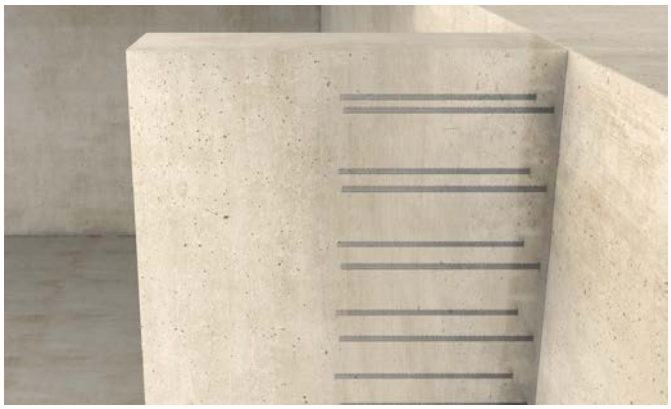
fischer

Post-installed rebar connections.
Safely connected.

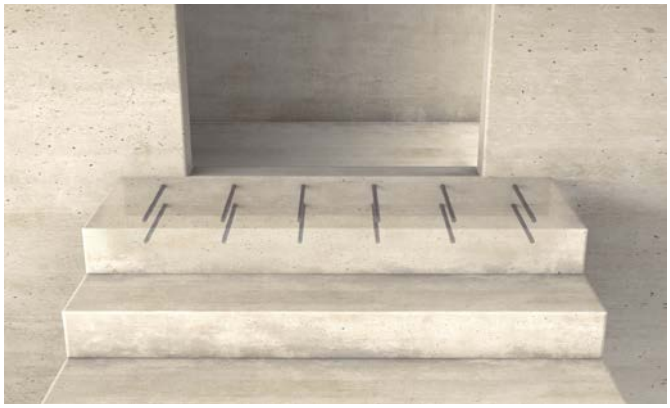
Applications for post-installed rebar connections.



Horizontal wall connection

Column connection

Closing a ceiling opening

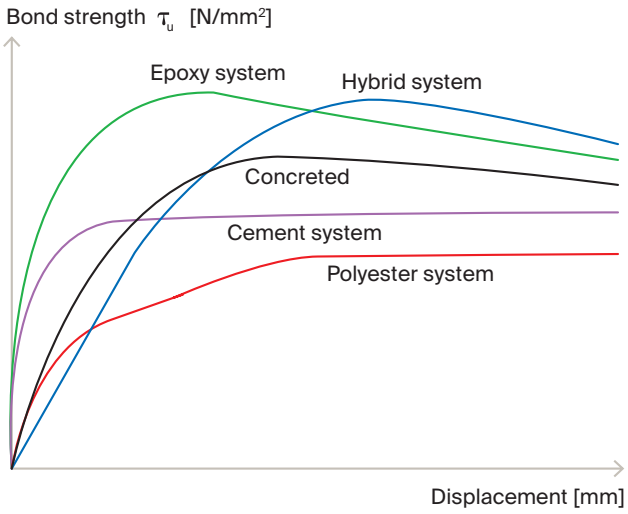


Stair connection

Post-installed vs. cast-in bars.

Performance

Reinforcement bars used with fischer injection mortars according to the building authority approval exceed the bond strength of concrete rods (Fig. 1). Therefore the design is carried out in Germany analogous to concrete rods according to DIN EN 1992-1-1 (EC 2) with NA or according to TR 069. Compared to the design according to EC2 Part 1-1, the new design method TR 069 offers new opportunities: Deeper concrete covers, thinner component thickness, shallower anchorage depths or non-existing connection reinforcement in the present structure. fischer offers two different solutions for post-installed rebar connections - The injection mortar RebarConnect FIS RC II, consisting of a vinylester formulation and the injection mortar FIS EM Plus, which is based on an Epoxy system. The load transfer of cast-in and post-installed rebar connections does not differ significantly from each other. In the case of a cast-in bar, the tensile or compressive force in the bar is transferred into the concrete as a compressive force via the ribbing. In the case of a post-installed rebars, the loads are first transmitted via the ribbing into the injection mortar, which then transfers them into the surrounding concrete via a bonding effect.



Example: d_s = 20 mm l_v = 300 mm C20/25

Corrosion protection

Concrete reinforcement bars are protected against corrosion by the alkaline environment of the cement contained in the concrete, which has a pH value of 12 – 14. They also have this protection, the so-called passivation, when using fischer injection mortars.
This is possible, because the fischer injection mortars for post-installed rebar connections have a pH value of ≥ 12.0. Thus, protection against corrosion is the same as that for cast-in rods.

Fire protection

Safety when it matters! Especially a load-bearing reinforced concrete structure must not fail in the event of a fire. This also applies to post-installed rebar connections. The fischer injection mortars with approval for post-installed rebar connections have proven their performance even under fire conditions. The European Technical Assessment (ETA) also permits designs up to fire resistance class R 180.

Execution security

In Germany, the Technical Building Regulations (MVV TB) or the administrative regulations (VV TB) of the respective federal states for post-installed rebar connections request certification of both the construction operatives as well as the main contractor.
The fischer Academy offers certification courses for this purpose, which in addition to a theoretical part also includes practical training in exact drilling, cleaning, bubble-free filling of the drill hole and the final insertion of the reinforcing rod.

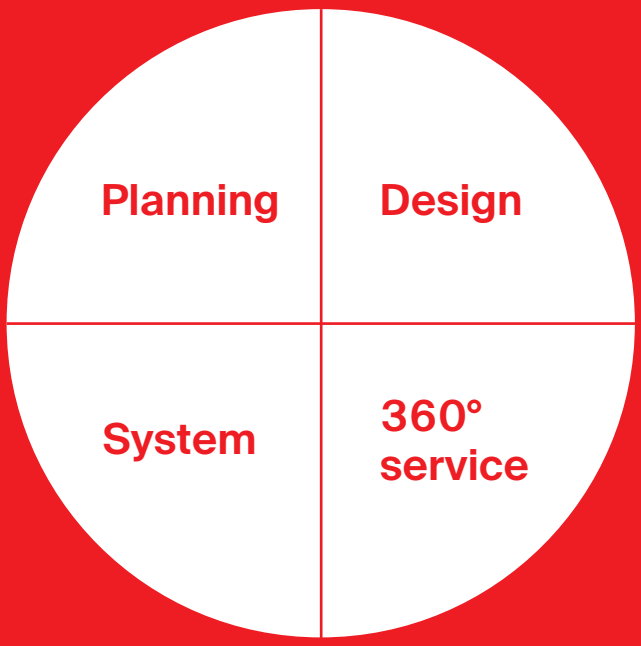
From planning to completion.

Planning safe and efficient constructions

Whether cast-in, with or without rebar connection – All projects have one thing in common: They start with the planning. Whether the design is according to anchor theory, rebar theory or done according to the new EOTA Technical Report TR 069 is your decision. With the fischer solutions there are no longer limits to your planning.

Design – Safe and reliable with REBAR-FIX

The modular design suite "FiXperience" offers safe and reliable designs making it quick and easy to use. Using the software module REBAR-FIX, Post-installed rebar connections can be easily designed using either end anchorages or lap joints.



System – The right solution for every application

Whether ETA or ICC-ESR (ICC Evaluation Service Report), whether 100 years of service life, seismic approval or fire assessment. With the fischer systems, consisting of injection mortar and the matching accessories, you are optimally equipped for every application. From the drill hole creation to completion:
With the fischer FIS-Rebar case you will have the right system components with you at all times. The fischer range of drill bits together with the fischer dispensers complete the package.

360° service

With fischer, no customer is left alone. No matter how difficult, unique or impossible the task seems, with our 360° service package you will find the right solution for your needs. We will support you before, during and after the completion of your project.

Design methods compared.

Nowadays, post-installed rebar connections can be created for many different applications as per EC2. Embedding the reinforcing bars relatively short is often sufficient, particularly if a small floor opening requires in filling. Points that require clarification include whether shear loads and additional tensile forces exist or whether a rigid moment connection is required or if rebar is already present in the existing structure. These aspects will affect which design method should be used.

Rebar theory

The loads in post-installed reinforcing bars are transferred through struts in the concrete into the reinforcement, in which case the post-installed bars are treated as cast-in bars. According to **rebar theory (EN 1992-1-1)**, reinforcing bars can be post-installed with and without connecting reinforcement.

TR 069

TR 069 bridges the gap between rebar and anchor theory and uses elements of both design approaches, allowing post-installed, rigid rebar connections to be carried out even in cases where there is no starter bar in the existing structure and only relatively short embedment depths are possible. This is possible as the bond strength is significantly higher than that according to rebar theory.

Anchor theory

EN 1992-4 only utilises the tensile strength of the concrete. The bond strength is considerably higher than that according to rebar theory and embedment depths of 4 to 20 times the diameter of the bars are covered. Unlike in rebar theory, shear loads can be transferred in addition to tensile loads.

Design method characteristics (comparative questions)	Post-installed rebar connection (EN 1992-1-1)	Anchor connection (EN 1992-4)	Rigid post-installed rebar connection (TR 069)
Is a starter bar/continuing reinforcement required?	Yes	No	No
What is the required edge spacing for high tensile loads?	Very low	Large	Large
How large is the expected displacement?	Very low	Low	Low
How large is the necessary embedment depth for an effective anchorage under tensile load?	Quite large	Not very large	Not very large
How large is the necessary member thickness (towards the bar axis)?	Quite large	Not very large	Not very large
Do installers need to be certified?	Yes (in Germany)	No	No
Can shear loads also be transferred?	No, but can be transferred through interface roughness	Yes, through the anchor	No, but can be transferred through interface roughness
Are linear or free bar layouts possible according to this design code?	Yes	No, max. 9 anchors	Yes
What is the minimum concrete grade?	C12/15	C12/15 (anchor ETA not yet applicable)	C20/25
Does this design method differentiate between cracked and non-cracked strength?	No	Yes, reduced resistance in cracked concrete	Yes, reduced resistance in cracked concrete
Are concrete-concrete connections regulated?	Yes	No	Yes

Solutions for post-installed rebar connections.

The RebarConnect FIS RC II injection mortar is the economical choice for post-installed rebar applications with a diameter of 8 – 40 mm and also for deep anchorages of up to 2 metres. In combination with the appropriate hollow drill bit, there is no drill hole cleaning as an additional work step required. Furthermore, a service life of 100 years, applications under seismic conditions and the processing of the FIS RC II at temperatures of -10 °C to +40 °C are assessed in the ETA.
With the epoxy injection mortar FIS EM Plus, post-installed rebar connections with a diameter of 8 – 40 mm, even under seismic conditions and with a service life of 100 years, can be processed. In addition, the ETA also assesses the installation in diamond drilled holes without additional roughening of the drill hole.

fischer offers various ETA approved systems to create post-installed rebar connections. In the following overview table you can see the main differences between the fischer system solutions.

Designation injection mortar	**FIS RC II**	**FIS EM Plus**	
European Technical Assessment	ETA-22/0502	ETA-17/1056	ETA-22/0001
Connection + verification as per EN 1992-1-1	End anchorage, overlap joint, cover envelope line of tensile force	End anchorage, overlap joint, cover envelope line of tensile force	–
Connection + verification as per TR 069	–	–	Rigid connection without overlap
Bar diameters	ø 8 – 40 mm	ø 8 – 40 mm	ø 8 – 40 mm
Rebar anchors	FRA M12 – M24	FRA M12 – M24	–
Maximum embedment depth	2,000 mm	2,000 mm	2,000 mm
Installation temperature in the base material	–10 °C bis +40° C	–5 °C to +40 °C	–5 °C to +40 °C
Minimum curing time	12 h – 35 min.	200 h – 5 h	200 h – 5 h
Hammer drilling	Yes	Yes	Yes
Hollow drilling	Yes	Yes	Yes
Diamond drilling	No	Yes	No
Dry and wet drill hole	Yes	Yes	Yes
Water-filled drill hole	No	No	Yes
Drill hole cleaning in case of hammer drilling	Blow out 2x, brush 2x, blow out 2x	Blow out 4x	Blow out 2x, brush 2x, blow out 2x
100-years service life	Yes	Yes	Yes
Application under seismic exposure	Yes	Yes	Yes
Application under fire exposure	Yes	Yes, R30 – R240	No

You can find more information on our website:
www.fischer-international.com/expertise/rebar-connections

Performance characteristics at a glance.

Approved systems according to ETA & ICC-ESR

Whether ETA, ICC-ESR, 100 years of service life, seismic approval or fire assessment, with the right fischer system and the right accessories for your application, you are always on the safe side.

REBAR-FIX software for design

With the fischer REBAR-FIX software you can quickly and reliably create a verifiable proof for post-installed rebar connections using clearly defined connection situations based on approvals.

Back-Office Support

Demanding projects are our strength. With more than 20 years of experience in the field of post-installed rebar connections we find a solution for every challenge. Whether by phone or on site - our qualified technical consultants support you whenever needed.

The fischer assembly protocol

With the fischer Pro App, construction projects are documented quickly, wherever they are located: directly on the construction site. The digital documentation of post-installed rebar connections are with you at all times.

fischer certified

Whether on site or in the fischer Academy, our experts train companies and users. fischer certifies training participants for post-installed rebar connections and also offers numerous trainings for planners, structural engineers and installers.

RebarConnect FIS RC II.
The economical injection mortar for post-installed rebar connections.

Functioning

The injection mortar RebarConnect FIS RC II is the first choice of hybrid mortar for post-installed rebar connections in the field of construction and civil engineering. Due to its price point and reduced hazardous symbols, FIS RC II is the cost efficient solution for any contractor who needs to carry out a post-installed rebar connection.

Your advantages at a glance

- The European Technical Assessment (ETA) assesses the application of post-installed rebar connections with reinforcing bars of 8 – 40 mm diameter and an embedment depth of up to 2 meters.
- The short processing and curing times ensure work is completed quickly.
- Processing at different substrate temperatures from -10 °C to +40 °C allows an universal use.
- The injection mortar RebarConnect FIS RC II is approved for use in holes drilled with hollow or hammer drill bits.
- In addition, the FIS RC II is suitable for post-installed rebar connections with a service life of 100 years.
- The injection mortar RebarConnect FIS RC II is the economical choice for post-installed rebar connections and for applications under challenging seismic conditions.

Suitable for building materials, such as:


Uncracked concrete


Cracked concrete

Certificates / Features

ETA-22/0501, for cracked and uncracked concrete

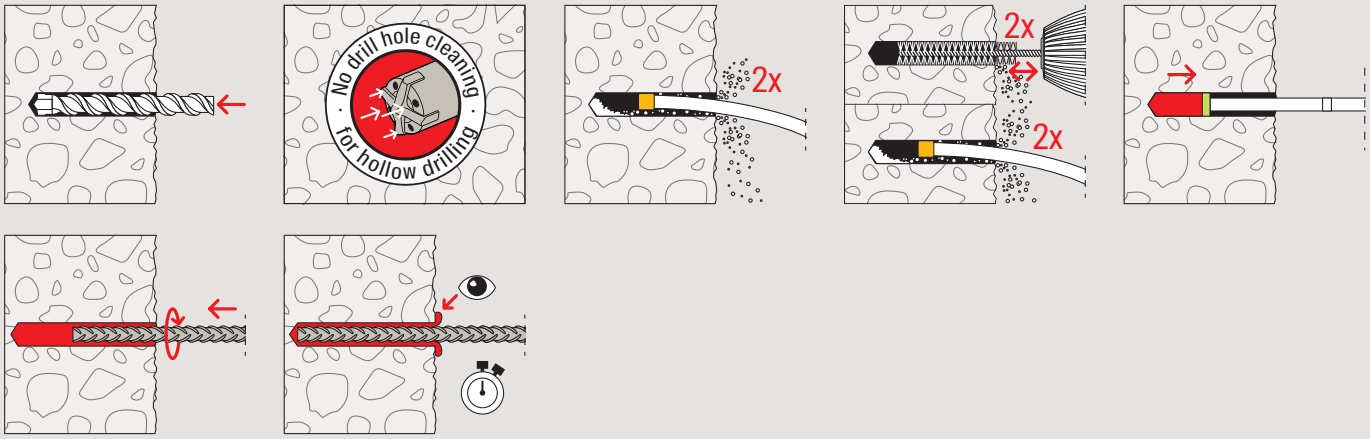
ETA-22/0502, for post-installed rebar connection

Fire resistance classification R 120

Seismic

Installation and Processing time.

Installation



Processing and curing times FIS RC II

RebarConnect FIS RC II			
Temperature in the anchorage ground	Maximum processing time t_{work}	Minimum curing time [1] t_{cure}	
[° C]	[min]	[hours]	[min]
-10 to ±0 [2]	20	12	–
> ±0 to +5 [2]	13	3	–
> +5 to +10 [2]	9	–	90
> +10 to +20	5	–	60
> +20 to +30	4	–	45
> +30 to +40 [3]	2	–	35

1) In damp concrete, the curing times must be doubled.
2) At temperatures in the anchorage base below 10 °C , heat the mortar cartridge to +15 °C .
3) At temperatures in the anchorage base above 30 °C , cool the mortar cartridge to +20 °C .

FIS EM Plus.
The powerful injection mortar for post-installed rebar connections.

Functioning

The formulation of the fischer epoxy injection mortar FIS EM Plus offers a wider range of applications for post-installed rebar connections both according to the already established Eurocode 2 (EC 2) and according to the EOTA Technical Report TR 069. The latter enables a design method for anchorages of post-installed rebars with improved composite gap behaviour compared to EN 1992-1-1.

Your advantages at a glance

- Approved for rebar connections with a diameter of 8 – 40 mm and an embedment depth of up to 2 m.
- The installation is approved for drill holes created with hammer, hollow and diamond drills according to the assessment.
- Long open and curing times ensure sufficient installation time for large embedment depths.
- The injection mortar can be used at low temperatures down to -5 °C.
- Use with the fischer FRA reinforcement anchor is included in the assessment.
- In the case of hammer-drilled boreholes, no brushing out is required, allowing for quicker installation.
- The FIS EM Plus is approved for rebar connections with a service life of 100 years.

Suitable for building materials, such as:


Uncracked concrete


Cracked concrete

Certificates / Features

ETA-17/0979, for cracked and uncracked concrete, Seismic performance catagories C1, C2

ETA-17/1056, for post-installed rebar connection

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

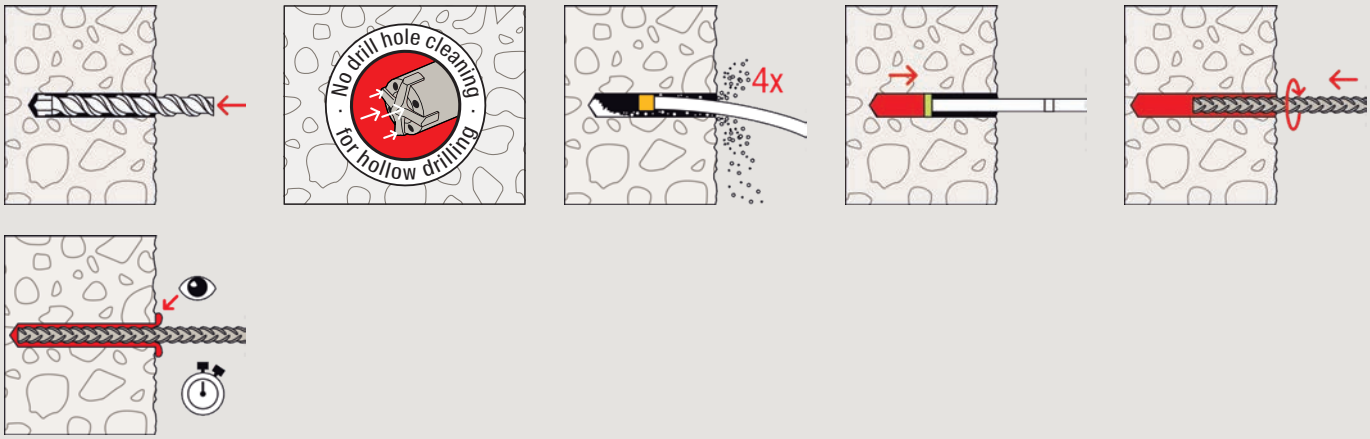
aBG Water Resources Act (WHG)

Fire resistance classification R 240

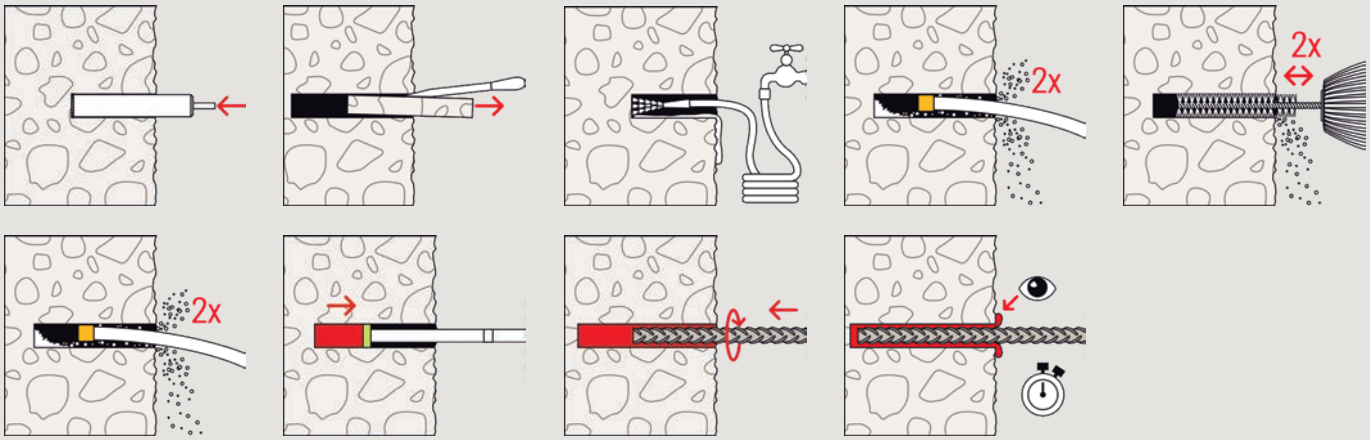
Seismic

Installation and Processing time.

Installation in hammer-drilled or hollow-drill-bit holes



Installation in diamond-drilled holes



Processing and curing times FIS EM Plus

FIS EM Plus		
Temperature in the anchorage base [°C]	Maximum processing time t_{work} [min]	Minimum curing time [1] t_{cure} [hours]
-5 to ±0[2]	240	200
> ±0 to +5[2]	150	90
> +5 to +10	120	40
> +10 to +20	30	18
> +20 to +30	14	10
> +30 to +40	7	5

[1] In damp concrete, the curing times must be doubled
[2] Minimum cartridge temperature +5 °C

Assortment

Injection mortar FIS RC II


FIS RC II 360 S


FIS RC II 825 S


FIS MR Plus


FIS JMR

Item	Item no.	Approval ETA	Languages on the cartridge	Scale unit	Contents	Sales unit [pcs]
FIS RC II 360 S	567517	●	IT, EN, DE	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 360 S	567518	●	EN, ES, PT	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 360 S	567519	●	PL, EN, RU	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 360 S	567520	●	DE, FR, NL	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 360 S	567521	●	DA, SV, NO, FI	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 360 S	567524	●	CZ, SK, HU, EL	180	1 catridge 360 ml, 2 x FIS MR Plus	6
FIS RC II 825 S	567514	●	DE, EN, FR, IT, NL	415	1 catridge 825 ml, 2 x FIS JMR 825	6
FIS RC II 825 S	567515	●	EN, ES, PT, FR, TR	415	1 catridge 825 ml, 2 x FIS JMR 825	6
FIS RC II 825 S	567516	●	EN, PL, RU, CZ, SK	415	1 catridge 825 ml, 2 x FIS JMR 825	6
FIS RC II 825 S	567523	●	DA, SV, NO, FI	415	1 catridge 825 ml, 2 x FIS JMR 825	6
FIS MR Plus	545853	–	–	–	10 static mixer FIS MR Plus for 360 ml cartridges	10
FIS JMR 825	567522	–	–	–	12 static mixer FIS JMR 825 for 825ml cartridges	12

Injection mortar FIS EM Plus


FIS EM Plus 300 T


FIS EM Plus 390 S

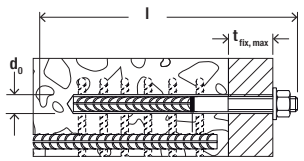

FIS EM Plus 585 S


FIS EM Plus 1500 S


FIS MR Plus


FIS UMR

Item	Item-No.	Approval ETA	Approval ICC	Languages on catridge	Scale unit	Contents	Sales unit [pcs]
FIS EM Plus 300 T	575312	●	●	EN, ES, FR	150	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 300 T	575313	●	●	IT, DE	150	1 cartridge 390 ml + 2 x static mixer FIS MR Plus	6
FIS EM Plus 300 T	575314	●	●	EN, AR, PT	150	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 390 S	544171	●	●	DE, FR	180	1 cartridge 390 ml + 2 x static mixer FIS MR Plus	6
FIS EM Plus 390 S	544154	●	●	EN, FR, NL	180	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 390 S	544155	●	●	EN, AR,	180	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 390 S	544176	●	●	CS, SK, RO	180	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 390 S	544159	●	●	RU, UK, KK	180	1 cartridge 390 ml, 2 x FIS MR Plus	6
FIS EM Plus 390 S in bucket	544172	●	●	EN, ZH, AR	180	20 cartridges 390 ml, 20 x FIS MR Plus 1 Bucket	1
FIS EM Plus 390 S HWK big	544156	●	●	EN, FR, KO	180	20 cartridges 390 ml, 20 x FIS MR Plus 1 HWK, big	1
FIS EM Plus 585 S	544166	●	●	EN, ES, PT, EL	270	1 cartridge 585 ml + 2 x FIS UMR	6
FIS EM Plus 585 S	544165	●	●	PL, CS, SK, KO	270	1 cartridge 585 ml + 2 x FIS UMR	6
FIS EM Plus 585 S	544175	●	●	EN, ZH, KO	270	1 cartridge 585 ml, 1 x FIS UMR, 1 x extension tube ø 9x250 mm	6
FIS EM Plus 585 S	567989	●	●	DE, FR, NL	270	1 cartridge 585 ml + 2 x static mixer FIS UMR	6
FIS EM Plus 1500 S	544167	●	●	DE, FR, IT, ES, EN	700	1 cartridge 1500 ml + 2 x static mixer FIS UMR	4
FIS MR Plus	545853	–		–	–	10 static mixer for FIS EM Plus 390 S	10
FIS UMR	520593	–		–	–	10 static mixer for FIS EM Plus 585 S, FIS EM Plus 1500 S	10



Rebar anchor FRA

FRA

Item	Item-No.	Approval ETA	Total length l [mm]	Max. fixing thickness t_{fix} [mm]	Drill hole d_0 [ø mm]	Fill quantity at max. embedment depth [scale unit]	Sales unit [pcs]
FRA 12/900 M12-60 [1]	**505529**	●	975	60	16	50	8
FRA 12/900 M12-60 [1]	**505533**	●	1180	60	20	81	8
FRA 20/1400 M20-60 [1]	**505534**	●	1485	60	25	160	4

[1] Reinforcing bar with friction welded threaded part made of A4 stainless steel.

Injection adapter / Extension tube

Injection adapter

Injection adapter

Extension tube

Item	Item-No.	Colour	Fit to extension tube [ø]	For drilling diameter [mm]	Sales unit [pcs]
Injection adapter (ø 9) for drill-ø 12 mm	**001497**	ecru	9	12	10
Injection adapter (ø 9) for drill-ø 14 mm	**001498**	blue	9	14	10
Injection adapter (ø 9) for drill-ø 16 mm	**001499**	red	9	16	10
Injection adapter (ø 9) for drill-ø 18 mm	**001483**	yellow	9	18	10
Injection adapter (ø 9) for drill-ø 20 mm	**001506**	green	9	20	10
Injection adapter (ø 15) for drill-ø 20 mm	**001508**	green	15	20	10
Injection adapter (ø 9) for drill-ø 25 mm	**001507**	black	9	25	10
Injection adapter (ø 15) for drill ø 25 mm	**001509**	black	15	25	10
Injection adapter (ø 9) for drill-ø 30 mm	**090689**	grey	9	30	10
Injection adapter (ø 15) for drill-ø 30 mm	**090700**	grey	15	30	10
Injection adapter (ø 9) for drill-ø 35 mm	**090699**	brown	9	35	10
Injection adapter (ø 15) for drill-ø 35 mm	**090701**	brown	15	35	10
Injection adapter (ø 9) for drill-ø 40 mm	**505077**	red	9	40	10
Injection adapter (ø 15) for drill-ø 40 mm	**505079**	red	15	40	10
Injection adapter (ø 9) for drill-ø 45 mm	**508909**	yellow	9	45	10
Injection adapter (ø 15) for drill-ø 45 mm	**508910**	yellow	15	45	10
Injection adapter (ø 9) for drill-ø 55 mm	**505078**	ecru	9	55	10
Injection adapter (ø 15) for drill-ø 55 mm	**505080**	ecru	15	55	10
Extension tube ø 9 (1,0 m)	**048983**	–	–	–	10
Extension tube ø 15 (10,0 m)	**530800**	–	–	–	1

Assortment

Cleaning brushes / Brush extension / SDS Chuck

Cleaning brush with thread M 8

FIS brush extension

SDS Chuck M8

Item	Item-No.	For drilling diameter [mm]	Colour	Length [mm]	Sales unit [pcs]
BSB for drill-ø 12 mm	001490	12	white	180	1
BSB for drill-ø 14 mm	001491	14	blue	180	1
BSB for drill-ø 16 mm	001492	16	red	180	1
BSB for drill-ø 18 mm	001493	18	yellow	180	1
BSB for drill-ø 20 mm	001494	20	green	180	1
BSB for drill-ø 25 mm	001495	25	black	180	1
BSB for drill-ø 30 mm	090063	30	grey	180	1
BSB for drill-ø 35 mm	090071	34	brown	180	1
BSB for drill-ø 40 mm	505061	40	–	180	1
BSB for drill-ø 40 mm	506254	45	–	180	1
BSB for drill-ø 55 mm	505062	55	–	180	1
FIS brush extension	508791	–	–	420	1
SDS Chuck M8	530332	–	–	–	1

Compressed air nozzles

Compressed air nozzles

Item	Item-No.	For drilling diameter [mm]	Match	Sales unit [pcs]
Compressed air nozzles D12-D15	511956	12 – 15	Compressed-air cleaning tool ABP, Compressed air cleaning hose	2
Compressed air nozzles D16-D19	511957	12 – 15	Compressed-air cleaning tool ABP, Compressed air cleaning hose	2
Compressed air nozzles D20-D25	511958	20 – 25	Compressed-air cleaning tool ABP, Compressed air cleaning hose	2
Compressed air nozzles D30-D35	511959	30 – 35	Compressed-air cleaning tool ABP, Compressed air cleaning hose	2
Compressed air nozzles D40-D55	511960	40 – 55	Compressed-air cleaning tool ABP, Compressed air cleaning hose	2

Compressed-air cleaning tool / Blow-out pump / Compressed air cleaning hose

Compressed-air cleaning tool ABP

Blow-out pump ABG

Compressed air cleaning hose

Item	Item-No.	Description	for drill hole depth [mm]	Sales unit [pcs]
Compressed-air cleaning tool ABP	059456	Compressed air cleaning device with compressed air nozzle D20 - D25	380	1
Blow-out pump ABG	567792	Hand blower	160	1
Compressed air cleaning hose	019705	Flexible cleaning hose incl. pistol	220	1

Dispenser


FIS DM S Pro


FIS AM


FIS DM S-L


FIS AM S-XL


FIS DB S Pro


FIS DB SL Pro


FIS DP S-XL

Item	Item-No.	Description	Sales unit [pcs]
FIS DM S Pro	**563337**	Manual dispenser for 360 ml- and 390 ml cartridges	1
FIS AM	**058000**	Manual dispenser for 360 ml- and 390 ml cartridges	1
FIS DM S-L	**567768**	Manual dispenser for 585 ml cartridges	1
FIS AM S-XL	**563241**	Manual dispenser for 825 ml cartridges	1
FIS DB S Pro	**558955**	Battery operated dispenser for 360 ml- and 390 ml-cartridges with 1x charger 12-36V EU, 1x battery pack 18V 2,0 Ah, 1x screw off handle, 1x belt hook, 1x hard case	1
FIS DB SL Pro	**562004**	Battery operated dispenser for 585 ml and 825 ml-cartridges with 1x charger 12-36V EU, 1x battery pack 18V 2,0 Ah, 1x screw off handle, 1x belt hook, 1x hard case	1
FSS-B 18V 2,0Ah	**563787**	Battery Pack 2,0 Ah FIS DB S Pro, FIS DB SL Pro	1
FSS-B 18V 4,0Ah	**552930**	Battery Pack 4,0 Ah FIS DB S Pro, FIS DB SL Pro	1
FIS DP S-XL	**512401**	Pneumatic dispenser for 1500 ml cartridges	1

Drilling aid / scrabbeling tool


Drilling aid 3pcs.


Scabbling tool

Item	Item-No.	Match	Description	Dimensions [mm]	Sales unit [pcs]
Drilling aid 3pcs.	**090819**	–	–	–	1
Scabbling tool	**001253**	Chuck type SDS max	SDS-max stocker for roughening the concrete surface	45 x 240	1

FIS-Rebar case


FIS-Rebar case

Item	Item-No.	Contents [mm]	Sales unit [pcs]
FIS-Rebar case DE	**505941**	8 x Cleaning brush BSB, 5 x Extensions for cleaning brushes à 40 cm, 1 x SDS Chuck with internal thread M 8, 24 x Injection adapter, 1 x Cleaning hose complete, 1 x Brush control template, 8 x Cleaning nozzle, 1 x Marker tape, 1 x Digital thermometer, 1 x Protective goggles, 1 x Installation instructions (german), 10 x Installation report, 2 x Flat spanner SW 7 and the relevant approvals	1
FIS-Rebar case EN	**505942**	8 x Cleaning brush BSB, 5 x Extensions for cleaning brushes à 40 cm, 1 x SDS Chuck with internal thread M 8, 24 x Injection adapter, 1 x Cleaning hose complete, 1 x Brush control template, 8 x Cleaning nozzle, 1 x Marker tape, 1 x Digital thermometer, 1 x Protective goggles, 1 x Installation instructions (german), 10 x Installation report, 2 x Flat spanner SW 7 and the relevant approvals	1

Loads for post-installed rebar connections.

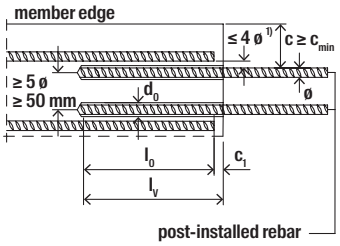
Injection systems FIS EM Plus or FIS RC II with reinforcing steel B500B[5] in accordance with rebar theory

Design resistances and permissible loads[1] [6] of single, post-installed rebars in cracked or non-cracked normal concrete of the strength class C20/25[2].

Reinforcing steel B500B fyk / fuk 500 / 540 N/mm² Type	Basic value for the anchorage length for FIS EM Plus $l_{b,rqd}$ [4] [mm]	Basic value for the anchorage length for FIS RC II $l_{b,rqd}$ [4] [mm]	Maximum anchorage depth $l_{V,max}$ [mm]	Maximum design resistance for axial tensile load $N_{Rd,s}$ [3] [kN]	Maximum permissible tensile load $N_{zul,s}$ [3] [kN]
ø 8 mm	378	378	1800 (3000)	21.9	15.6
ø 10 mm	473	473	1800 (3000)	34.1	24.4
ø 12 mm	567	567	1800 (3000)	49.2	35.1
ø 14 mm	662	662	1800 (3000)	66.9	47.8
ø 16 mm	756	756	1800 (3000)	87.4	62.4
ø 20 mm	945	945	1800 (3000)	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	2000 (3000)	213.4	152.4
ø 26 mm	1229	–	2000	230.8	164.9
ø 28 mm	1323	1323	2000 (3000)	267.7	191.2
ø 30 mm	1418	1418	2000	307.3	219.5
ø 32 mm	1512	1512	2000 (3000) (1500)[8]	349.7	249.8
ø 34 mm	1607	607	2000	394.7	282.0
ø 36 mm	1701	1701	2000	442.6	316.1
ø 40 mm	1890	1890	2000	546.4	390.3

For planning and design the complete European Technical Assessments ETA-17/1056 (FIS EM Plus) 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 γ_L = 1.4 are considered.
[2] The ETAs for FIS EM Plus 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 N/mm² 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 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] FIS RC II at installation temperature T_i > 0 °C.



[1] If the clear distance of the lapped bars is larger than 4 x ø, EC2 must be applied.

Loads for reinforcing anchors.

Rebar anchor FRA with injection systems FIS EM Plus 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 C20/25[3)].

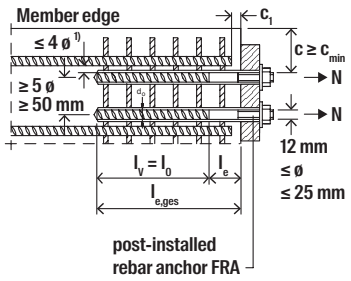
Type	Basic value for anchorage length $l_{b,rqd}$[4)] [mm]	Maximum anchorage depth $l_{v,max}$ [mm]	Maximum embedment depth $l_{e,ges,max}$ [mm]	Maximum Installation torque T_{inst} [Nm]	Maximum design resistance for axial tension load $N_{Rd,s}$[5)] [kN]	Maximum permissible tension load $N_{perm,s}$[5)] [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) 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 γ_L = 1.4 are considered.
[2)] With FIS EM Plus 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 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_0 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 x ø, 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
ø	Diameter of the post-installed rebar anchor
l_0	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

References worldwide

Hong Kong-Zhuhai-Macau Bridge

Far – Further – the Hong Kong-Zhuhai-Macao Bridge. 20 times as long as the Golden Gate Bridge in San Francisco, it serves as an overwater crossing for tens of thousands of passenger every day. Designed for a service life of 120 years, FIS EM Plus was the right choice and used, due to its certified durability and its suitability for anchorages in coastal regions as well as post-installed rebar connections.

Grand Paris

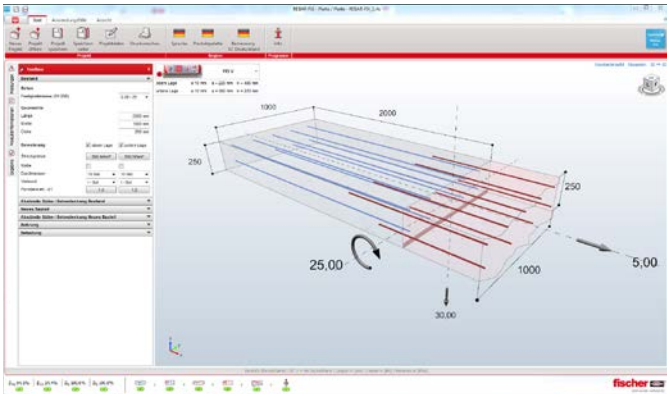
The largest infrastructure project in Western Europe "Grand Paris Express" will double the length of the Paris metro network by 2030 and connect the city centre with the Paris suburbs. In 14 years 200 km of additional railway lines with 68 new metro stations will be built. The FIS EM Plus ensures structural integrity by using it to connect the floor plates to the retaining walls.

REBAR-FIX.
For the design of post-installed rebar connections in concrete construction.

fischer REBAR-FIX enables engineers to quickly and easily create a verifiable proof for post-installed rebar connections via clearly defined configurations, set out in the approvals.
In addition to EC2 Part 1-1 for end anchorages, tensile force covers and lap joints, the verification according to EOTA TR 069 can also be used for flexurally stiff connections without the need for reinforcement in the existing structure. Special cases can be designed using the engineering method (ENSO) which is included in the software.

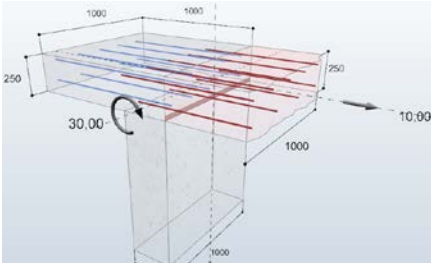
Your advantages at a glance

- Design using fischer approved mortar systems RebarConnect FIS RC II and FIS EM Plus.
- Designs can be created for all concrete compressive strength classes from C12/15 to C50/60 according to EN 206:2013.
- FIS EM Plus rod diameter 8 – 40 mm and RebarConnect FIS RC II rod diameter 8 – 40 mm.
- Status bar with degree of utilization.
- Proof under the influence of fire possible.
- Verifiable printout.
- Materials required listed in the printout.
- Verification according to EN 1992-1-1:2004+AC:2010.
- Verification according to TR 069.
- Design according to "ENSO" (Engineering Solution) for special cases (e.g. frame nodes).
- Proof of tensile load, torque and transverse load.

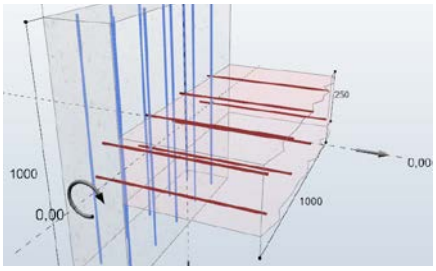


The program can be downloaded free of charge on the fischer website (as a complete package) from the link below:
www.fischer-international.com/fixperience

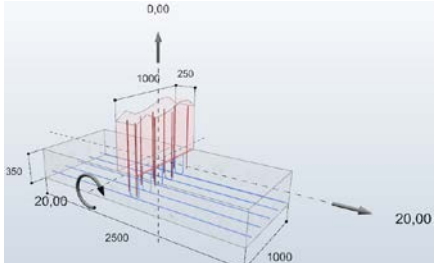
If you have any questions about the application:
Phone: 01805 520 29 01 or E-Mail: anwendungstechnik@fischer.de



Connection plate / plate with support



Connection plate / wall



Connection wall / foundation

System accessories drill bits.

fischer offers a wide range of drill bits. For post-installed rebar connection, the fischer hammer drill Quattric II (ø 12 - 25) and the hammer drill SDS Max II (ø 12 - 40) with drill lengths over 2 m as well as the hollow drill FHD and FHD Max (ø 12 - 35) are suitable.

Hammer drill bit Quattric II

- "Power Shoulders" for improved break-up performance in concrete.
- Massive main cutting edges for rapid drilling progress.
- Centering tip for easy positioning.
- Two-piece spiral increases drilling speed and prolongs service life.

Hammer drill bit SDS Max IV

- The SDS-Max drive optimises power transmission and enables fast drilling progress in large-volume holes.
- The four-edged drill head prevents jamming in the reinforcement unlike to conventional drill bits.
- The 4-speed drill efficiently removes drilling dust from the borehole thus reducing wear.
- The core-reinforced drilling coil ensures maximum energy transfer and reduces vibration.

Hollow drill bit FHD / FHD Max

- Drilling and hole cleaning in one operation replaces conventional cleaning for both chemical and mechanical anchors (with appropriate ETA approval).
- Time savings of 55% for correct drill hole creation.
- Drill dust extracted during the operation creating a cleaner and healthier environment.
- Removal of dust from drill tip reduces jamming and ensures smoother faster drilling when compared to conventional drills.
- Centering tip for easy and accurate drilling, prevents slipping on smooth surfaces.

The battery dispenser for professionals.

Universal cartridge holder for the cartridge sizes 150T, 300T, 360S and 390S.

Dosing function for **optimum mortar use** depending on the application.

Adjustment for **permanent squeezing.**

Speed controller for **variable processing speed.**

Detachable handle for **ergonomic working.**

Compatible CAS battery with 2 Ah and 4 Ah.

FIS DB S Pro
Item-No. 558955 (EU)
Item-No. 564960 (UK)

Powerful drive for **deep drill holes.**

Sturdy cartridge cage made of metal for a **long-lasting use.**

Universal cartridge holder for cartridge sizes 585S and 825S.

Soft ergonomic rubber grip.

FIS DB SL Pro
Item-No. 562004 (EU)
Item-No. 564961 (UK)

Convenient Belt Hook **for easy carrying..**

The advantages at a glance

- The dosing function enables efficient adjustment of the mortar quantity to match the drill hole size.
- The dispensing speed can be adjusted to the application via a controller.
- The detachable handle and belt hook ensure the dispenser is easy and comfortable to use.
- The sturdy design of the device guarantees reliable and long-lasting use under demanding building site conditions.
- The 18V technology delivers the necessary dispensing power. Furthermore, the battery is compatible with all Cordless Alliance System (CAS) power tools and chargers worldwide.

More information:
www.fischer-international.com/dispenser

Seminars for contractors.

Qualification training for post-installed rebar connections (including in diamond-drilled holes)

The seminar is aimed at contractors in the construction industry. At the end of the seminar, participants receive a certificate confirming that they have been trained in the installation of post-installed rebar connections in accordance with the requirements of the Model Administrative Regulation on Technical Building Regulations (MVV TB) and the Administrative Regulation on Technical Building Regulations (VV TB) of the respective federal states. This stipulates that "the installation of post-installed rebar connections must be carried out by companies that have a qualified manager, a site supervisor and site personnel who are specially trained to carry out the reinforcement connections and can provide evidence of a valid certificate for this purpose." You will be authorized to perform post-installed rebar connections in hammer-drilled, pneumatic-drilled and diamond-drilled holes in accordance with the European Technical Assessments.

Introduction to the procedure (Theory)

- Requirements of the approval to the contractor.
- Required equipment.
- Special conditions for using various fischer injection systems for post-installed rebar connection.

Installation procedure (Practical)

- Creation of the drill hole (> 1m).
- Drill hole cleaning.
- Filling drill hole with injection mortar.
- Inserting the reinforcement bar.

Examination

- Validated by an independent auditor appointed by DIBt (theoretical and practical examination).

Our 360° service to you.

From software solutions, to training, to personal consulting. As a reliable partner, we are always happy to assist you with technical advice and prcatical solutions.

Your advantages:

- We have an extensive range of products from chemical resin systems and steel anchors through to nylon anchors.
- We offer competance and innovation as a reult of our own research, development and production.
- We have a global presence and active sales service in over 100 countries.
- Qualified technical consulting for cost effective and approved fastening solutions. Onsite technical assistance on site if requested.
- Training sessions, with and without accreditation, at your location or at the fischer academy.
- Design and construction software for demanding. applications.

Design Software fischer FiXperience.

The fischer design Software FiXperience gives you safe and reliable support in accessing the fixings for your projects whether you are a planer, structural engineer or constructors. Measuring has never been so simple!

Software and modules for your daily work.

- The modular design program includes engineering software and application modules.
- The software is based on international design standards (ETAG 001, EC1, EC2, EC3 and EC5), including the national application documents. All standard load and units of measurement are available.
- Incorrect input will be recognized and the software will give tips to ensure the correct result. This ensures a safe and reliable designs every time.
- The graphical image can easily be rotated through 360°, panned, tilted or zoomed as required.
- The 3D display gives a detailed and realistic image.
- The “live update” feature helps to keep the program up to date ensuring you are always working with the latest version.
- Free download and updates at: **www.fischer-international.com/fixperience**

Dealer:

www.fischer-international.com

fischer stands for

Fixing Systems
fischertechnik
Consulting
Electronic Solutions

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