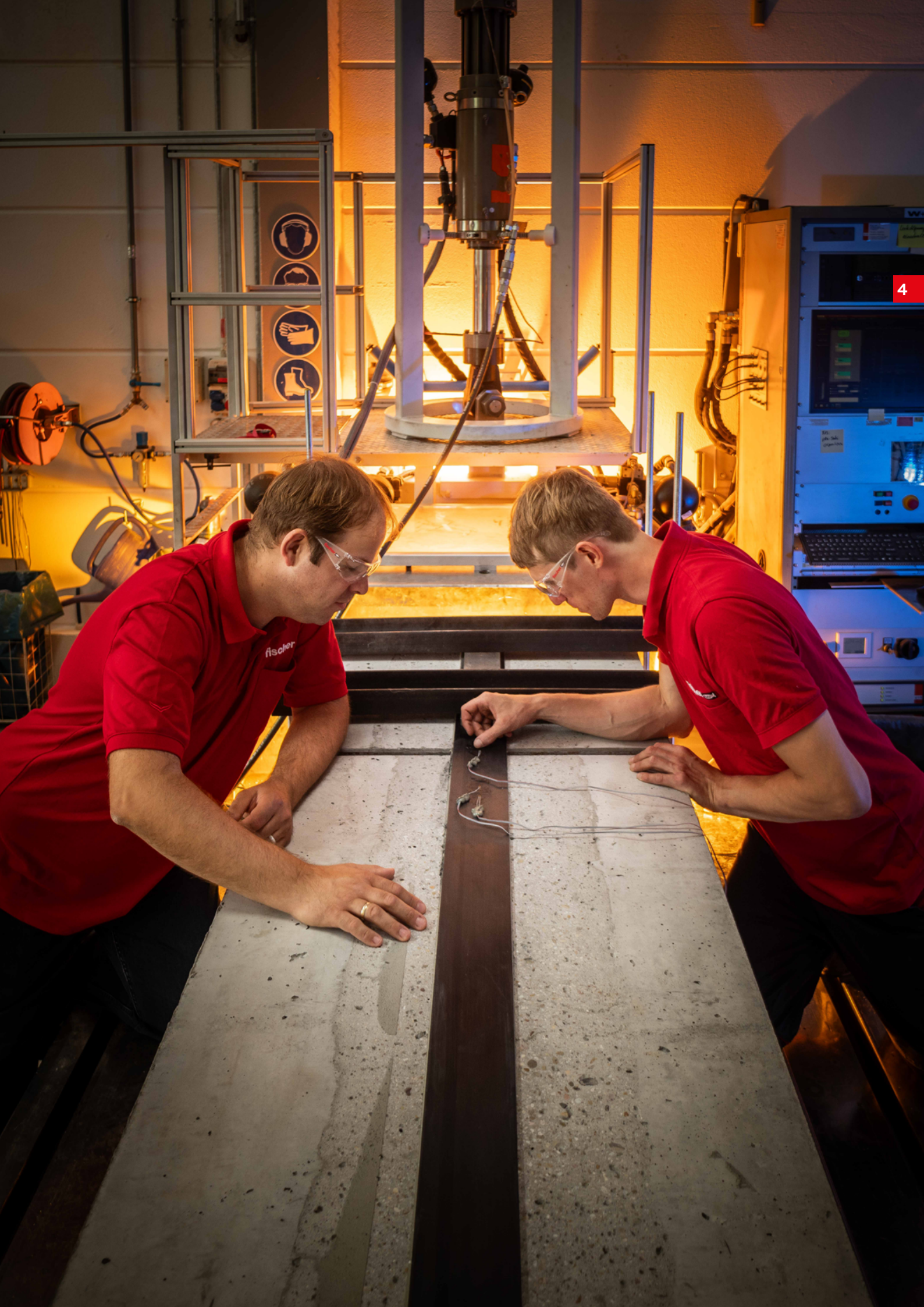


Schematic of a 4-point flexural test on a clamping plate



Our structural member testing capabilities at a glance

- Bending, tensile or compressive tests of structural members (reinforced concrete beams, light-weight concrete, pre-stressed concrete, timber, small-scaled columns etc.)
- Quasi-static loading up to 500 kN with a one-way loading jack
- Cyclic and fatigue loading up to 250 kN using a servo-hydraulic loading jack under displacement or load control
- Maximum dimensions of the tested member: 7 meters span width between the supports, 2 meter height, 1,5 meters in width
- Displacement and crack-width measurements on up to 28 simultaneously recorded channels
- Short-term and sustained load tensile tests on any kind of base material in accordance with e.g. EAD 160086 under ambient as well as under harsh climatic conditions (elevated temperature and humidity)
- Crack-opening tests



Main catalogue Structural Strengthening.

Products and solutions for structural strengthening applications.

The Structural Strengthening Catalogue offers many facts and helps with quick and safe product selection, e.g.:

- Carbon fiber laminates and carbon fiber wrap solutions
- Products for concrete overlay solutions
- Products for post-installed rebars
- Products descriptions with benefits
- Tips for installations
- Basics of structural strengthening
- Technical data



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Main catalogue Fixing systems.

Products for use in fixing technology.

The fixing catalogue offers many facts and helps with quick and safe product selection, e.g.:

- Product descriptions with benefits
- Tips for installation
- Application aids
- Detailed technical data and drawings
- Basics of fastening technology
- All you need to know about professional fixing



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Main catalogue Installation Systems.

Products for use in installation technology.

Many facts about the products and everything you need to know about fischer installation systems, e.g.:

- Product- and system introductions
- Plugs and anchors for fixing the system components
- Application aids
- Detailed technical data and drawings
- Basics of installation technology

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4

Catalogue Cast-in Channels.

Products and applications of the fischer Cast-in Channel systems.

The Cast-in Channel catalogue shows innovative and secure solutions, offers comprehensive information and helps with a quick selection of system components.

- Presentation of the bolt and rail types and their possible combinations, with detailed technical data and illustrations
- Application support and references
- Basic knowledge on applications, processing and services
- Available design software

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All the data in this catalogue concerning work with our fixing elements must be adapted to suit local conditions and the type of materials in use.

If no detailed performance specifications are given for certain articles and types, please contact our Technical Service Department for advice.

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