fischer

# FIS EM Plus.

## The injection mortar for strong bonds.

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


FIS EM Plus 585 S | FIS EM Plus 390 S | FIS EM Plus 1500 S

## Advantages

- The assessment (ETA) guarantees a service life of 100 years for post-installed rebar connections and anchorings in cracked concrete.
- The injection mortar is approved for diamond-drilled and water-filled drill holes, as well as seismic applications of the performance categories C1, C2 and offers a secure hold even under extreme conditions.
- Anchorages with the FIS EM Plus can be carried out safely in sealing surfaces in accordance with the Water Resources Law with a general design approval (aBG) and an additional report.
- The epoxy resin mortar enables the transfer of high loads and variable anchoring depths in combination with the anchor rod FIS A.
- The approved anchoring elements allow a broad range of applications, including temporary and removable fixings with the internal threaded anchor RG M I made of zinc plated or stainless steel R.

## Certificates

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

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

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

aBG WHG, General design approval (aBG) Water resources law (WRL)

Fire resistance class R 240

# 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.

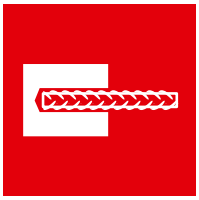
## Water-filled drill holes

**Can be used in all weather conditions:**
According to the assessment (ETA), FIS EM Plus can easily be used in water-filled drill holes and can therefore be used under all work site conditions.

## Underwater application

**The expert for special applications:**
According to the ICC approval, anchorings can also be carried out under water.

## 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.

## Anchorage substrate

**Suitable for the following building materials:**

Cracked concrete

Uncracked concrete

**Approved for anchorages in:**

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

**Also suitable for:**

· Natural stone with dense structure

## 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

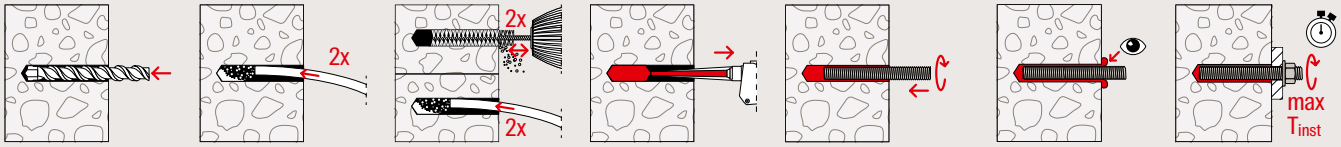
## Curing times

| 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]** | 200 | 90 | 40 | 18 | 10 | 5 |

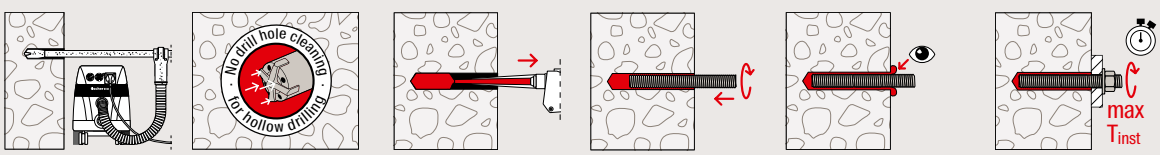
1) In wet concrete and water-filled borehole, double the curing times

## Installation

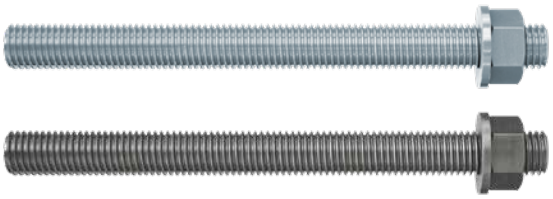
Pre-positioned installation




Pre-positioned installation with hollow drilling



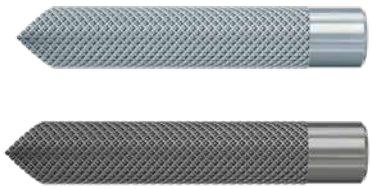
# Compatible anchoring elements.



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

## 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 rebar anchor is a concrete steel bar with metric connection thread made of stainless steel in sizes M12-M24.
- The stainless steel connection thread in sizes M12-M24 enables the transmission of very high tensile loads.

**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.

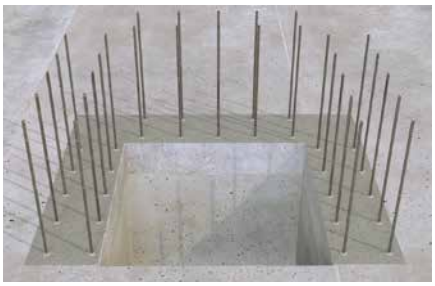
# Special applications are our strength.


## 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) certfies also for seismic applications a service life of 100 years.
- 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


## WRL compliant anchorages

**Tight. Tested. Officially sealed.**

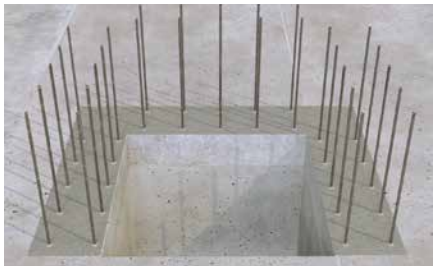
### First WRL-compliant anchorage with general design approval

- FIS EM Plus is the first system approved with a general design approval for WRL-compliant anchorages in FD/FDE concrete.
- For coated concrete, 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-74.2-099
General design approval
(aBG WHG - German designation)
Water resource law (WRL)

# Applications

## Post-installed rebar connections



## Rail fastenings, noise barriers and railings

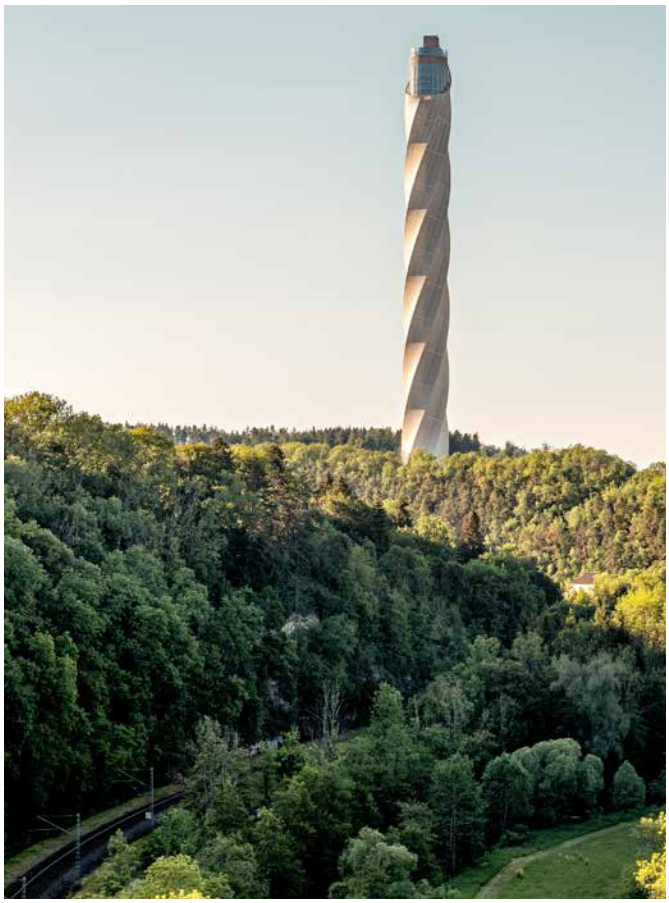
## Seismic applications and concrete-concrete connections


## Diamond-drilled boreholes, WRL and underwater applications

# 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 390 S

FIS EM Plus 585 S

FIS EM Plus 1500 S

FIS MR Plus

FIS UMR

| Item | Item No. | Approval | | Languages on the cartridge | Contents | Sales unit |
|---|---|---|---|---|---|---|
| | | ETA | ICC | | | [pcs] |
| **FIS EM Plus 390 S** | **544154** | ● | ● | DE, EN, FR, NL, ES, PT | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544155** | ● | ● | EN, ZH, EL, KO, CS, PL | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544176** | ● | ● | CS, SK, RO, AR, FR, EN | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 390 S** | **544159** | ● | ● | LT, LV, ET, UK, RU, KK | 1 cartridge 390 ml + 2 x static mixer FIS MR Plus | 6 |
| **FIS EM Plus 585 S** | **544166** | ● | ● | DE, EN, FR, NL, ES, PT | 1 cartridge 585 ml + 2 x static mixer FIS UMR | 6 |
| **FIS EM Plus 585 S** | **544165** | ● | ● | EN, ZH, RU, KO, CS, PL | 1 cartridge 585 ml + 2 x static mixer FIS UMR | 6 |
| **FIS EM Plus 585 S** | **544175** | ● | ● | EN, ZH, RU, KO, CS, PL | 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** | ● | ● | DE, IT, FR, NL, CS, SK | 1 cartridge 1500 ml + 2 x static mixer FIS UMR | 4 |
| **FIS EM Plus 1500 S** | **544173** | ● | ● | EN, ES, PT, ZH, RU, PL | 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

FIS AM

FIS DM S-L

FIS DCD S

FIS AP

FIS DP S-L

FIS DP S-XL

| Item | Item No. | Description | Sales unit |
|---|---|---|---|
| | | | [pcs] |
| **FIS DM S** | **511118** | Manual dispenser for FIS EM Plus 390 S | 1 |
| **FIS AM** | **058000** | Manual dispenser for FIS EM Plus 390 S | 1 |
| **FIS DM S-L** | **510992** | Manual dispenser for FIS EM Plus 585 S | 1 |
| **FIS DCD S**<br>**FIS DCD S Battery Pack** | **543629**<br>**543946** | Battery operated dispenser with dosing function for FIS EM Plus 390 S<br>Battery Pack for dispenser FIS DCD S | 1<br>1 |
| **FIS AP** | **058027** | Pneumatic dispenser for FIS EM Plus 390 S | 1 |
| **FIS DP S-L** | **511125** | Pneumatic dispenser for FIS EM Plus 585 S | 1 |
| **FIS DP S-XL** | **512401** | Pneumatic dispenser for FIS EM Plus 1500 S | 1 |

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

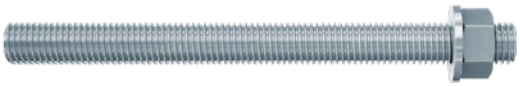
Compressed-air cleaning tool ABP

Blow-out pump AB G

Centring wedge

| Item | Item No. | Description | Sales unit |
|---|---|---|---|
| | | | [pcs] |
| **Compressed-air cleaning tool ABP** | **093286** | – | 1 |
| **Blow-out pump AB G** | **089300** | – | 1 |
| **Centring wedge** | **093076** | 10 wedges for overhead installation, from M16 | 10 |

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



FIS A, Zinc plated

FIS A, Stainless steel

| Item | Item No. | | | Drill hole diameter | Min. anchorage depth | Max. usable length | Min. filling quantity FIS EM Plus | Max. anchorage depth | Max. usable length | Max. filling quantity FIS EM Plus | Sales unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Zinc plated | Zinc plated | Stainless steel | $d_o$ | $h_{ef, min}$ | $t_{fix, hef min}$ | $h_{ef min}$ | $h_{ef max}$ | $t_{fix, hef max}$ | $h_{ef, max}$ | |
| | Steel grade 5.8 | Steel grade 8.8 | R FK 70 CRC III | [mm] | [mm] | [mm] | [scale units] | [mm] | [mm] | [scale units]] | [pcs]] |
| 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 | – | 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 |

* Order washer and nut separately. – FIS A made of high-corrosion resistant steel HCR upon request. Further dimensions on request.

# Accessories

## Nut and washer

Hexagonal nut and washer

| Item | Item No. | | Width across nut | Washer (outer diameter x thickness) | Match | Sales unit |
|---|---|---|---|---|---|---|
| | Zinc plated | Stainless steel | | | | |
| | steel grade 8.8 | R | SW | [mm] | | [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 | – | 36 | 37 x 3,0 | FIS A M24 x 1.000 | 5 |
| Nut & washer M30 | 559124 | – | 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 | Item No. | | Internal thread | Drill hole diameter | Anchorage depth | filling quantity FIS EM Plus | Min. bolt penetration | Max. bolt penetration | Sales unit |
|---|---|---|---|---|---|---|---|---|---|
| | Zinc plated | Stainless steel | M | $d_0$ | $h_{ef}$ | | | | |
| | Steel grade 5.8 | R | [mm] | [mm] | [mm] | [scale units] | [mm] | [mm] | [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 | Total length | Max. fixing thickness | Drill hole | Fill quantity | Sales unit |
|---|---|---|---|---|---|---|---|
| | | | l | $t_{fix}$ | $d_0$ | | |
| | | ETA | [mm] | [mm] | [Ø mm] | [scale units] | [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.

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

FCC-H

| Item | Item No. | Drill hole diameter | Rebar diameter | Anchor length | Material | Sales unit |
|---|---|---|---|---|---|---|
| | | [mm] | [mm] | [mm] | | [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 |

## 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

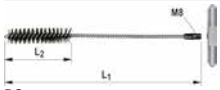


Injection adapter

| 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 |

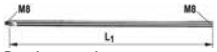
[1] When using the WRL Set, the usable length must be reduced by the thickness of the WRL Set.

## 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 |

# 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 | | | |
| Type | | $h_{ef}$ [in] | $h_{min}$ [in] | $T_{inst,max}$ [ft-lb] | $N_{perm}$[4)] [lb] | $V_{perm}$[4)] [lb] | $s_{min}$[4)] [in] | $c_{min}$[4)] [in] | $N_{perm}$[4)] [lb] | $V_{perm}$[4)] [lb] | $s_{min}$[4)] [in] | $c_{min}$[4)] [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 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 M 8** | 5.8 | 60 | 100 | 10 | 5.4 | 6.3 | 40 | 40 | 9.0 | 6.3 | 40 | 40 |
| | 5.8 | 80 | 110 | 10 | 7.2 | 6.3 | 40 | 40 | 9.0 | 6.3 | 40 | 40 |
| | 5.8 | 160 | 190 | 10 | 9.0 | 6.3 | 40 | 40 | 9.0 | 6.3 | 40 | 40 |
| | R-70 | 60 | 100 | 10 | 5.4 | 6.0 | 40 | 40 | 9.9 | 6.0 | 40 | 40 |
| | R-70 | 80 | 110 | 10 | 7.2 | 6.0 | 40 | 40 | 9.9 | 6.0 | 40 | 40 |
| | R-70 | 160 | 190 | 10 | 9.9 | 6.0 | 40 | 40 | 9.9 | 6.0 | 40 | 40 |
| **FIS A M 10** | 5.8 | 60 | 100 | 20 | 6.7 | 9.7 | 45 | 45 | 10.9 | 9.7 | 45 | 45 |
| | 5.8 | 90 | 120 | 20 | 10.1 | 9.7 | 45 | 45 | 13.8 | 9.7 | 45 | 45 |
| | 5.8 | 200 | 230 | 20 | 13.8 | 9.7 | 45 | 45 | 13.8 | 9.7 | 45 | 45 |
| | R-70 | 60 | 100 | 20 | 6.7 | 9.2 | 45 | 45 | 10.9 | 9.2 | 45 | 45 |
| | R-70 | 90 | 120 | 20 | 10.1 | 9.2 | 45 | 45 | 15.7 | 9.2 | 45 | 45 |
| | R-70 | 200 | 230 | 20 | 15.7 | 9.2 | 45 | 45 | 15.7 | 9.2 | 45 | 45 |
| **FIS A M 12** | 5.8 | 70 | 100 | 40 | 9.6 | 14.3 | 55 | 45 | 13.7 | 14.3 | 55 | 45 |
| | 5.8 | 110 | 140 | 40 | 17.8 | 14.3 | 55 | 45 | 20.5 | 14.3 | 55 | 45 |
| | 5.8 | 240 | 270 | 40 | 20.5 | 14.3 | 55 | 45 | 20.5 | 14.3 | 55 | 45 |
| | R-70 | 70 | 100 | 40 | 9.6 | 13.7 | 55 | 45 | 13.7 | 13.7 | 55 | 45 |
| | R-70 | 110 | 140 | 40 | 17.8 | 13.7 | 55 | 45 | 22.5 | 13.7 | 55 | 45 |
| | R-70 | 240 | 270 | 40 | 22.5 | 13.7 | 55 | 45 | 22.5 | 13.7 | 55 | 45 |
| **FIS A M 16** | 5.8 | 80 | 120 | 60 | 11.7 | 23.5 | 65 | 50 | 16.8 | 26.9 | 65 | 50 |
| | 5.8 | 125 | 170 | 60 | 22.9 | 26.9 | 65 | 50 | 32.7 | 26.9 | 65 | 50 |
| | 5.8 | 320 | 360 | 60 | 37.6 | 26.9 | 65 | 50 | 37.6 | 26.9 | 65 | 50 |
| | R-70 | 80 | 120 | 60 | 11.7 | 23.5 | 65 | 50 | 16.8 | 25.2 | 65 | 50 |
| | R-70 | 125 | 170 | 60 | 22.9 | 25.2 | 65 | 50 | 32.7 | 25.2 | 65 | 50 |
| | R-70 | 320 | 360 | 60 | 42.0 | 25.2 | 65 | 50 | 42.0 | 25.2 | 65 | 50 |
| **FIS A M 20** | 5.8 | 90 | 140 | 120 | 14.0 | 28.0 | 85 | 55 | 20.0 | 40.0 | 85 | 55 |
| | 5.8 | 170 | 220 | 120 | 36.3 | 42.3 | 85 | 55 | 51.9 | 42.3 | 85 | 55 |
| | 5.8 | 400 | 450 | 120 | 58.6 | 42.3 | 85 | 55 | 58.6 | 42.3 | 85 | 55 |
| | R-70 | 90 | 140 | 120 | 14.0 | 28.0 | 85 | 55 | 20.0 | 39.4 | 85 | 55 |
| | R-70 | 170 | 220 | 120 | 36.3 | 39.4 | 85 | 55 | 51.9 | 39.4 | 85 | 55 |
| | R-70 | 400 | 450 | 120 | 65.7 | 39.4 | 85 | 55 | 65.7 | 39.4 | 85 | 55 |
| **FIS A M 24** | 5.8 | 96 | 160 | 150 | 15.4 | 30.8 | 105 | 60 | 22.0 | 44.1 | 105 | 60 |
| | 5.8 | 210 | 270 | 150 | 49.9 | 60.6 | 105 | 60 | 71.3 | 60.6 | 105 | 60 |
| | 5.8 | 480 | 540 | 150 | 84.3 | 60.6 | 105 | 60 | 84.3 | 60.6 | 105 | 60 |
| | R-70 | 96 | 160 | 150 | 15.4 | 30.8 | 105 | 60 | 22.0 | 44.1 | 105 | 60 |
| | R-70 | 210 | 270 | 150 | 49.9 | 56.8 | 105 | 60 | 71.3 | 56.8 | 105 | 60 |
| | R-70 | 480 | 540 | 150 | 94.3 | 56.8 | 105 | 60 | 97.3 | 56.8 | 105 | 60 |
| **FIS A M 30** | 5.8 | 120 | 190 | 300 | 21.6 | 43.1 | 140 | 80 | 30.8 | 61.6 | 140 | 80 |
| | 5.8 | 280 | 350 | 300 | 76.8 | 96.0 | 140 | 80 | 109.8 | 96.0 | 140 | 80 |
| | 5.8 | 600 | 670 | 300 | 133.8 | 96.0 | 140 | 80 | 133.8 | 96.0 | 140 | 80 |
| | R-70 | 120 | 190 | 300 | 21.6 | 43.1 | 140 | 80 | 30.8 | 61.6 | 140 | 80 |
| | R-70 | 280 | 350 | 300 | 76.8 | 90.2 | 140 | 80 | 109.8 | 90.2 | 140 | 80 |
| | R-70 | 600 | 670 | 300 | 150.1 | 90.2 | 140 | 80 | 150.1 | 90.2 | 140 | 80 |

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

2) The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 72 °C). Drill hole cleaning as per specification in the ETA. The factor $\Psi_{sus}$ 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 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 | 9.0 | 5.3 | 55 | 55 | 9.0 | 5.3 | 55 | 55 |
| | 8.8 | 90 | 120 | 10 | 11.3 | 8.3 | 55 | 55 | 13.8 | 8.3 | 55 | 55 |
| | R-70 | 90 | 120 | 10 | 9.9 | 5.9 | 55 | 55 | 9.9 | 5.9 | 55 | 55 |
| **RG M10 I** | 5.8 | 90 | 130 | 20 | 12.9 | 8.3 | 65 | 65 | 13.8 | 8.3 | 65 | 65 |
| | 8.8 | 90 | 130 | 20 | 12.9 | 13.3 | 65 | 65 | 20.0 | 13.3 | 65 | 65 |
| | R-70 | 90 | 130 | 20 | 12.9 | 9.3 | 65 | 65 | 15.7 | 9.3 | 65 | 65 |
| **RG M12 I** | 5.8 | 125 | 170 | 40 | 20.2 | 12.1 | 75 | 75 | 20.5 | 12.1 | 75 | 75 |
| | 8.8 | 125 | 170 | 40 | 20.2 | 19.3 | 75 | 75 | 32.4 | 19.3 | 75 | 75 |
| | R-70 | 125 | 170 | 40 | 20.2 | 13.5 | 75 | 75 | 22.5 | 13.5 | 75 | 75 |
| **RG M16 I** | 5.8 | 160 | 210 | 80 | 33.2 | 22.4 | 95 | 95 | 37.6 | 22.4 | 95 | 95 |
| | 8.8 | 160 | 210 | 80 | 33.2 | 30.9 | 95 | 95 | 47.4 | 30.9 | 95 | 95 |
| | R-70 | 160 | 210 | 80 | 33.2 | 25.1 | 95 | 95 | 42.0 | 25.1 | 95 | 95 |
| **RG M20 I** | 5.8 | 200 | 260 | 120 | 46.4 | 35.4 | 125 | 125 | 58.6 | 35.4 | 125 | 125 |
| | 8.8 | 200 | 260 | 120 | 46.4 | 51.4 | 125 | 125 | 66.3 | 51.4 | 125 | 125 |
| | R-70 | 200 | 260 | 120 | 46.4 | 39.4 | 125 | 125 | 66.7 | 39.4 | 125 | 125 |

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

2) The specified loads are valid for anchorages in dry and damp concrete. For temperatures in the anchoring substrate up to 50 °C (resp. short term up to 72 °C). Drill hole cleaning as per specification in the ETA. The factor $\Psi_{sus}$ 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.

Dealer:

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