fischer

# FIS EM Plus.

The injection mortar for strong bonds.

# The high-performance injection mortar for post-installed rebar connections, anchorings in cracked concrete and wood.


FIS EM Plus 585 S

FIS EM Plus 390 S

FIS EM Plus 1500 S

FIS EM Plus 300 T

# Advantages and product description.

**Your advantages at a glance:**

- The assessment (ETA) guarantees a service life of 100 years for post-installed rebar connections and anchorages in cracked and non-cracked concrete.
- The injection mortar is suitable for diamond drilled and water-filled holes and seismic applications in the performance categories C1 and C2 and therefore offers a secure hold even under extreme conditions.
- The epoxy resin mortar enables the transmission of high loads and installation with variable anchoring depths in combination with the FIS A anchor rod.
- The approved anchoring elements open up a wide range of applications, including temporary and removable fixings with the RG M I internally threaded anchor made of galvanized or stainless steel R.
- In combination with the fischer anchor rods FIS A/RG M (8.8 gvz or rust-proof steel R) and the appropriate filling set, the system offers a solution for anchoring dynamic loads that complies with the approval.
- Anchoring with the FIS EM Plus can be used in sealing surfaces in accordance with the German Water Resources Act with construction type approvals for FD-FDE concrete or coated concrete.
- The approved bonding of anchor rods and internally threaded anchors in timber construction materials (glued laminated or glued solid timber made of spruce, fir, pine) allows the bearing of high loads in structural timber construction.

- The ETA assessment guarantees a service life of 100 years. The IEA Stuttgart report even confirms a service life of up to 120 years, underlining the reliability and durability of FIS EM Plus.
- The optimized formulation of the FIS EM Plus epoxy resin mortar leads to improved load values in cracked and non-cracked concrete.
- The mortar can be used for reinforcement connections with a diameter of 8 to 40 mm.
- With the FIS A anchor rod, the loads to be applied can be varied by selecting the anchoring depth. Temporary and removable fixing points are possible with the RG M I internally threaded anchor.
- FIS EM Plus can also be processed at low temperatures down to -5°C for use on construction sites.

**Certificates / Features**

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

ETA-17/0979,
for cracked concrete, Seismic performance categories C1, C2

ETA-22/0001,
post-installed rebar connections with improved bond-splitting behaviour under static loading and seismic action

ETA-23/0842,
for subsequently installed fasteners in concrete under fatigue-relevant cyclic loading

ETA-19/0657,
for glued-in steel rods for wood joints

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

aBG WHG, General design approval (aBG) Water resources law (WRL) / Bonding steel rods in timber construction materials

Fire resistance
class R 240

# NEW! FIS EM Plus now in the 300 ml cartridge. Suitable for standard silicone dispensers.


**FIS EM Plus 300 T**
The injection mortar can be applied without special tools using stable, commercially available silicone injection devices.

# Performance features at a glance.

## Service life up to 120 years


**Lasts for eternity:**
In the assessment (ETA), anchorages and post-installed rebar connections for the FIS EM Plus are regulated with a service life of 100 years.
An official expert report from the IEA Stuttgart even certifies a service life of 120 years for anchorages.

## Seismic applications in earthquake zones


**Always on the safe side with FIS EM Plus:**
Approved for seismic applications of the performance categories C1 and C2 as well as for the seismic zones A to F according to the ICC-ESR.
Post-installed rebar connections are also approved in the assessment (ETA) for seismic loads.

## Diamond drilling


**Maximum load level in cracked concrete:**
FIS EM Plus achieves its maximum load values in diamond drilled holes even without additional roughening. This saves time and avoids misapplication.

## Installation temperatures

**Well equipped for every season:**
The approved installation temperatures of -5 °C to + 40 °C enable the use of FIS EM Plus all year round.

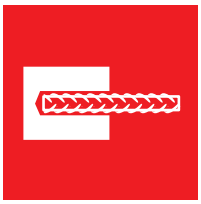
## Steel fibre reinforced concrete


**Secure anchoring in all substrates:**
With the ETA for applications in steel fibre reinforced concrete, the injection mortar FIS EM Plus is also the safe choice in steel fibre reinforced substrates.

## Underwater application

**Can be used in all weather conditions:**
FIS EM Plus can be easily installed in water-filled drill holes, hence can be used under all construction site conditions. In accordance with the ICC approval, anchoring can even be carried out underwater

## Post-installed rebar connections

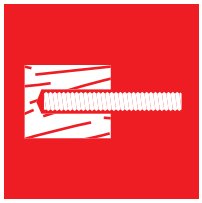


**The partner for strong connections:**
Optimised for large diameters and deep drill holes FIS EM Plus is the reliable choice for post-installed rebar connections.

## Anchorages in WRL sealing surfaces


**Tight, tested and officially certified:**
In the system with the anchor rod FIS A and the WRL marking, FIS EM Plus is the first injection mortar with a general design approval (aBG) for WRL-compliant anchorages in FD-/FDE concrete.

## Glued anchorings in wood constructions



**Appealing connection solutions for structural timber construction:**
In accordance with construction type approval Z-9.1-914 FIS EM Plus is suitable for glued anchorings in glued laminated timber or glued solid timber made of spruce, fir or pine. This allows the installation of wood-wood, wood-concrete and wood-steel connections.

## Dynamic


**Prepared for dynamic loads:**
The FIS EM Plus is also approved for dynamic loads in accordance with ETA-23/0842 and in combination with the fischer anchor rods FIS A / RG M in sizes M12 – M24. The system can also be installed in push-through installation without subsequent annular gap filling.

# Functioning in concrete.

## Functioning

- The epoxy resin mortar FIS EM Plus can be used with the anchor rod FIS A for pre-positioned and push-through installation and with the RG M I internal threaded anchor for push-through installation.
- Resin and hardener are stored in two separate chambers and are only mixed and activated in the static mixer when the cartridge is pressed out.
- The mortar is injected bubble-free from the bottom of the drill hole.
- The mortar bonds the fixing to the drill hole wall over the entire surface and seals the drill hole completly.
- The fixing element is set by hand with a slight twisting movement down to the bottom of the hole.
- For push-through installation, the annular gap between the fixing element and the attachment part is filled with FIS EM Plus.

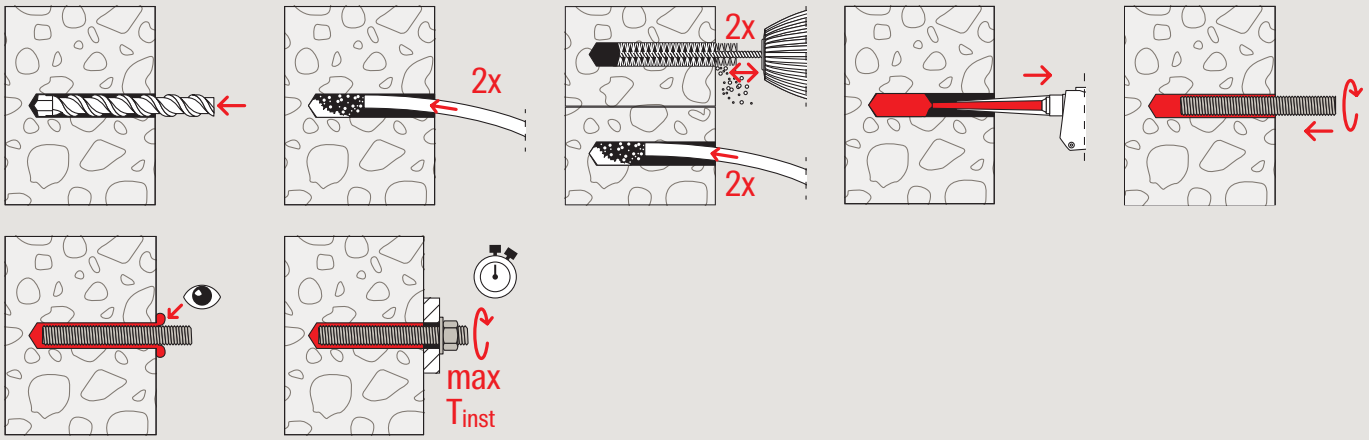
Injection mortar FIS EM Plus
with anchor rod FIS A

## Curing times

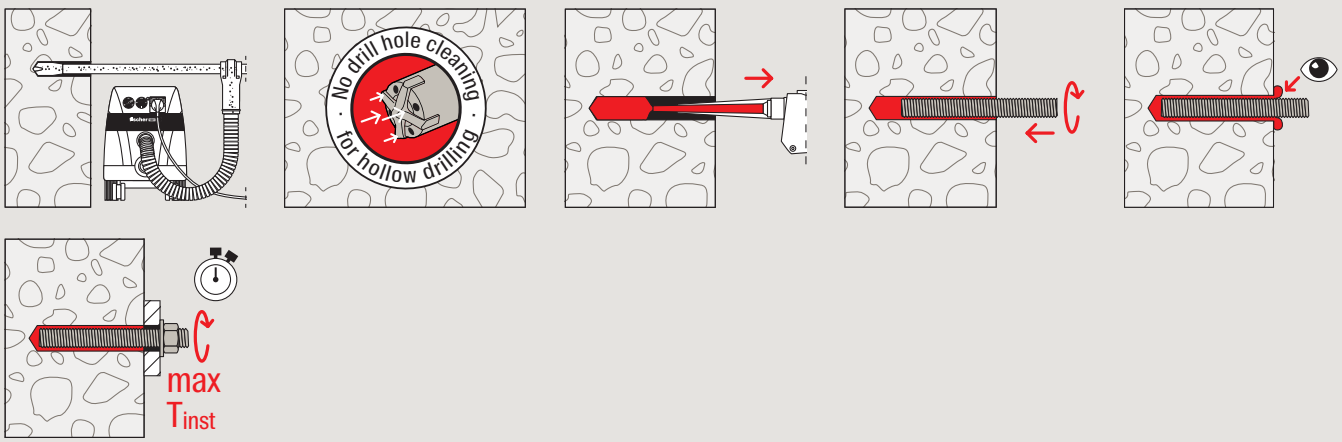
| Processing and curing times | | | | | | |
|---|---|---|---|---|---|---|
| **Temperature in the anchorage base [°C]** | - 5 – 0 | >0 – +5 | >+5 – +10 | >+10 – +20 | >+20 – +30 | >+30 – +40 |
| **Maximum processing time [minutes]** | 240 | 150 | 120 | 30 | 14 | 7 |
| **Minimum curing time [hours]**[1)] | 200 | 90 | 40 | 18 | 10 | 5 |

1) In wet concrete and water-filled borehole, double the curing times

## Pre-positioned installation




## Pre-positioned installation with hollow drilling



# Suitable building materials and compatible anchoring elements.

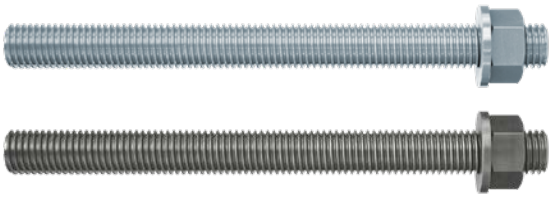
Cracked concrete

Uncracked concrete

Steel fibre reinforced concrete

**Approved for anchorages in:**
- Concrete C20/25 to C50/60, cracked and non-cracked

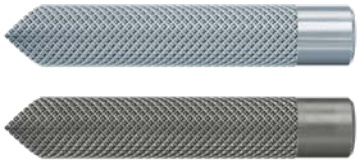
**Also suitable for:**
- Natural stone with dense structure



**Anchor rod FIS A**
Made of zinc plated or stainless steel R or HCR.

## Anchor rod FIS A

- The anchor rod FIS A is approved for use with FIS EM Plus in sizes M8 – M30 made of zinc plated or stainless steel R for use with FIS EM Plus.
- The variable anchoring depths allow optimum adaptation to the application and load requirements.



**Internally threaded anchor RG M I**
Made of zinc plated or stainless steel R.

## Internally threaded anchor RG M I

- The internal threaded anchor RG M I is available in the sizes M8 – M20 made of zinc plated or stainless steel R.
- In combination with metric screws or anchor rods, the RG M I can be used to create detachable fixings.

**Rebar anchor FRA**
Rebar anchor made of reinforcing steel with metric connection thread made of stainless steel.

## Rebar anchor FRA

- The FRA reinforcement anchor is a reinforcement bar with a metric connection thread made of stainless steel in the sizes M12 – M24.
- Thanks to the connection thread, the anchoring of steel components can be carried out and verified according to reinforcement theory.
- This makes it possible to introduce high tensile loads at a small distance from the concrete edge.
- The FRA is approved as an overlap joint according to reinforcement theory and as an anchor connection.

**Concrete-concrete Shear Connector FCC-H**
Concrete steel bar bar with head bolt for structural reinforcement.

## Concrete-Concrete Shear Connector FCC-H

- The FCC-H is a concrete steel bar with head bolt for connecting a concrete layer with the existing concrete structure.
- The concrete-concrete shear connector FCC-H is approved by the building authorities for renovation of structures, such as the renovation of bridges, the increase the load-bearing capacity of ceilings or for the reinforcement of columns.

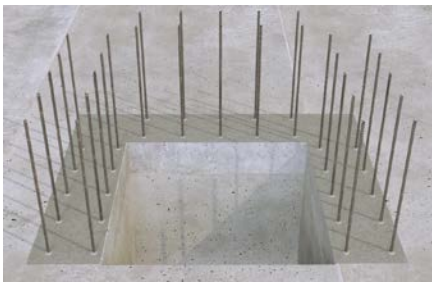
# Special applications are our strength.


## Post-installed rebar connections

**How post-installed rebar connections are professionally carried out.**

### Approved system for post-installed rebar connections

- The injection mortar FIS EM Plus can be used for post-installed rebar connections in diameters of 8 - 40 mm. The assessment (ETA) also certfies for seismic applications a service life of 100 years.
- In addition to the already established method according to Eurocode 2 (EC 2), FIS EM Plus also has an ETA in accordance with EOTA Technical Report TR 069 (incl. Seismic), which provides a design procedure for anchoring of post-installed rebars with improved bond gap behavior compared to EN 1992-1-1.
- The rebar anchor FRA with connection thread made of stainless steel fully uses the load-bearing of the concrete. This allows very high tensile loads to be introduced into the anchorage base.
- Accessories suitable for the construction site such as injection aids and extension hoses ensure a quick work progress. The FIS-rebar case contains all the necessary individual components to ensure an easy, safe and comfortable installation.



CE ETA-17/1056, EAD 330087-01-0601 post-installed rebar connections

CE ETA-22/0001, post-installed rebar connections with improved bond-splitting behaviour under static loading and seismic action


## WRL compliant anchorages

**Tight. Tested. Officially sealed.**

### First WRL-compliant anchorage with general design approval

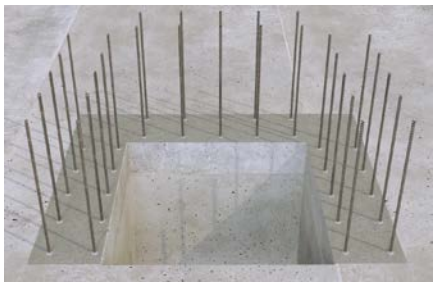
- FIS EM Plus is the first system approved with a general design approval for WRL-compliant anchorages in FD/FDE concrete.
- For coated concrete, FIS EM Plus in combination with the epoxy resin coating StoCretec WRL System 2 also has a general construction type approval for a wide range of media groups.
- For coated concrete, fischer has proven the WRL suitability through an accredited testing institute and an expert opinion.
- The system consisting of injection mortar FIS EM Plus, FIS A anchor rod and WRL marking or WRL set offers safe and uncomplicated installation in WRL sealing surfaces.

aBG Mit allgemeiner Bauartgenehmigung Z-74.6-199 / Z-74.8-211 / Z-31-914

General design approval (aBG WHG - German designation) Water resource law (WRL)

# Applications

## Post-installed rebar connections



For further information on post-installed rebar connections please visit fischer-international.com/rebar

## Rail fastenings, noise barriers and railings

## Seismic applications and concrete-concrete connections

## WRL, underwater applications

Further information on WHG applications can be found online at fischer-international.com/en/service/planning-aids/wrl

# Dynamic applications in concrete.


## Fastening with FIS A and RG M for dynamic loads.

### Approved system for fastening dynamic loads

- The system provides values for the load-bearing capacity under dynamic action in an ETA for the fischer anchor rods FIS A and RG M in strength 8.8 gvz and stainless steel R-70, using the dynamic set. The ETA regulates gvz in sizes M12 and M16 and stainless steel R in sizes M12 to M24.
- The FIS A or RGM anchor rods are installed using FIS EM Plus injection mortar.
- The approved stainless steel R anchor rods can be used outdoors.
- Variable anchoring depths enable ideal adaptation to the load and ensure optimized use of installation and materials.
- Low component thickness as well as center and edge distances.

CE ETA-23/0842,
for subsequently installed fasteners in concrete under fatigue-relevant cyclic loading

Further information on dynamic applications can be found online at fischer-international.com/en/expertise/dynamic-fixing-solutions or in the brochure (Art. No. 508466)

### Dynamic applications

The applications in wood and for dynamic fastenings are each described in separate, specific brochures. You can download these from the fischer website.

# 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 **flexible processing speed.**

Detachable handle for **ergonomic working.**

**Compatible CAS battery** with 2 Ah and 4 Ah.

**FIS DB S Pro**
Art.-No. 558955

Powerful 18 V drive also for **deep drill holes.**

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


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

Soft rubber coating for **ergonomic working.**

**FIS DB SL Pro**
Art.-No. 562004

Belt hook for **practical carrying.**

## The advantages at a glance

- The dosing function enables the 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 particularly ergonomic use.
- The sturdy design of the device guarantees reliable and long-lasting processing under demanding building site conditions.
- The 18V technology provides for 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

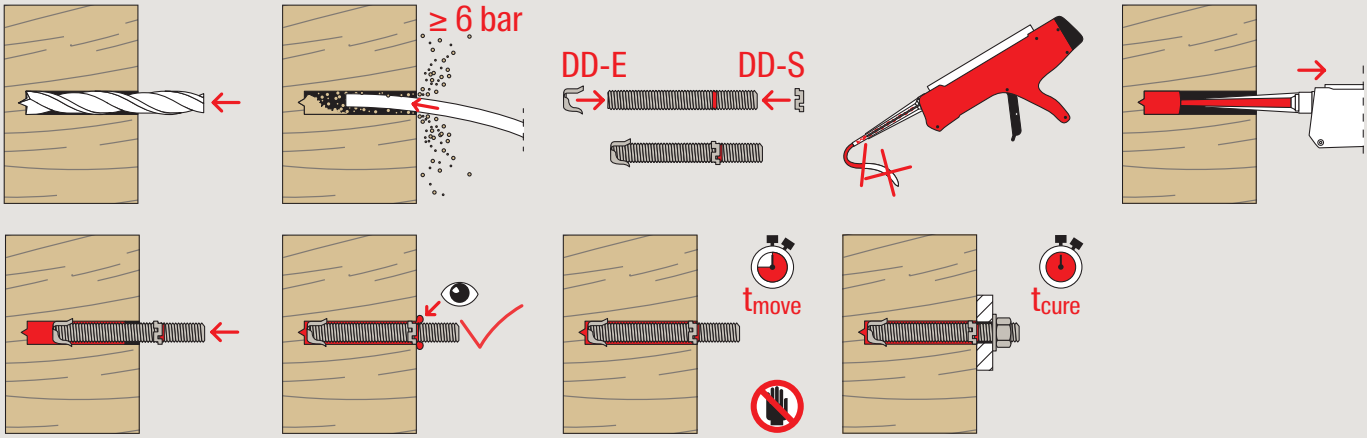
# Glued anchorings in wood.

## Functioning

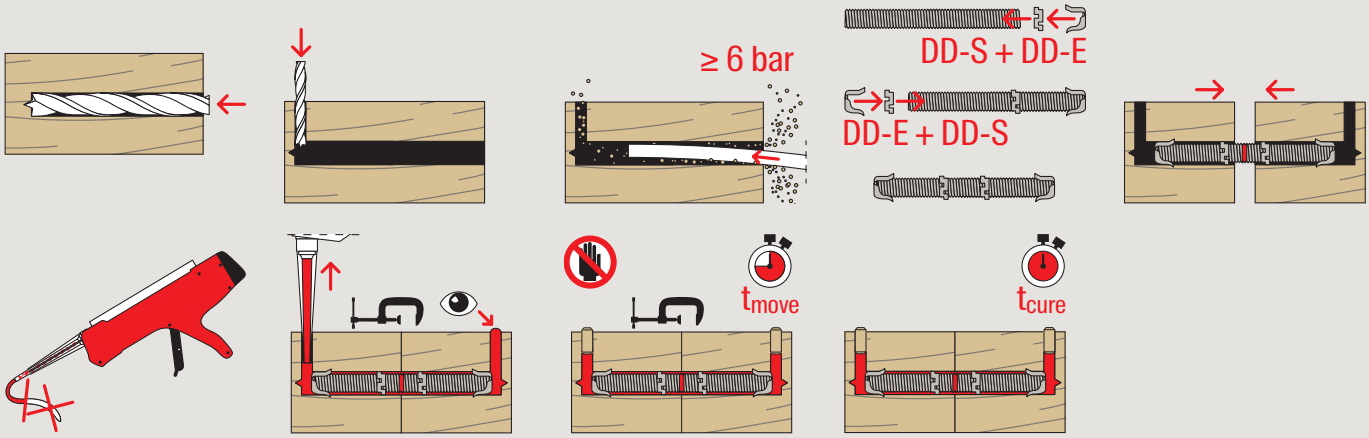
- The FIS EM Plus epoxy resin mortar is approved with the FIS A anchor rod for pre-positioned and push-through installation and with the internally threaded anchor FIS IG for pre-positioned installation.
- To center the fastening elements in the drill hole, it is recommended to use the anchor rods with centering clips, such as the fischer DD-E and DD-S.
- When using the method without side-injection holes, the mortar is injected bubble-free from the bottom of the drill hole. The anchor is set manually by lightly rotating it until it reaches the drill hole base.
- When using the processing method with side-injection holes, the fastening element is inserted into the empty drill hole in the first step. The mortar is then applied via the side-injection hole from the bottom of the drill hole until the mortar emerges at the entrance of the drill hole.
- Resin and hardener are stored in two separate chambers and are not mixed and activated until extrusion from the injection cartridge in the static mixer.
- The mortar bonds the fastening element to the entire surface of the drill hole wall. The centering clips ensure the centering of the fixing element.

Injection mortar FIS EM Plus in wood with anchor rod FIS A

## Gluing in wood with FIS EM Plus and anchor rod FIS A as pre-positioned installation



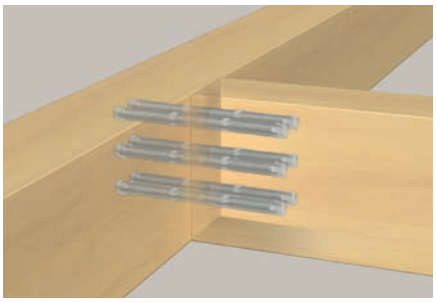

## Gluing in wood with FIS EM Plus and anchor rod FIS A as wood-wood-connection



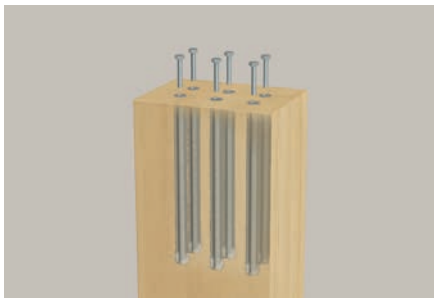

Other installation methods such as push-through installation or installation with vent hole can be found in the detailed installation instructions for the product or at the fischer website.

# Application examples in wood.

Glued laminated timber or glued solid timber made of spruce, fir, pine

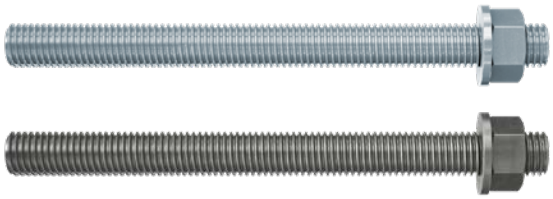


Wood-wood connection with anchor rod FIS A



Connection with internally threaded anchor FIS IG and hexagon head screw

## Applications in structural timber construction



**Anchor rod FIS A**
Made of galvanized or stainless steel R or HCR.

### Anchor rod FIS A

- The FIS A anchor rod is available in sizes M6 - M30 made of galvanized or stainless steel R or HCR for use with FIS EM Plus.
- Variable anchoring depths enable optimum adaptation to the respective application, component thickness and load requirement.

**Internally threaded anchor FIS IG**
Made of galvanized or stainless steel R.

### Internally threaded anchor FIS IG

- The internally threaded anchor FIS IG is available in the internal thread sizes M8 - M20 made of galvanized or stainless steel R.
- In combination with metric screws or anchor rods, the FIS IG can be used to create detachable fixings.

# Reference projects 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 over water crossing for tens of thousand of passers-by every day.
Designed for a service life of 120 years, FIS EM Plus was able to convince thanks to its certified durability. The product was also used due to its suitability for anchorages in seacoast regions and for post-installed rebar connections.

## A true highlight - Germany's highest viewing platform

Larger than any building in Baden-Württemberg: with the lift test tower, thyssenkrupp Elevator AG literally provides a new highlight in the popular southern German region.
In order to fix this construction securely to the ground, in zone 1, the area from 0-27 m, our FIS EM Plus came into play.

## Anchors for the world's tallest statue

High up: India's "Statue of Unity" towers all statues in the world with a height of 182 metres. From the viewing platform visitors can look far out through openings at the chest level of the statue.

FIS EM Plus scored with high load-bearing capacity in concrete as well as applicability in earthquake-prone areas and gives this "Colossus" a firm hold.

## The St. Pauli Elbtunnel - a centuries-long connection

The 426.5 metre long St. Pauli Elbtunnel has connected the northern edge of the St. Pauli Landing Bridges with the Elbe Island of Steinwerder.
In the course of the tunnel renovation the stairways for pedestrians were rebuilt. Earthquake-proof support is provided for the approx. 20-metre high construction with our FIS EM Plus injection mortar.

# Product range

## Epoxy 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 No. | Approval ETA | Approval ICC | Languages on the cartridge | Contents | Sales unit [pcs] |
|---|---|---|---|---|---|---|
| **Item** | | | | | | |
| **FIS EM Plus 300 T** | **575313** | ● | ● | IT, DE | 1 cartridge 300 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 300 T** | **575314** | ● | ● | EN,AR,PT | 1 cartridge 300 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544154** | ● | ● | EN, FR, NL | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544155** | ● | ● | EN, AR, ZH | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544176** | ● | ● | CS, SK, RO | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544159** | ● | ● | RU, UK, KK | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 585 S** | **544166** | ● | ● | EN, ES, PT, EL | 1 cartridge 585 ml + 2 x static mixer FIS UMR | 6 |
| **FIS EM Plus 585 S** | **544165** | ● | ● | PL, CS, SK, KO | 1 cartridge 585 ml + 2 x static mixer FIS UMR | 6 |
| **FIS EM Plus 585 S** | **544175** | ● | ● | EN, ZH, KO | 1 cartridge 585 ml + 1 x static mixer FIS UMR, 1 x extension tube Ø 9 x 250mm | 6 |
| **FIS EM Plus 1500 S** | **544167** | ● | ● | EN,DE,FR,IT,ES | 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 |

## Dispenser


FIS DM S Pro


FIS AM


FIS AM S-XL

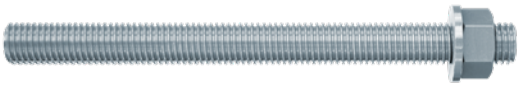

FIS DB S Pro


FIS DB SL Pro


FIS AP

| | Item No. | Description | Suitable for | Sales unit [pcs] |
|---|---|---|---|---|
| **Item** | | | | |
| **FIS DM S Pro** | **563337** | Manual dispenser | 150 T, 300 T, 360 S, 390 S cartridges | 1 |
| **FIS AM** | **058000** | Manual dispenser | 150 T, 300 T, 360 S, 390 S cartridges | 1 |
| **FIS AM S-XL** | **563241** | Manual dispenser | 525 S cartridges | 1 |
| **FIS DB S Pro (EU)** | **558955** | Battery operated dispenser with 1x charger 12-36V EU, 1x battery pack 18V 2.0 Ah, 1x screw off handle, 1x belt hook, 1x hard case | 150 T, 300 T, 360 S, 390 S cartridges | 1 |
| **FIS DB S Pro (UK)** | **564960** | Battery operated dispenser with 1x charger 12-36V UK, 1x battery pack 18V 2.0 Ah, 1x screw off handle, 1x belt hook, 1x hard case | 150 T, 300 T, 360 S, 390 S cartridges | 1 |
| **FIS DB S Pro Solo** | **567189** | Battery operated dispenser with 1x screw off handle, 1x belt hook, 1x hard case | 150 T, 300 T, 360 S, 390 S cartridges | 1 |
| **FIS DB SL Pro (EU)** | **562004** | Battery operated dispenser with 1x charger 12-36V EU, 1x battery pack 18V 2.0 Ah, 1x screw off handle, 1x belt hook, 1x hard case | 585 S, 825 S cartridges | 1 |
| **FIS DB SL Pro (UK)** | **564961** | Battery operated dispenser with 1x charger 12-36V UK, 1x battery pack 18V 2.0 Ah, 1x screw off handle, 1x belt hook, 1x hard case | 585 S, 825 S cartridges | 1 |
| **FIS DB SL Pro Solo** | **567295** | Battery operated dispenser with 1x screw off handle, 1x belt hook, 1x hard case | 585 S, 825 S cartridges | 1 |
| **FSS-B 18V 2,0Ah** | **563787** | Battery Pack | FIS DB S Pro, FIS DB SL Pro | 1 |
| **FSS-B 18V 4,0Ah** | **552930** | Battery Pack | FIS DB S Pro, FIS DB SL Pro | 1 |
| **FIS AP** | **058027** | Pneumatic dispenser | 150 T, 300 T, 360 S, 390 S cartridges | 1 |

**Threaded rod FIS A in combination with FIS EM Plus in concrete**



FIS A, Zinc plated

FIS A, Stainless steel

| | Zinc plated Steel grade 5.8 | Zinc plated Steel grade 8.8 | Stainless steel R FK 70 CRC III | Drill hole diameter | Min. anchorage depth | Max. usable length $h_{ef,min}$ | Min. filling quantity FIS EM Plus | Max. anchorage depth | Max. usable length $h_{ef,max}$ | Max. filling quantity FIS EM Plus | Sales unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Item No. | Item No. | Item No. | $d_0$ [mm] | $h_{ef,min}$ [mm] | $t_{fix}$ [mm] | $h_{ef,min}$ [scale units] | $h_{ef,max}$ [mm] | $t_{fix}$ [mm] | $h_{ef,max}$ [scale units] | [pcs]] |
| **Item** | | | | | | | | | | | |
| **FIS A M 8 x 90** | 090274 | 519390 | 090440 | 10 | 60 | 19 | 2 | 78 | 1 | 3 | 10 |
| **FIS A M 8 x 110** | 090275 | 519391 | 090441 | 10 | 60 | 39 | 2 | 98 | 1 | 3 | 10 |
| **FIS A M 8 x 130** | 090276 | 519392 | 090442 | 10 | 60 | 59 | 2 | 118 | 1 | 4 | 10 |
| **FIS A M 8 x 140** | 553763 | – | – | 10 | 60 | 70 | 2 | 129 | 1 | 2 | 10 |
| **FIS A M 8 x 175** | 090277 | 519393 | 090443 | 10 | 60 | 104 | 2 | 160 | 4 | 5 | 10 |
| **FIS A M 8 x 1000** | 509214 | 509222 | 509230 | 10 | 60 | – | 2 | 160 | – | 5 | 10 |
| **FIS A M 10 x 110** | 090278 | – | 090444 | 12 | 60 | 37 | 3 | 96 | 1 | 4 | 10 |
| **FIS A M 10 x 130** | 090279 | – | 090447 | 12 | 60 | 57 | 3 | 116 | 1 | 5 | 10 |
| **FIS A M 10 x 150** | 090281 | 517935 | 090448 | 12 | 60 | 77 | 3 | 136 | 1 | 5 | 10 |
| **FIS A M 10 x 170** | 044969 | 519395 | 044973 | 12 | 60 | 97 | 3 | 156 | 1 | 6 | 10 |
| **FIS A M 10 x 190** | – | 517936 | – | 12 | 60 | 117 | 3 | 176 | 1 | 7 | 10 |
| **FIS A M 10 x 200** | 090282 | 519396 | 090449 | 12 | 60 | 127 | 3 | 186 | 1 | 7 | 10 |
| **FIS A M 10 x 1000*** | 509215 | 509223 | 509231 | 12 | 60 | – | 3 | 200 | – | 7 | 10 |
| **FIS A M 12 x 120** | 044971 | 519397 | 044974 | 14 | 70 | 34 | 3 | 103 | 1 | 5 | 10 |
| **FIS A M 12 x 140** | 090283 | 519398 | 090450 | 14 | 70 | 54 | 3 | 123 | 1 | 6 | 10 |
| **FIS A M 12 x 160** | 090284 | 517937 | 090451 | 14 | 70 | 74 | 3 | 143 | 1 | 7 | 10 |
| **FIS A M 12 x 180** | 090285 | 519399 | 090452 | 14 | 70 | 94 | 3 | 163 | 1 | 7 | 10 |
| **FIS A M 12 x 200** | – | 517938 | 519421 | 14 | 70 | 114 | 3 | 183 | 1 | 8 | 10 |
| **FIS A M 12 x 210** | 090286 | – | 090453 | 14 | 70 | 124 | 3 | 193 | 1 | 9 | 10 |
| **FIS A M 12 x 260** | 090287 | – | 090454 | 14 | 70 | 174 | 3 | 240 | 4 | 10 | 10 |
| **FIS A M 12 x 1000*** | 509216 | 509224 | 509232 | 14 | 70 | – | 3 | 240 | – | 10 | 10 |
| **FIS A M 16 x 130** | 044972 | 519400 | 044975 | 18 | 80 | 30 | 5 | 109 | 1 | 7 | 10 |
| **FIS A M 16 x 175** | 090288 | 519401 | 090455 | 18 | 80 | 75 | 5 | 154 | 1 | 10 | 10 |
| **FIS A M 16 x 200** | 090289 | 517939 | 090456 | 18 | 80 | 100 | 5 | 179 | 1 | 11 | 10 |
| **FIS A M 16 x 250** | 090290 | 517940 | 090457 | 18 | 80 | 150 | 5 | 229 | 1 | 14 | 10 |
| **FIS A M 16 x 300** | 090291 | 519402 | 090458 | 18 | 80 | 200 | 5 | 279 | 1 | 17 | 10 |
| **FIS A M 16 x 350** | – | 558865 | – | 18 | 80 | 250 | 4 | 320 | 10 | 16 | 10 |
| **FIS A M 16 x 1000*** | 509217 | 509225 | 509233 | 18 | 80 | – | 5 | 320 | – | 19 | 10 |
| **FIS A M 20 x 245** | 090292 | 519404 | 090459 | 24 | 90 | 131 | 11 | 220 | 1 | 28 | 10 |
| **FIS A M 20 x 290** | 090293 | 519406 | 090460 | 24 | 90 | 176 | 11 | 265 | 1 | 32 | 10 |
| **FIS A M 20 x 350** | – | 559627 | – | 20 | 90 | 236 | 24 | 320 | 6 | 120 | 10 |
| **FIS A M 20 x 400** | – | 558866 | – | 20 | 90 | 286 | 10 | 375 | 1 | 42 | 10 |
| **FIS A M 20 x 1000*** | – | 519410 | 519427 | 24 | 90 | – | 11 | 400 | – | 48 | 10 |
| **FIS A M 24 x 290** | 090294 | – | 090461 | 28 | 96 | 165 | 15 | 260 | 1 | 39 | 5 |
| **FIS A M 24 x 380** | 090295 | – | 090462 | 28 | 96 | 255 | 15 | 350 | 1 | 52 | 5 |
| **FIS A M 24 x 450** | – | 558867 | – | 28 | 96 | 325 | 13 | 420 | 1 | 63 | 5 |
| **FIS A M 24 x 650** | – | 558868 | – | 28 | 96 | 525 | 13 | 480 | 141 | 63 | 5 |
| **FIS A M 24x 1000*** | – | 551771 | 568801 | 28 | 96 | – | 13 | 480 | – | 63 | 5 |
| **FIS A M 30 x 430** | 090297 | – | 090464 | 35 | 120 | 275 | 28 | 394 | 1 | 88 | 5 |
| **FIS A M 30 x 550** | – | 558869 | – | 35 | 120 | 396 | 24 | 515 | 1 | 120 | 5 |
| **FIS A M 30 x 650** | – | 558870 | – | 35 | 120 | 496 | 24 | 600 | 16 | 120 | 5 |
| **FIS A M 30 x 750** | – | 558871 | – | 35 | 120 | 596 | 24 | 600 | 116 | 120 | 5 |
| **FIS A M 30 x 1000*** | – | 568800 | 568802 | 35 | 120 | – | 27 | 600 | – | 132 | 5 |

* Order washer and nut separately. – FIS A made of high-corrosion resistant steel HCR upon request. Further dimensions on request.
The installation data do not apply for use in wood. Please follow the separate installation instructions for wood.

# Product range

## Internal threaded anchor FIS IG for use with FIS EM Plus in wood

FIS IG zinc plated steel

FIS IG stainless steel

| | Zinc plated steel | Stainless steel R | Internal thread | External thread | Drill hole diameter in wood | Min. drill hole depth | Anchor length | Max. screw-in depth | Sales unit |
|---|---|---|---|---|---|---|---|---|---|
| | Item No. | Item No. | [mm] | [mm] | $d_{drill}$ [mm] | $h_{drill}$ [mm] | l [mm] | $l_{E,max}$ [mm] | [pcs] |
| **Item** | | | | | | | | | |
| **FIS IG 8** | **572992** | **572997** | M8 | M12 | 14 / 16 | 120 | 120 | 20 | 10 |
| **FIS IG 10** | **572993** | **572998** | M10 | M16 | 18 / 20 | 160 | 160 | 25 | 10 |
| **FIS IG 12** | **572994** | **572999** | M12 | M20 | 22 / 24 | 200 | 200 | 30 | 10 |
| **FIS IG 16** | **572995** | **573000** | M16 | M24 | 26 / 28 | 240 | 240 | 40 | 5 |
| **FIS IG 20** | **572996** | **573001** | M20 | M30 | 32 / 34 | 300 | 300 | 50 | 5 |

## Centering clip DD-E

DD-E

| | Item No. | Thread M [mm] | Sales unit [pcs] |
|---|---|---|---|
| **Item** | | | |
| **DD-E M12** | **563722** | M12 | 100 |
| **DD-E M16** | **563724** | M16 | 100 |
| **DD-E M20** | **563726** | M20 | 100 |
| **DD-E M24** | **563728** | M24 | 100 |
| **DD-E M27** | **563730** | M27 | 100 |
| **DD-E M30** | **563732** | M30 | 100 |

Used for overhead mounting or in combination with the centering clip DD-S for centering in the drill hole.

## Centering clip DD-S

DD-S

| | Item No. | Thread M [mm] | Sales unit [pcs] |
|---|---|---|---|
| **Item** | | | |
| **DD-S M12** | **563721** | M12 | 100 |
| **DD-S M16** | **563723** | M16 | 100 |
| **DD-S M20** | **563725** | M20 | 100 |
| **DD-S M24** | **563727** | M24 | 100 |
| **DD-S M27** | **563729** | M27 | 100 |
| **DD-S M30** | **563731** | M30 | 100 |

Used in combination with the centering clip DD-E for centering in the drill hole.

# Accessories

## Nut and washer

Hexagonal nut and washer

| Item | Zinc plated steel grade 8.8<br>Item No. | Stainless steel R<br>Item No. | Width across nut<br>SW | Washer (outer diameter x thickness)<br>[mm] | Match | Sales unit<br>[pcs] |
|---|---|---|---|---|---|---|
| Nut & washer M8 | 510509 | 510113 | 13 | 16 x 1.6 | FIS A M8 x 1.000 | 50 |
| Nut & washer M10 | 510510 | 510514 | 17 | 20 x 2.0 | FIS A M10 x 1.000 | 50 |
| Nut & washer M12 | 510511 | 510515 | 19 | 24 x 2.5 | FIS A M12 x 1.000 | 25 |
| Nut & washer M16 | 510512 | 510516 | 24 | 30 x 3.0 | FIS A M16 x 1.000 | 20 |
| Nut & washer M20 | 519737 | 519738 | 30 | 37 x 3.0 | FIS A M20 x 1.000 | 10 |
| Nut & washer M24 | 552110 | 552111 | 36 | 37 x 3,0 | FIS A M24 x 1.000 | 5 |
| Nut & washer M30 | 559124 | 573787 | 46 | 56 x 4,0 | FIS A M30 x 1.000 | 5 |

## Internal-threaded anchor RG M I in combination with FIS EM Plus

RG M I, Zinc-plated

RG M I, Stainless steel

| Item | Zinc plated Steel grade 5.8<br>Item No. | Stainless steel R<br>Item No. | Internal thread<br>M<br>[mm] | Drill hole diameter<br>$d_o$<br>[mm] | Anchorage depth<br>$h_{ef}$<br>[mm] | filling quantity FIS EM Plus<br>[scale units] | Min. bolt penetration<br>[mm] | Max. bolt penetration<br>[mm] | Sales unit<br>[pcs] |
|---|---|---|---|---|---|---|---|---|---|
| RG 12 x 90 M 8 I | 050552 | 050565 | M8 | 14 | 90 | 5 | 8 | 18 | 10 |
| RG 16 x 90 M 10 I | 050553 | 050566 | M10 | 18 | 90 | 7 | 10 | 23 | 10 |
| RG 16 x 125 M 12 I | 050562 | 050567 | M12 | 20 | 125 | 11 | 12 | 26 | 10 |
| RG 22 x 160 M 16 I | 050563 | 050568 | M16 | 24 | 160 | 17 | 16 | 35 | 5 |
| RG 28 x 200 M 20 I | 050564 | 050569 | M20 | 32 | 200 | 48 | 20 | 45 | 5 |

## Rebar anchor FRA in combination with FIS EM Plus

Rebar anchor FRA

| Item | Item No. | Approval<br>ETA | Total length<br>l<br>[mm] | Max. fixing thickness<br>$t_{fix}$<br>[mm] | Drill hole<br>$d_o$<br>[Ø mm] | Fill quantity<br>[scale units] | Sales unit<br>[pcs] |
|---|---|---|---|---|---|---|---|
| FRA 12/900 M 12-60* | 505529 | ● | 975 | 60 | 16 | 50 | 8 |
| FRA 16/1100 M 16-60* | 505533 | ● | 1180 | 60 | 20 | 81 | 8 |
| FRA 20/1400 M 20-60* | 505534 | ● | 1485 | 60 | 25 | 160 | 4 |

* Concrete steel bar with metric thread made of stainless steel R.

# Accessories

## Concrete-Concrete Shear Connector FCC in combination with FIS EM Plus

FCC-H

| Item | Item No. | Drill hole diameter [mm] | Rebar diameter [mm] | Anchor length [mm] | Material | Sales unit [pcs] |
|---|---|---|---|---|---|---|
| **FCC-H 10 x 180** | **520081** | 14 | 10 | 180 | Concrete steel bar B 500 B | 100 |
| **FCC-H 12 x 230 *** | **520082** | 16 | 12 | 230 | Concrete steel bar B 500 B | 100 |
| **FCC-H 14 x 290 *** | **520083** | 18 | 14 | 290 | Concrete steel bar B 500 B | 50 |
| **FCC-H 16 x 360 *** | **520085** | 20 | 16 | 360 | Concrete steel bar B 500 B | 25 |

* Delivery time on request.

## WRL marking for LI-/ LIP-concrete

WRL marking

| Item | Item No. | Suitable for | Content | Outer diameter [mm] | Sales Unit [pcs] |
|---|---|---|---|---|---|
| **WRL marking LI-concrete M8** | **558307** | FIS A M8 R | 10x WRL marking disc M8 | 35 | 10 |
| **WRL marking LI-concrete M10** | **558308** | FIS A M10 R | 10x WRL marking disc M10 | 35 | 10 |
| **WRL marking LI-concrete M12** | **558309** | FIS A M12 R | 10x WRL marking disc M12 | 40 | 10 |
| **WRL marking LI-concrete M16** | **558310** | FIS A M16 R | 10x WRL marking disc M16 | 50 | 10 |
| **WRL marking LI-concrete M20** | **558311** | FIS A M20 R | 10x WRL marking disc M20 | 60 | 10 |
| **WRL marking LI-concrete M24** | **558312** | FIS A M24 R | 10x WRL marking disc M24 | 65 | 10 |

## WRL set for coated concrete

WRL marking

Filling disc

Rounded washer

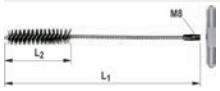


Injection adapter

| Item | Zinc plated Item No. | Stainless steel R Item No. | Suitable for | Height filling disc [1] [mm] | Content | Sales Unit [pcs] |
|---|---|---|---|---|---|---|
| **WRL Set coated concrete M8** | **558313** | **558319** | FIS A M8 | 6 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |
| **WRL Set coated concrete M10** | **558314** | **558320** | FIS A M10 | 6 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |
| **WRL Set coated concrete M12** | **558315** | **558321** | FIS A M12 | 6 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |
| **WRL Set coated concrete M16** | **558316** | **558322** | FIS A M16 | 7 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |
| **WRL Set coated concrete M20** | **558317** | **558323** | FIS A M20 | 8 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |
| **WRL Set coated concrete M24** | **558318** | **558324** | FIS A M24 | 10 | 10 pcs. each of marking disc, filling disc, rounded washer, 3x injection adapter | 10 |

1) When using the WRL Set, the usable length must be reduced by the thickness of the WRL Set.

## Cleaning brushes



BS


SDS-Adapter M8

Brush extension


Compressed air nozzle

| Item | Item No. | Length $L_1$ [mm] | Length $L_2$ [mm] | Brush diameter ø [mm] | For drill diameter [mm] | Sales unit [pcs] |
|---|---|---|---|---|---|---|
| **BS ø 8** | **078177** | 120 | 50 | 9 | 8 | 1 |
| **BS ø 10** | **078178** | 120 | 50 | 11 | 10 | 1 |
| **BS ø 12** | **078179** | 150 | 80 | 13 | 12 | 1 |
| **BS ø 14** | **078180** | 250 | 80 | 16 | 14 | 1 |
| **BS ø 16/18** | **078181** | 250 | 80 | 20 | 16/18 | 1 |
| **BS ø 20/22** | **052277** | 180 | 80 | 25 | 20/22 | 1 |
| **BS ø 24** | **078182** | 300 | 100 | 26 | 24 | 1 |
| **BS ø 25** | **097806** | 300 | 100 | 27 | 25 | 1 |
| **BS ø 28** | **078183** | 350 | 100 | 30 | 28 | 1 |
| **BS ø 30/32/35** | **078184** | 400 | 100 | 40 | 30/32/35 | 1 |
| **Brush extension** | **508791** | 410 | – | – | – | 1 |
| **Compressed air nozzle D16-D19** | **511957** | – | – | – | – | 2 |
| **Compressed air nozzle D20-D25** | **511958** | – | – | – | – | 2 |

## Compressed-air cleaning tool, Blow-out pump and Centring wedge


Compressed-air cleaning tool ABP

Blow-out pump AB G


Centring wedge

| Item | Item No. | Description | Sales unit [pcs] |
|---|---|---|---|
| **Compressed-air cleaning tool ABP** | **059456** | – | 1 |
| **Blow-out pump AB G** | **567792** | – | 1 |
| **Centring wedge** | **093076** | 10 wedges for overhead installation | 10 |

# Loads according to ICC

**Injection System FIS EM Plus with anchor rod FIS A resp. RGM**

Permissible loads of a single anchor[1)2)] in normal-weight concrete of strength class 20 Mpa resp. 3000 psi.
For the design the complete current ICC-ES Evaluation Report ESR-1990 has to be considered.

| | | | | | Cracked concrete | | | | Non-cracked concrete | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Material/ surface[3)] | Effective anchorage depth | Minimum member thickness | Maximum installation torque | 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 | | | |
| | | $h_{ef}$ | $h_{min}$ | $T_{inst,max}$ | $N_{perm}$[4)] | $V_{perm}$[4)] | $s_{min}$[4)] | $c_{min}$[4)] | $N_{perm}$[4)] | $V_{perm}$[4)] | $s_{min}$[4)] | $c_{min}$[4)] |
| Type | | [mm] | [mm] | [Nm] | [kN] | [kN] | [mm] | [mm] | [kN] | [kN] | [mm] | [mm] |
| **FIS A M8** | 5.8 | 60 | 100 | 10 | 6.8 | 5.1 | 40 | 40 | 9.6 | 5.1 | 40 | 40 |
| | | 80 | 110 | 10 | 9.7 | 5.1 | 40 | 40 | 9.7 | 5.1 | 40 | 40 |
| | | 160 | 190 | 10 | 9.7 | 5.1 | 40 | 40 | 9.7 | 5.1 | 40 | 40 |
| | R-70 | 60 | 100 | 10 | 6.8 | 6.8 | 40 | 40 | 9.6 | 7.1 | 40 | 40 |
| | | 80 | 110 | 10 | 10.5 | 11.3 | 40 | 40 | 13.6 | 7.1 | 40 | 40 |
| | | 160 | 190 | 10 | 13.6 | 7.1 | 40 | 40 | 13.6 | 7.1 | 40 | 40 |
| **FIS A M10** | 5.8 | 60 | 100 | 20 | 6.8 | 6.8 | 45 | 45 | 9.6 | 8.0 | 45 | 45 |
| | | 90 | 120 | 20 | 12.5 | 8.0 | 45 | 45 | 15.4 | 8.0 | 45 | 45 |
| | | 200 | 230 | 20 | 15.4 | 8.0 | 45 | 45 | 15.4 | 8.0 | 45 | 45 |
| | R-70 | 60 | 100 | 20 | 6.8 | 6.8 | 45 | 45 | 9.6 | 9.6 | 45 | 45 |
| | | 90 | 120 | 20 | 12.5 | 11.3 | 45 | 45 | 17.6 | 11.3 | 45 | 45 |
| | | 200 | 230 | 20 | 21.6 | 11.3 | 45 | 45 | 21.6 | 11.3 | 45 | 45 |
| **FIS A M12** | 5.8 | 70 | 100 | 40 | 8.6 | 11.7 | 55 | 55 | 12.1 | 11.7 | 55 | 55 |
| | | 110 | 140 | 40 | 16.9 | 11.7 | 55 | 55 | 22.5 | 11.7 | 55 | 55 |
| | | 240 | 270 | 40 | 22.5 | 11.7 | 55 | 55 | 22.5 | 11.7 | 55 | 55 |
| | R-70 | 70 | 100 | 40 | 8.6 | 16.3 | 55 | 55 | 12.1 | 16.3 | 55 | 55 |
| | | 110 | 140 | 40 | 16.9 | 16.3 | 55 | 55 | 23.8 | 16.3 | 55 | 55 |
| | | 240 | 270 | 40 | 31.4 | 16.3 | 55 | 55 | 31.4 | 16.3 | 55 | 55 |
| **FIS A M16** | 5.8 | 80 | 120 | 60 | 10.5 | 21.0 | 65 | 65 | 14.8 | 21.7 | 65 | 65 |
| | | 125 | 170 | 60 | 20.5 | 21.7 | 65 | 65 | 28.8 | 21.7 | 65 | 65 |
| | | 320 | 360 | 60 | 41.7 | 21.7 | 65 | 65 | 41.7 | 21.7 | 65 | 65 |
| | R-70 | 80 | 120 | 60 | 10.5 | 21.0 | 65 | 65 | 14.8 | 29.5 | 65 | 65 |
| | | 125 | 170 | 60 | 20.5 | 30.4 | 65 | 65 | 28.8 | 30.4 | 65 | 65 |
| | | 320 | 360 | 60 | 58.4 | 30.4 | 65 | 65 | 58.4 | 30.4 | 65 | 65 |
| **FIS A M20** | 5.8 | 90 | 140 | 120 | 12.5 | 25.0 | 85 | 85 | 17.6 | 33.9 | 85 | 85 |
| | | 170 | 220 | 120 | 32.5 | 33.9 | 85 | 85 | 45.7 | 33.9 | 85 | 85 |
| | | 400 | 450 | 120 | 65.2 | 33.9 | 85 | 85 | 65.2 | 33.9 | 85 | 85 |
| | R-70 | 90 | 140 | 120 | 12.5 | 25.0 | 85 | 85 | 17.6 | 35.2 | 85 | 85 |
| | | 170 | 220 | 120 | 32.5 | 47.4 | 85 | 85 | 45.7 | 47.4 | 85 | 85 |
| | | 400 | 450 | 120 | 91.3 | 47.4 | 85 | 85 | 91.3 | 47.4 | 85 | 85 |
| **FIS A M24** | 5.8 | 96 | 160 | 150 | 13.8 | 27.6 | 105 | 105 | 19.4 | 38.8 | 105 | 105 |
| | | 210 | 270 | 150 | 44.6 | 48.8 | 105 | 105 | 62.8 | 48.8 | 105 | 105 |
| | | 480 | 540 | 150 | 93.9 | 48.8 | 105 | 105 | 93.9 | 48.8 | 105 | 105 |
| | R-70 | 96 | 160 | 150 | 13.8 | 27.6 | 105 | 105 | 19.4 | 38.8 | 105 | 105 |
| | | 210 | 270 | 150 | 44.6 | 68.3 | 105 | 105 | 62.8 | 68.3 | 105 | 105 |
| | | 480 | 540 | 150 | 131.4 | 68.3 | 105 | 105 | 131.4 | 68.3 | 105 | 105 |
| **FIS A M30** | 5.8 | 120 | 190 | 300 | 19.3 | 38.5 | 140 | 140 | 27.1 | 54.3 | 140 | 140 |
| | | 280 | 350 | 300 | 68.7 | 77.6 | 140 | 140 | 96.7 | 77.6 | 140 | 140 |
| | | 600 | 670 | 300 | 149.3 | 77.6 | 140 | 140 | 149.3 | 77.6 | 140 | 140 |
| | R-70 | 120 | 190 | 300 | 19.3 | 38.5 | 140 | 140 | 27.1 | 54.3 | 140 | 140 |
| | | 280 | 350 | 300 | 68.7 | 108.7 | 140 | 140 | 96.7 | 108.7 | 140 | 140 |
| | | 600 | 670 | 300 | 209.0 | 108.7 | 140 | 140 | 209.0 | 108.7 | 140 | 140 |

1) The partial safety factors for material resistance as regulated in ESR report as well as a partial safety factor for load actions 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 related ESR report.

2) The specified loads are valid for anchorages in dry concrete and short term loades only. Values for sustained loads, are given in ESR report. For temperatures in the anchoring substrate up to 50 °C / 122 °F (resp. short term up to 72 °C / 162 °F). Drill hole cleaning as per specification in related ESR report.

3) Further steel grades, versions and technical data see related ESR report, 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 related ESR report and the provisions of the ACI 318-14 Ch. 17 or ACI 318-11 appendix D.

**Injection System FIS EM Plus with fractional threaded road**

Permissible loads of a single anchor[1)2)] in normal-weight concrete of strength class 20 Mpa resp. 3000 psi.
For the design the complete current ICC-ES Evaluation Report ESR-1990 has to be considered.

| | | | | | Cracked concrete | | | | Non-cracked concrete | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Material/ surface[3)] | Effective anchorage depth | Minimum member thickness | Maximum installation torque | 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 | | | |
| | | $h_{ef}$ | $h_{min}$ | $T_{inst,max}$ | $N_{perm}$[4)] | $V_{perm}$[4)] | $s_{min}$[4)] | $c_{min}$[4)] | $N_{perm}$[4)] | $V_{perm}$[4)] | $s_{min}$[4)] | $c_{min}$[4)] |
| Type | | [in] | [in] | [ft-lb] | [lb] | [lb] | [in] | [in] | [lb] | [lb] | [in] | [in] |
| **3/8"** | ASTM | 2-3/8 | 4 | 15 | 1,531 | 1,245 | 1.67 | 1.67 | 2,156 | 1,245 | 1.67 | 1.67 |
| | A36 | 5 | 6 | 15 | 2,394 | 1,245 | 1.67 | 1.67 | 2,394 | 1,245 | 1.67 | 1.67 |
| | | 7-1/2 | 8-3/4 | 15 | 2,394 | 1,245 | 1.67 | 1.67 | 2,394 | 1,245 | 1.67 | 1.67 |
| | ASTM | 2-3/8 | 4 | 15 | 1,531 | 1,649 | 1.67 | 1.67 | 2,156 | 2,322 | 1.67 | 1.67 |
| | A193 B7 | 5 | 6 | 15 | 4,461 | 2,471 | 1.67 | 1.67 | 4,461 | 2,471 | 1.67 | 1.67 |
| | | 7-1/2 | 8-3/4 | 15 | 4,461 | 2,471 | 1.67 | 1.67 | 4,461 | 2,471 | 1.67 | 1.67 |
| **1/2"** | ASTM | 2-3/4 | 4 | 30 | 1,929 | 2,282 | 2.26 | 2.26 | 2,717 | 2,282 | 2.26 | 2.26 |
| | A36 | 6-1/2 | 7-3/4 | 30 | 4,381 | 2,282 | 2.26 | 2.26 | 4,381 | 2,282 | 2.26 | 2.26 |
| | | 10 | 11-1/4 | 30 | 4,381 | 2,282 | 2.26 | 2.26 | 4,381 | 2,282 | 2.26 | 2.26 |
| | ASTM | 2-3/4 | 4 | 30 | 1,929 | 4,155 | 2.26 | 2.26 | 2,717 | 4,520 | 2.26 | 2.26 |
| | A193 B7 | 6-1/2 | 7-3/4 | 30 | 6,982 | 4,520 | 2.26 | 2.26 | 8,165 | 4,520 | 2.26 | 2.26 |
| | | 10 | 11-1/4 | 30 | 8,165 | 4,520 | 2.26 | 2.26 | 8,165 | 4,520 | 2.26 | 2.26 |
| **5/8"** | ASTM | 3-1/8 | 4-1/2 | 50 | 2,313 | 3,631 | 2.56 | 2.56 | 3,258 | 3,631 | 2.56 | 2.56 |
| | A36 | 7-7/8 | 9-1/2 | 50 | 6,979 | 3,631 | 2.56 | 2.56 | 6,979 | 3,631 | 2.56 | 2.56 |
| | | 12-1/2 | 14 | 50 | 6,979 | 3,631 | 2.56 | 2.56 | 6,979 | 3,631 | 2.56 | 2.56 |
| | ASTM | 3-1/8 | 4-1/2 | 50 | 2,313 | 4,982 | 2.56 | 2.56 | 3,258 | 7,017 | 2.56 | 2.56 |
| | A193 B7 | 7-7/8 | 9-1/2 | 50 | 9,318 | 7,202 | 2.56 | 2.56 | 13,010 | 7,202 | 2.56 | 2.56 |
| | | 12-1/2 | 14 | 50 | 13,010 | 7,202 | 2.56 | 2.56 | 13,010 | 7,202 | 2.56 | 2.56 |
| **3/4"** | ASTM | 3-1/2 | 5-1/4 | 90 | 2,766 | 5,374 | 3.15 | 3.15 | 3,896 | 5,374 | 3.15 | 3.15 |
| | A36 | 9-1/4 | 11 | 90 | 10,331 | 5,374 | 3.15 | 3.15 | 10,331 | 5,374 | 3.15 | 3.15 |
| | | 15 | 16-3/4 | 90 | 10,331 | 5,374 | 3.15 | 3.15 | 10,331 | 5,374 | 3.15 | 3.15 |
| | ASTM | 3-1/2 | 5-1/4 | 90 | 2,766 | 5,957 | 3.15 | 3.15 | 3,896 | 8,391 | 3.15 | 3.15 |
| | A193 B7 | 9-1/4 | 11 | 90 | 11,868 | 10,669 | 3.15 | 3.15 | 16,715 | 10,669 | 3.15 | 3.15 |
| | | 15 | 16-3/4 | 90 | 19,256 | 10,669 | 3.15 | 3.15 | 19,256 | 10,669 | 3.15 | 3.15 |
| **1"** | ASTM | 4 | 6-1/4 | 135 | 3,394 | 7,309 | 4.33 | 4.33 | 4,780 | 9,732 | 4.33 | 4.33 |
| | A36 | 12 | 14-1/4 | 135 | 17,547 | 9,732 | 4.33 | 4.33 | 18,711 | 9,732 | 4.33 | 4.33 |
| | | 20 | 22-1/4 | 135 | 18,711 | 9,732 | 4.33 | 4.33 | 18,711 | 9,732 | 4.33 | 4.33 |
| | ASTM | 4 | 6-1/4 | 135 | 3,394 | 7,309 | 4.33 | 4.33 | 4,780 | 10,295 | 4.33 | 4.33 |
| | A193 B7 | 12 | 14-1/4 | 135 | 17,547 | 19,317 | 4.33 | 4.33 | 24,715 | 19,317 | 4.33 | 4.33 |
| | | 20 | 22-1/4 | 135 | 34,870 | 19,317 | 4.33 | 4.33 | 34,870 | 19,317 | 4.33 | 4.33 |
| **1 - 1/4"** | ASTM | 5 | 7-3/4 | 240 | 4,715 | 10,155 | 6.30 | 6.30 | 6,641 | 14,303 | 6.30 | 6.30 |
| | A36 | 15 | 17-3/4 | 240 | 24,403 | 15,562 | 6.30 | 6.30 | 29,940 | 15,562 | 6.30 | 6.30 |
| | | 25 | 27-3/4 | 240 | 29,940 | 15,562 | 6.30 | 6.30 | 29,940 | 15,562 | 6.30 | 6.30 |
| | ASTM | 5 | 7-3/4 | 240 | 4,715 | 10,155 | 6.30 | 6.30 | 6,641 | 14,303 | 6.30 | 6.30 |
| | A193 B7 | 15 | 17-3/4 | 240 | 24,403 | 30,895 | 6.30 | 6.30 | 34,370 | 30,895 | 6.30 | 6.30 |
| | | 25 | 27-3/4 | 240 | 52,713 | 30,895 | 6.30 | 6.30 | 55,786 | 30,895 | 6.30 | 6.30 |

1) The partial safety factors for material resistance as regulated in ESR report as well as a partial safety factor for load actions 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 related ESR report.

2) The specified loads are valid for anchorages in dry concrete and short term loades only. Values for sustained loads, are given in ESR report. For temperatures in the anchoring substrate up to 50 °C / 122 °F (resp. short term up to 72 °C / 162 °F). Drill hole cleaning as per specification in related ESR report.

3) Further steel grades, versions and technical data see related ESR report, 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 related ESR report and the provisions of the ACI 318-14 Ch. 17 or ACI 318-11 appendix D.

# Loads according to ETA

**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 of 22.04.2024 has to be considered.

| | | | | | Cracked concrete | | | | Non-cracked concrete | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Material/ surface[3)] | Effective anchorage depth | Minimum member thickness | Maximum installation-torque | 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 | | | |
| Type | | $h_{ef}$ [mm] | $h_{min}$ [mm] | $T_{inst,max}$ [Nm] | $N_{perm}$[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 | 90 | 10 | 5.2 | 6.2 | 40 | 40 | 8.7 | 6.2 | 40 | 40 |
| | 5.8 | 80 | 110 | 10 | 6.9 | 6.2 | 40 | 40 | 8.7 | 6.2 | 40 | 40 |
| | 5.8 | 160 | 190 | 10 | 8.7 | 6.2 | 40 | 40 | 8.7 | 6.2 | 40 | 40 |
| | R-70 | 60 | 90 | 10 | 5.2 | 5.9 | 40 | 40 | 9.8 | 5.9 | 40 | 40 |
| | R-70 | 80 | 110 | 10 | 6.9 | 5.9 | 40 | 40 | 9.8 | 5.9 | 40 | 40 |
| | R-70 | 160 | 190 | 10 | 9.8 | 5.9 | 80 | 40 | 9.8 | 5.9 | 40 | 40 |
| **FIS A M 10** | 5.8 | 60 | 90 | 20 | 7.6 | 9.9 | 45 | 45 | 10.9 | 9.9 | 45 | 45 |
| | 5.8 | 90 | 120 | 20 | 11.4 | 9.9 | 45 | 45 | 13.8 | 9.9 | 45 | 45 |
| | 5.8 | 200 | 230 | 20 | 13.8 | 9.9 | 45 | 45 | 13.8 | 9.9 | 45 | 45 |
| | R-70 | 60 | 90 | 20 | 7.6 | 9.3 | 45 | 45 | 10.9 | 9.3 | 45 | 45 |
| | R-70 | 90 | 120 | 20 | 11.4 | 9.3 | 45 | 45 | 15.5 | 9.3 | 45 | 45 |
| | R-70 | 200 | 230 | 20 | 15.5 | 9.3 | 45 | 45 | 15.5 | 9.3 | 45 | 45 |
| **FIS A M 12** | 5.8 | 70 | 100 | 40 | 9.6 | 14.4 | 55 | 45 | 13.7 | 14.4 | 55 | 45 |
| | 5.8 | 110 | 140 | 40 | 18.8 | 14.4 | 55 | 45 | 20.0 | 14.4 | 55 | 45 |
| | 5.8 | 240 | 270 | 40 | 20.0 | 14.4 | 55 | 45 | 20.0 | 14.4 | 55 | 45 |
| | R-70 | 70 | 100 | 40 | 9.6 | 13.5 | 55 | 45 | 13.7 | 13.5 | 55 | 45 |
| | R-70 | 110 | 140 | 40 | 18.8 | 13.5 | 55 | 45 | 22.5 | 13.5 | 55 | 45 |
| | R-70 | 240 | 270 | 40 | 22.5 | 13.5 | 55 | 45 | 22.5 | 13.5 | 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 | 37.4 | 26.9 | 65 | 50 | 37.4 | 26.9 | 65 | 50 |
| | R-70 | 80 | 120 | 60 | 11.7 | 23.5 | 65 | 50 | 16.8 | 25.1 | 65 | 50 |
| | R-70 | 125 | 170 | 60 | 22.9 | 25.1 | 65 | 50 | 32.7 | 25.1 | 65 | 50 |
| | R-70 | 320 | 360 | 60 | 42.0 | 25.1 | 65 | 50 | 42.0 | 25.1 | 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 | 42.0 | 85 | 55 | 51.9 | 42.0 | 85 | 55 |
| | 5.8 | 400 | 450 | 120 | 58.3 | 42.0 | 85 | 55 | 58.3 | 42.0 | 85 | 55 |
| | R-70 | 90 | 140 | 120 | 14.0 | 28.0 | 85 | 55 | 20.0 | 39.2 | 85 | 55 |
| | R-70 | 170 | 220 | 120 | 36.3 | 39.2 | 85 | 55 | 51.9 | 39.2 | 85 | 55 |
| | R-70 | 400 | 450 | 120 | 65.5 | 39.2 | 85 | 55 | 65.5 | 39.2 | 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 | 60.5 | 105 | 60 | 71.3 | 60.5 | 105 | 60 |
| | 5.8 | 480 | 540 | 150 | 84.0 | 60.5 | 105 | 60 | 84.0 | 60.5 | 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 | 56.5 | 105 | 60 | 71.3 | 56.5 | 105 | 60 |
| | R-70 | 480 | 540 | 150 | 94.4 | 56.5 | 105 | 60 | 94.4 | 56.5 | 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 | 96.2 | 140 | 80 | 109.8 | 96.2 | 140 | 80 |
| | 5.8 | 600 | 670 | 300 | 133.6 | 96.2 | 140 | 80 | 133.6 | 96.2 | 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 | 89.9 | 140 | 80 | 109.8 | 89.9 | 140 | 80 |
| | R-70 | 600 | 670 | 300 | 150.0 | 89.9 | 140 | 80 | 150.0 | 89.9 | 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). Higher loads are possible at lower temperatures. Drilling method and borehole cleaning according to ETA specifications. The factor $\Psi_{sus}$ 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 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 of 22.04.2024 has to be considered.

| | | | | | Cracked concrete | | | | Non-cracked concrete | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Screw material[3)] | Effective anchorage depth | Minimum member thickness | Maximum installation-torque | 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 | | | |
| Type | | $h_{ef}$ [mm] | $h_{min}$ [mm] | $T_{inst.max}$ [Nm] | $N_{perm}$[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 | 8.7 | 6.2 | 55 | 55 | 8.7 | 6.2 | 55 | 55 |
| | 8.8 | 90 | 120 | 10 | 11.3 | 8.3 | 55 | 55 | 13.9 | 8.3 | 55 | 55 |
| | R-70 | 90 | 120 | 10 | 9.8 | 5.9 | 55 | 55 | 9.8 | 5.9 | 55 | 55 |
| **RG M10 I** | 5.8 | 90 | 130 | 20 | 12.9 | 9.9 | 65 | 65 | 13.8 | 9.9 | 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 | 15.5 | 9.3 | 65 | 65 |
| **RG M12 I** | 5.8 | 125 | 170 | 40 | 20.0 | 14.4 | 75 | 75 | 20.0 | 14.4 | 75 | 75 |
| | 8.8 | 125 | 170 | 40 | 20.2 | 19.3 | 75 | 75 | 32.1 | 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 | 26.9 | 95 | 95 | 37.3 | 26.9 | 95 | 95 |
| | 8.8 | 160 | 210 | 80 | 33.2 | 35.9 | 95 | 95 | 47.4 | 35.9 | 95 | 95 |
| | R-70 | 160 | 210 | 80 | 33.2 | 25.1 | 95 | 95 | 41.9 | 25.1 | 95 | 95 |
| **RG M20 I** | 5.8 | 200 | 260 | 120 | 46.4 | 42.0 | 125 | 125 | 58.3 | 42.0 | 125 | 125 |
| | 8.8 | 200 | 260 | 120 | 46.4 | 56.0 | 125 | 125 | 66.3 | 56.0 | 125 | 125 |
| | R-70 | 200 | 260 | 120 | 46.4 | 39.2 | 125 | 125 | 65.4 | 39.2 | 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 $\gamma_L = 1.4$ 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. Drilling method and borehole cleaning according to ETA specifications. The factor $\Psi_{sus}$ 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.

**Notice**
The load tables for anchoring in wood can be found under the product FIS EM Plus on the fischer website: **www.fischer-international.com**

# Loads according to ETA

**Injection system FIS EM plus dynamic with threaded rod FIS A resp. RG M**

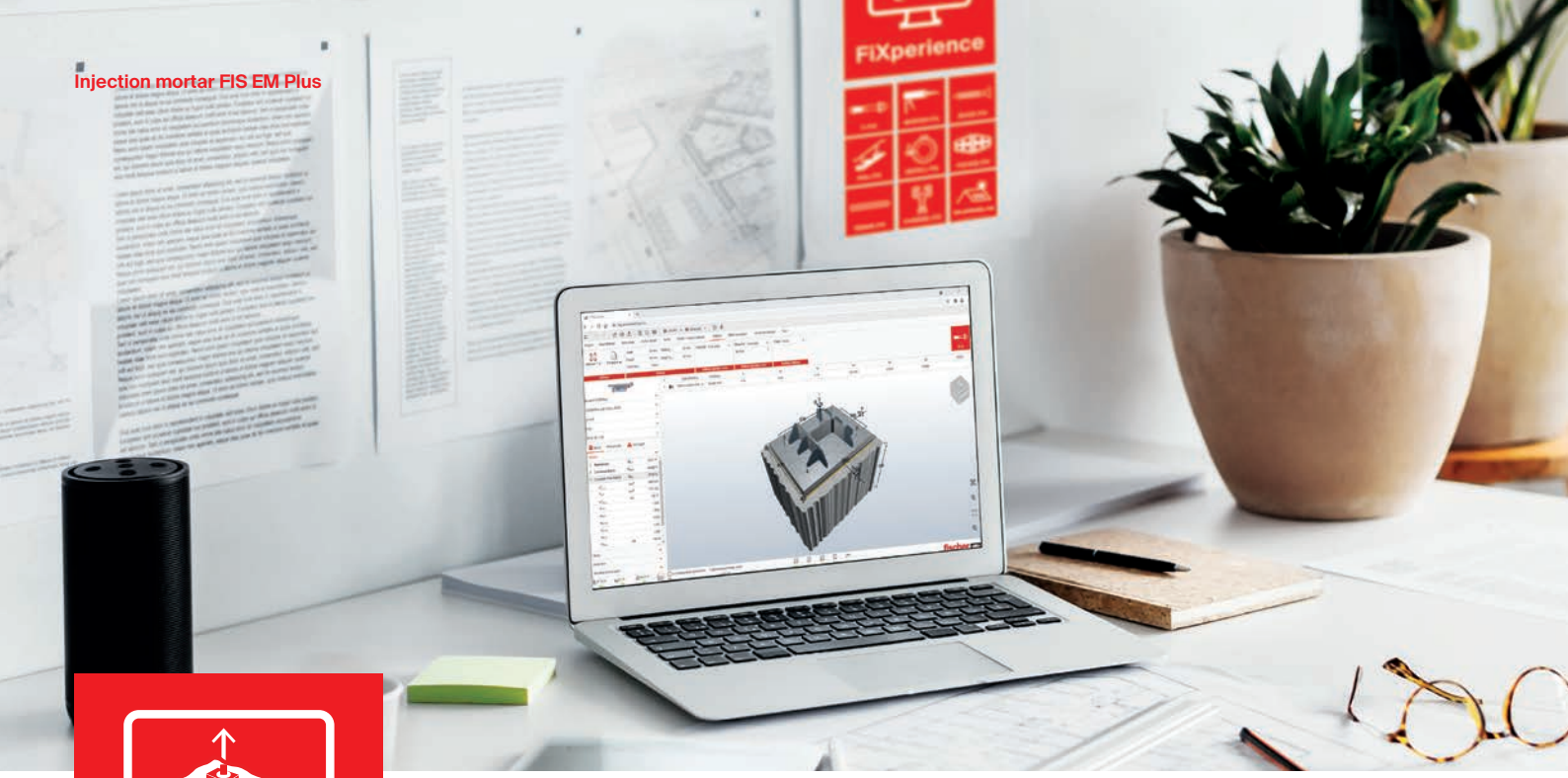
Design values for cyclic fatigue loading[1] of a single anchor in cracked or non-cracked normal concrete of strength class C20/25[2]
For the design the complete current assessment ETA-23/0842 of 11.06.2024 has to be considered.

| | | | | | Cracked concrete | | | | Non-cracked concrete | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Material / surface | Effective anchorage depth | Minimum member thickness | Installation torque | Design values of tension ($\Delta N_{Ed,max}$) and shear loads ($\Delta V_{Ed,max}$); minimum spacing ($s_{min}$) and edge distances ($c_{min}$) with reduced loads | | | | Design values of tension ($\Delta N_{Ed,max}$) and shear loads ($\Delta V_{Ed,max}$); minimum spacing ($s_{min}$) and edge distances ($c_{min}$) with reduced loads | | | |
| Type | | $h_{ef}$ [mm] | $h_{min}$ [mm] | $T_{inst}$ [Nm] | $\Delta N_{Ed,max}$[3] [kN] | $\Delta V_{Ed,max}$[3] [kN] | $s_{min}$[3] [mm] | $c_{min}$[3] [mm] | $\Delta N_{Ed,max}$[3] [kN] | $\Delta V_{Ed,max}$[3] [kN] | $s_{min}$[3] [mm] | $c_{min}$[3] [mm] |
| **FIS A M 12** | 8.8 | 70 | 100 | 40 | 3.8 | 2.0 | 55 | 55 | 4.5 | 2.0 | 55 | 55 |
| | 8.8 | 110 | 140 | 40 | 4.5 | 2.0 | 55 | 55 | 4.5 | 2.0 | 55 | 55 |
| | 8.8 | 240 | 270 | 40 | 4.5 | 2.0 | 55 | 55 | 4.5 | 2.0 | 55 | 55 |
| | R-70 | 70 | 100 | 40 | 3.8 | 2.6 | 55 | 55 | 4.9 | 2.6 | 55 | 55 |
| | R-70 | 110 | 140 | 40 | 4.9 | 2.6 | 55 | 55 | 4.9 | 2.6 | 55 | 55 |
| | R-70 | 240 | 270 | 40 | 4.9 | 2.6 | 55 | 55 | 4.9 | 2.6 | 55 | 55 |
| **FIS A M 16** | 8.8 | 80 | 120 | 60 | 5.7 | 3.7 | 65 | 65 | 8.4 | 3.7 | 65 | 65 |
| | 8.8 | 125 | 170 | 60 | 8.4 | 3.7 | 65 | 65 | 8.4 | 3.7 | 65 | 65 |
| | 8.8 | 320 | 360 | 60 | 8.4 | 3.7 | 65 | 65 | 8.4 | 3.7 | 65 | 65 |
| | R-70 | 80 | 120 | 60 | 5.7 | 4.9 | 65 | 65 | 9.2 | 4.9 | 65 | 65 |
| | R-70 | 125 | 170 | 60 | 9.2 | 4.9 | 65 | 65 | 9.2 | 4.9 | 65 | 65 |
| | R-70 | 320 | 360 | 60 | 9.2 | 4.9 | 65 | 65 | 9.2 | 4.9 | 65 | 65 |
| **FIS A M 20** | R-70 | 90 | 140 | 120 | 8.1 | 7.6 | 85 | 85 | 14.0 | 7.6 | 85 | 85 |
| | R-70 | 170 | 220 | 120 | 14.3 | 7.6 | 85 | 85 | 14.3 | 7.6 | 85 | 85 |
| | R-70 | 400 | 450 | 120 | 14.3 | 7.6 | 85 | 85 | 14.3 | 7.6 | 85 | 85 |
| **FIS A M 24** | R-70 | 96 | 160 | 150 | 9.9 | 11.0 | 105 | 105 | 15.4 | 11.0 | 105 | 105 |
| | R-70 | 210 | 270 | 150 | 20.6 | 11.0 | 105 | 105 | 20.6 | 11.0 | 105 | 105 |
| | R-70 | 480 | 540 | 150 | 20.6 | 11.0 | 105 | 105 | 20.6 | 11.0 | 105 | 105 |

[1] The design values of the cyclic fatigue loading apply for load cycles > $10^8$ in accordance with design method I acc. to TR061 – for unknown static lower load. If the static lower load is known and / or for lower number of load cycles higher load values are possible. The partial safety factors as regulated in the design standard are considered. As a single anchor counts e.g. an anchor with a spacing $s \geq 3 \times h_{ef}$ . The given load values apply for anchorages in dry and wet concrete and temperatures in the base material up to 50 °C (resp. short-term up to 72 °C). Higher loads are possible at lower temperatures. Drilling method and borehole cleaning according to ETA specifications.

[2] For higher concrete strength classes up to C50/60 higher permissible loads may be possible, see assessment. The concrete is assumed to be standard-reinforced.

[3] In the case of combinations of tensile loads, 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. We recommend using our anchor design software C-FIX.

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