



LEISTUNGSERKLÄRUNG



DoP: 0107

für fischer Injektionssystem FIS VL (Verbundanker für die Verwendung in Beton) – DE

1. Eindeutiger Kenncode des Produkttyps: **DoP: 0107**
2. Verwendungszweck(e): **Nachträgliche Befestigung im gerissenen und ungerissenen Beton, siehe Anhang, insbesondere Anhänge B 1 bis B 8**
3. Hersteller: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Straße 1, 72178 Waldachtal, Deutschland**
4. Bevollmächtigter: --
5. System(e) zur Bewertung und Überprüfung der Leistungsbeständigkeit: **1**
6. Europäisches Bewertungsdokument: **ETAG 001; 2013-04**
Europäische Technische Bewertung: **ETA-10/0352; 2017-08-10**
Technische Bewertungsstelle: **DIBt**
Notifizierte Stelle(n): **1343 – MPA Darmstadt**
7. Erklärte Leistung(en):

Mechanische Festigkeit und Standsicherheit (BWR 1), Sicherheit bei der Nutzung (BWR 4)

- **Charakteristische Werte unter statischer und quasi-statischer Belastung, Verschiebungen: Siehe Anhang, insbesondere Anhänge C 1 bis C 6**

Brandschutz (BWR 2)

- **Brandverhalten: Der Dübel erfüllt die Anforderungen der Klasse A 1**
- **Feuerwiderstand: KLF**

8. Angemessene Technische Dokumentation und/oder Spezifische Technische Dokumentation: ---

Die Leistung des vorstehenden Produkts entspricht der erklärten Leistung/den erklärten Leistungen. Für die Erstellung der Leistungserklärung im Einklang mit der Verordnung (EU) Nr. 305/2011 ist allein der obengenannte Hersteller verantwortlich.

Unterzeichnet für den Hersteller und im Namen des Herstellers von:

Andreas Bucher, Dipl.-Ing.

Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

Tumlingen, 2017-08-17

- Diese Leistungserklärung wurde in verschiedenen Sprachversionen erstellt. Für den Fall unterschiedlicher Auslegung hat immer die englische Version Vorrang.
- Der Anhang enthält freiwillige und ergänzende Informationen in englischer Sprache. Diese gehen über die (sprachneutral angegebenen) gesetzlichen Anforderungen hinaus.

Specific Part

1 Technical description of the product

The fischer injection system FIS VL is a bonded anchor consisting of a cartridge with injection mortar fischer FIS VL, FIS VL High Speed or FIS VL Low Speed and a steel element.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic | Performance |
|---|----------------------|
| Characteristic values for static and quasi-static action, displacements | See Annex C 1 to C 6 |

3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|--------------------------|---|
| Reaction to fire | Anchorage satisfy requirements for Class A1 |
| Resistance to fire | No performance assessed |

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

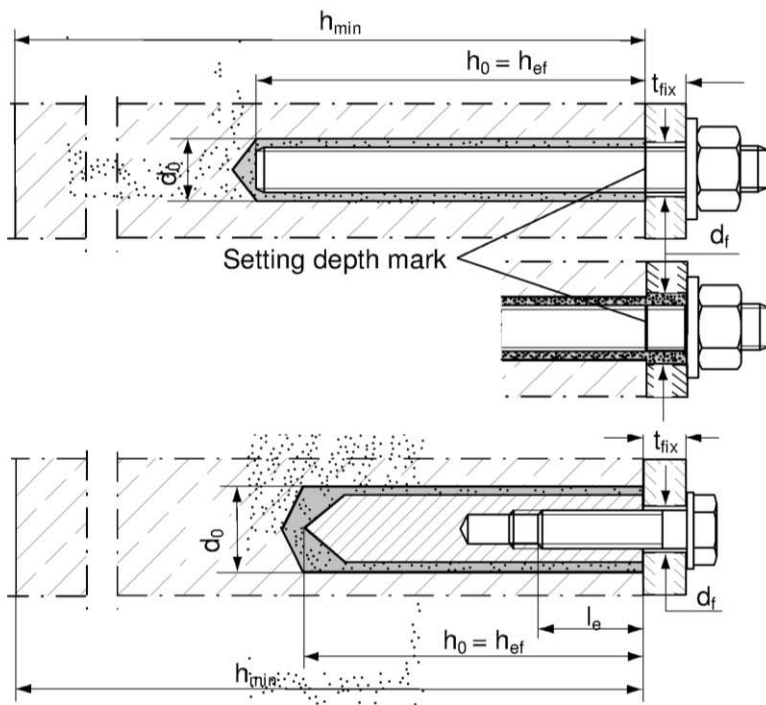
The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

Installation conditions



Anchor rod
Pre-positioned anchor

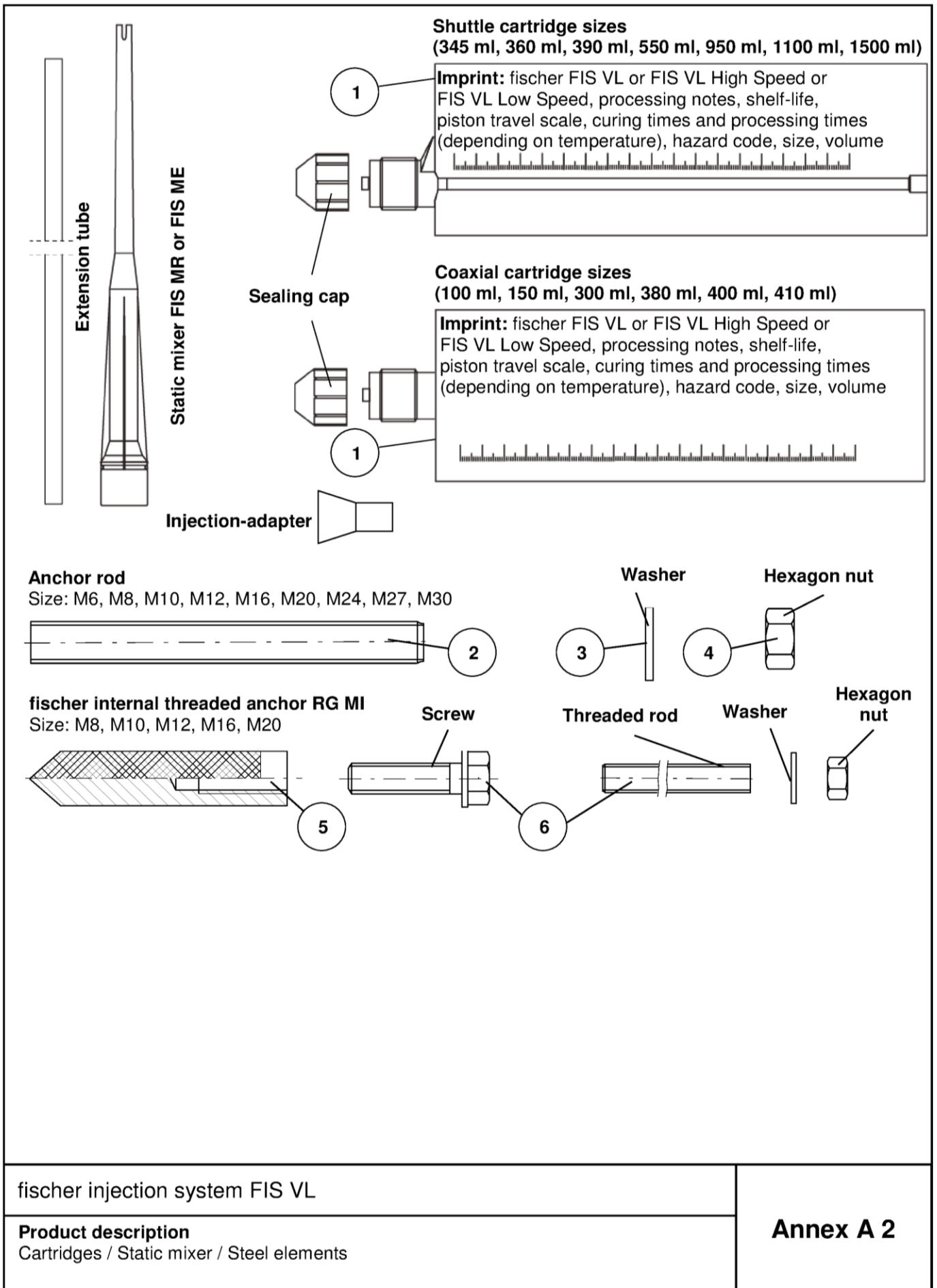
Anchor rod
Push through anchor
(annular gap filled with mortar)

fischer
internal threaded anchor RG MI
Pre-positioned anchor only





fischer injection system FIS VL

Product description
Installation conditions

Annex A 1



| Table A1: Materials | | | | |
|---|---|---|--|--|
| Part | Designation | Material | | |
| 1 | Mortar cartridge | Mortar, hardener, filler | | |
| | Steel grade | Steel, zinc plated | Stainless steel A4 | High corrosion resistant steel C |
| 2 | Anchor rod | Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462 EN 10088-1:2014 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation | Property class 50 or 80 EN ISO 3506-1:2009 or property class 70 with $f_{yk} = 560 \text{ N/mm}^2$ 1.4565; 1.4529 EN 10088-1:2014 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation |
| 3 | Washer ISO 7089:2000 | zinc plated $\geq 5 \mu\text{m}$, EN ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 | 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 | 1.4565; 1.4529 EN 10088-1:2014 |
| 4 | Hexagon nut | Property class 5 or 8; EN ISO 898-2:2012 zinc plated $\geq 5 \mu\text{m}$, ISO 4042:1999 A2K or hot-dip galvanised EN ISO 10684:2004 | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 | Property class 50, 70 or 80 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014 |
| 5 | fischer internal threaded anchor RG MI | Property class 5.8 ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$, ISO 4042:1999 A2K | Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 | Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014 |
| 6 | Commercial standard screw or anchor / threaded rod for fischer internal threaded anchor RG MI | Property class 5.8 or 8.8; EN ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$, ISO 4042:1999 A2K fracture elongation $A_5 > 8 \%$ | Property class 70 EN ISO 3506-1:2009 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088-1:2014 fracture elongation $A_5 > 8 \%$ | Property class 70 EN ISO 3506-1:2009 1.4565; 1.4529 EN 10088-1:2014 fracture elongation $A_5 > 8 \%$ |
| fischer injection system FIS VL | | | | Annex A 3 |
| Product description Materials | | | | |

| Specifications of intended use (part 1) | | | | | |
|---|----------------------------|---|---------------------------|--|---------------------------|
| Table B1: Overview use and performance categories | | | | | |
| Anchorages subject to | | FIS VL, FIS VL High Speed or FIS VL Low Speed with ... | | | |
| | | Anchor rod  | | fischer internal threaded anchor RG MI  | |
| Hammer drilling with standard drill bit  | | all sizes | | | |
| Hammer drilling with hollow drill bit (Heller "Duster Expert" or Hilti "TE-CD, TE-YD")  | | Nominal drill bit diameter (d_0) 12 mm to 35 mm | | | |
| Static and quasi static load, in | uncracked concrete | M6 to M30 | Tables: C1, C3, C4, C6 | M8 to M20 | Tables: C2, C3, C5, C7 |
| | cracked concrete | M10 to M20 | | not assessed | |
| Use category | dry or wet concrete | M6 to M30 | | M8 to M20 | |
| | flooded hole ¹⁾ | M12 to M30 | | M8 to M20 | |
| Installation temperature | | -10 °C to +40 °C | | | |
| In-service temperature | Temperature range I | -40 °C to +80 °C (max. long term temperature +50 °C and max. short term temperature +80 °C) | | | |
| | Temperature range II | -40 °C to +120 °C (max. long term temperature +72 °C and max. short term temperature +120 °C) | | | |
| ¹⁾ Only with coaxial cartridges: 380 ml, 400 ml, 410 ml | | | | | |
| fischer injection system FIS VL | | | | | Annex B 1 |
| Intended Use Specifications (part 1) | | | | | |

Specifications of intended use (part 2)

Base materials:

- Reinforced or unreinforced normal weight concrete Strength classes C20/25 to C50/60 according to EN 206-1:2000

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel)
- Structures subject to external atmospheric exposure, to permanently damp internal conditions or in other particular aggressive conditions (high corrosion resistant steel)

Note: Particular aggressive conditions are e. g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e. g. in desulphurization plants or road tunnels where de-icing materials are used)

Design:

- Anchorages have to be designed by a responsible engineer with experience of concrete anchor design
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.)
- Anchorages under static or quasi-static actions are designed in accordance with EOTA Technical Report TR 029 "Design of bonded anchors" Edition September 2010 or CEN/TS 1992-4: 2009

Installation:

- Anchor installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- In case of aborted hole: The hole shall be filled with mortar
- Anchorage depth should be marked and adhered to on installation
- Overhead installation is allowed

fischer injection system FIS VL

Intended Use
Specifications (part 2)

Annex B 2

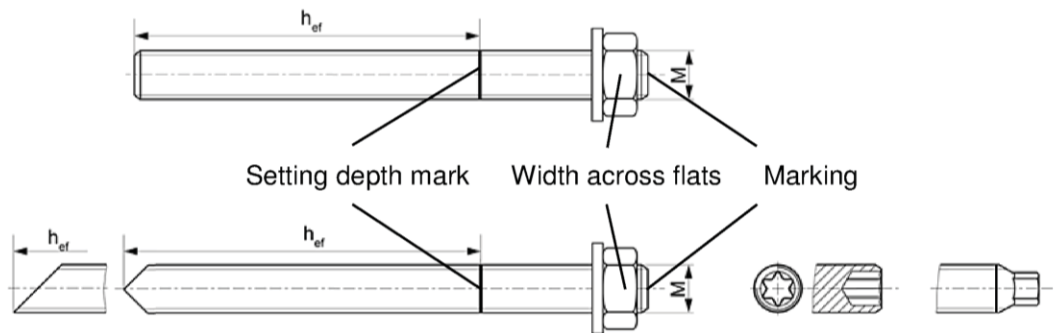
Table B2: Installation parameters for anchor rods

| Size | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 | |
|---|-----------------------------------|---------------------------------|-----|-----|-----|-----------------|-----|-----|-----|-----|-----|
| Width across flats | SW | 10 | 13 | 17 | 19 | 24 | 30 | 36 | 41 | 46 | |
| Nominal drill bit diameter | d_0 | 8 | 10 | 12 | 14 | 18 | 24 | 28 | 30 | 35 | |
| Drill hole depth | h_0 | $h_0 = h_{ef}$ | | | | | | | | | |
| Effective anchorage depth | $h_{ef,min}$ | 50 | 60 | 60 | 70 | 80 | 90 | 96 | 108 | 120 | |
| | $h_{ef,max}$ | 72 | 160 | 200 | 240 | 320 | 400 | 480 | 540 | 600 | |
| Minimum spacing and minimum edge distance | s_{min} = | 40 | 40 | 45 | 55 | 65 | 85 | 105 | 125 | 140 | |
| | c_{min} | | | | | | | | | | |
| Diameter of clearance hole in the fixture ¹⁾ | pre-positioned anchorage d_f | 7 | 9 | 12 | 14 | 18 | 22 | 26 | 30 | 33 | |
| | push through anchorage d_f | 9 | 11 | 14 | 16 | 20 | 26 | 30 | 32 | 40 | |
| Minimum thickness of concrete member | h_{min} | $h_{ef} + 30$ (≥ 100) | | | | $h_{ef} + 2d_0$ | | | | | |
| Maximum installation torque | $T_{inst,max}$ | [Nm] | 5 | 10 | 20 | 40 | 60 | 120 | 150 | 200 | 300 |

¹⁾ For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1:2009, 5.2.3.1

Anchor rods:

fischer FIS A



Marking (on random place) fischer anchor rod:

Property class 8.8, stainless steel A4 property class 80 and high corrosion resistant steel C property class 80: •

Stainless steel A4 property class 50 and high corrosion resistant steel C property class 50: ••

Or colour coding according to DIN 976-1

Commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:

- Materials, dimensions and mechanical properties according Annex A 3, Table A1
- Inspection certificate 3.1 according to EN 10204:2004, the documents have to be stored
- Setting depth is marked

fischer injection system FIS VL

Intended Use
Installation parameters anchor rods

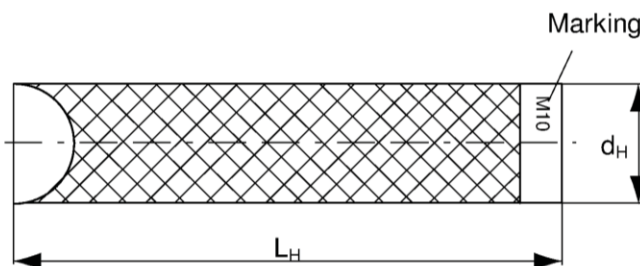
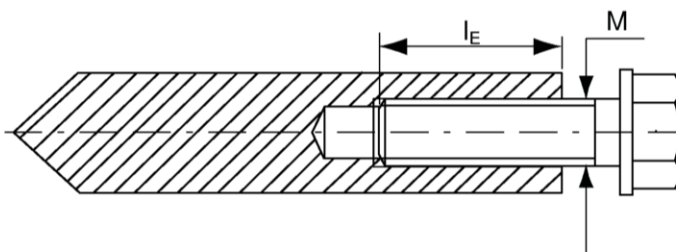
Annex B 3

Table B3: Installation parameters for fischer internal threaded anchors RG MI

| Size | | M8 | M10 | M12 | M16 | M20 |
|---|---------------------|----------------------|-----|-----|-----|-----|
| Diameter of anchor | d_H | 12 | 16 | 18 | 22 | 28 |
| Nominal drill bit diameter | d_0 | 14 | 18 | 20 | 24 | 32 |
| Drill hole depth | h_0 | $h_0 = h_{ef} = L_H$ | | | | |
| Effective anchorage depth ($h_{ef} = L_H$) | h_{ef} | 90 | 90 | 125 | 160 | 200 |
| Minimum spacing and minimum edge distance | $s_{min} = c_{min}$ | 55 | 65 | 75 | 95 | 125 |
| Diameter of clearance hole in the fixture ¹⁾ | d_f | 9 | 12 | 14 | 18 | 22 |
| Minimum thickness of concrete member | h_{min} | 120 | 125 | 165 | 205 | 260 |
| Maximum screw-in depth | $l_{E,max}$ | 18 | 23 | 26 | 35 | 45 |
| Minimum screw-in depth | $l_{E,min}$ | 8 | 10 | 12 | 16 | 20 |
| Maximum installation torque | $T_{inst,max}$ [Nm] | 10 | 20 | 40 | 80 | 120 |

¹⁾ For larger clearance holes in the fixture see TR 029, 4.2.2.1 or CEN/TS 1992-4-1: 2009, 5.2.3.1

fischer internal threaded anchor RG MI



Marking: Anchor size
e. g.: **M10**

Stainless steel additional **A4**
e. g.: **M10 A4**

High corrosion resistant steel
additional **C**
e. g.: **M10 C**

Retaining bolt or threaded rods (including nut and washer) must comply with the appropriate material and strength class of Annex A 3, Table A1

fischer injection system FIS VL

Intended Use
Installation parameters fischer internal threaded anchors RG MI

Annex B 4

Table B4: Diameters of cleaning brush BS (steel brush)

The size of the steel brush refers to the nominal drill bit diameter

| | | | | | | | | | | | | | | |
|----------------------------|-------|------|---|----|----|----|----|----|----|----|----|----|----|----|
| Nominal drill bit diameter | d_0 | [mm] | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 25 | 28 | 30 | 35 |
| Steel brush diameter | d_b | | 9 | 11 | 14 | 16 | 20 | | 25 | 26 | 27 | 30 | 40 | |

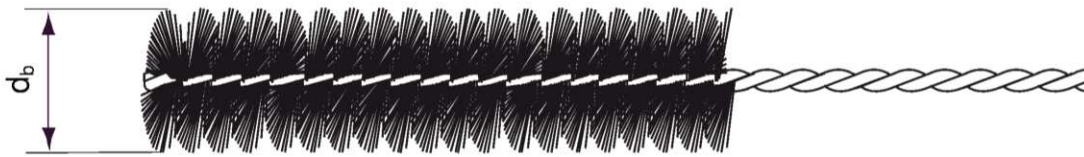


Table B5: Maximum processing time of the mortar and minimum curing time
(During the curing time of the mortar the concrete temperature may not fall below the listed minimum temperature)

| System temperature [°C] | Maximum processing time t_{work} | | | Minimum curing time ¹⁾ t_{cure} | | |
|----------------------------|---------------------------------------|--------|---------------------|---|--------|---------------------|
| | FIS VL High Speed | FIS VL | FIS VL Low Speed | FIS VL High Speed | FIS VL | FIS VL Low Speed |
| -10 to -5 | --- | --- | --- | 12 h | --- | --- |
| > -5 to ± 0 | 5 min | --- | --- | 3 h | 24 h | --- |
| > ± 0 to +5 | 5 min | 13 min | --- | 3 h | 3 h | 6 h |
| > +5 to +10 | 3 min | 9 min | 20 min | 50 min | 90 min | 3 h |
| > +10 to +20 | 1 min | 5 min | 10 min | 30 min | 60 min | 2 h |
| > +20 to +30 | --- | 4 min | 6 min | --- | 45 min | 60 min |
| > +30 to +40 | --- | 2 min | 4 min | --- | 35 min | 30 min |

¹⁾ In wet concrete or flooded holes the curing times must be doubled

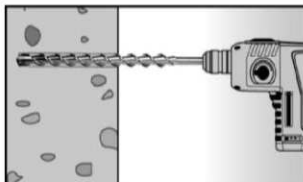
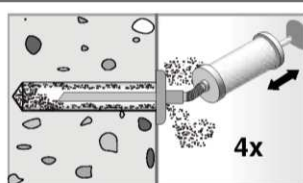
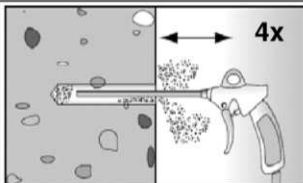
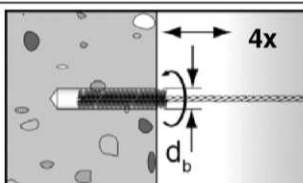
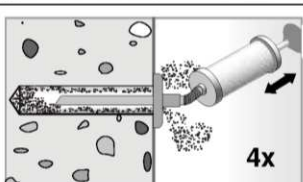
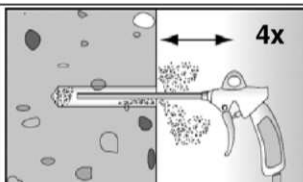
fischer injection system FIS VL

Intended Use
Cleaning tools
Processing times and curing times

Annex B 5

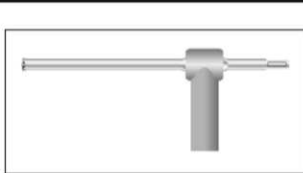
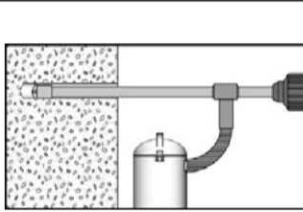
Installation instructions part 1

Drilling and cleaning the hole (hammer drilling with standard drill bit)

| | | | |
|---|--|--|--|
| 1 |  | <p>Drill the hole. Drill hole diameter d_0 and drill hole depth h_0 see Tables B2, B3</p> | |
| 2 |  | <p>Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole four times by hand</p> |  <p>For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole four times with oil-free compressed air ($p \geq 6$ bar)</p> |
| 3 |  | <p>Brush the drill hole four times. For deep holes use an extension. Corresponding brushes see Table B4</p> | |
| 4 |  | <p>Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole four times by hand</p> |  <p>For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole four times with oil-free compressed air ($p \geq 6$ bar)</p> |

Go to step 5

Drilling and cleaning the hole (hammer drilling with hollow drill bit)

| | | |
|---|---|--|
| 1 |  | <p>Check a suitable hollow drill (see Table B1) for correct operation of the dust extraction</p> |
| 2 |  | <p>Use a suitable dust extraction system, e. g. Bosch GAS 35 M AFC or a comparable dust extraction system with equivalent performance data</p> <p>Drill the hole with hollow drill bit. The dust extraction system has to extract the drill dust nonstop during the drilling process and must be adjusted to maximum power. Diameter of drill hole d_0 and drill hole depth h_0 see Tables B2, B3</p> |

Go to step 5

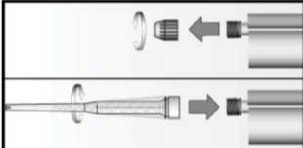
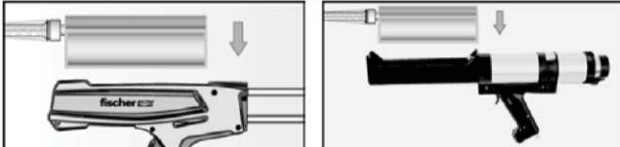

fischer injection system FIS VL

Intended use
Installation instructions part 1

Annex B 6

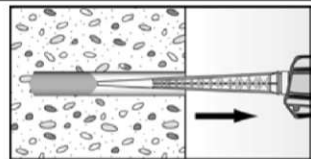
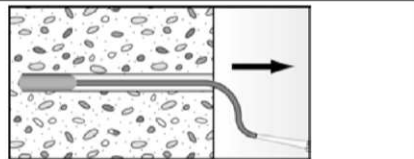
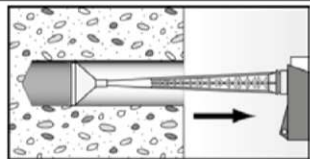
Installation instructions part 2

Preparing the cartridge

| | | |
|---|---|---|
| 5 |  | <p>Remove the sealing cap</p> <p>Screw on the static mixer (the spiral in the static mixer must be clearly visible)</p> |
| 6 |  | <p>Place the cartridge into the dispenser</p> |
| 7 |  | <p>Extrude approximately 10 cm of material until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey</p> |

Go to step 8

Mörtelinjektion

| | | | |
|---|--|--|--|
| 8 |  <p>Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles</p> |  <p>For drill hole depth ≥ 150 mm use an extension tube</p> |  <p>For overhead installation, deep holes ($h_0 > 250$ mm) or drill hole diameter ($d_0 \geq 40$ mm) use an injection-adapter</p> |
|---|--|--|--|

Go to step 9

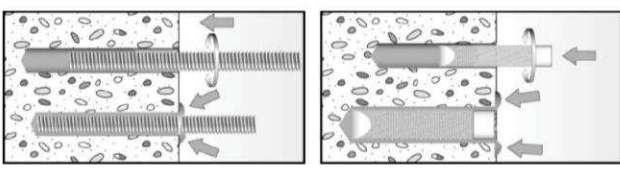
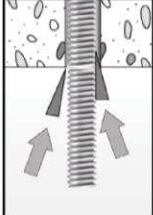
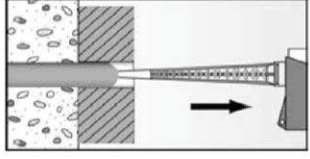

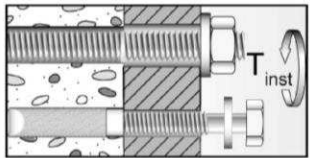
fischer injection system FIS VL

Intended use
Installation instructions part 2

Annex B 7

Installation instructions part 3

Installation of anchor rods or fischer internal threaded anchors RG MI

| | | |
|-----------|--|--|
| <p>9</p> |  | <p>Only use clean and oil-free anchor elements. Mark the setting depth of the anchor. Push the anchor rod or fischer internal threaded RG MI anchor down to the bottom of the hole, turning it slightly while doing so. After inserting the anchor element, excess mortar must be emerged around the anchor element.</p> |
| |  <p>For overhead installations support the anchor rod with wedges. (e. g. fischer centering wedges)</p> |  <p>For push through installation fill the annular gap with mortar</p> |
| <p>10</p> |  <p>Wait for the specified curing time t_{cure} see Table B5</p> | <p>11</p>  <p>Mounting the fixture $T_{inst,max}$ see Tables B2 and B3</p> |

fischer injection system FIS VL

Intended use
Installation instructions part 3

Annex B 8

| Table C1: Characteristic values for the steel bearing capacity of anchor rods under tensile / shear load | | | | | | | | | | | | | |
|--|---|----------------|-------|------|---------------------------|-----|-----|-----|-----|------------------|-----|------|------|
| Size | | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 | | |
| Bearing capacity under tensile load, steel failure | | | | | | | | | | | | | |
| Charact.bearing capacity $N_{Rk,s}$ | Steel zinc plated | Property class | 5.8 | [kN] | 10 | 19 | 29 | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 8.8 | | 16 | 29 | 47 | 68 | 126 | 196 | 282 | 368 | 449 |
| | Stainless steel A4 and High corrosion resistant steel C | | 50 | | 10 | 19 | 29 | 43 | 79 | 123 | 177 | 230 | 281 |
| | | | 70 | | 14 | 26 | 41 | 59 | 110 | 172 | 247 | 322 | 393 |
| | | | 80 | | 16 | 30 | 47 | 68 | 126 | 196 | 282 | 368 | 449 |
| Partial safety factors¹⁾ | | | | | | | | | | | | | |
| Partial safety factor $\gamma_{Ms,N}$ | Steel zinc plated | Property class | 5.8 | [-] | 1,50 | | | | | | | | |
| | | | 8.8 | | 1,50 | | | | | | | | |
| | Stainless steel A4 and High corrosion resistant steel C | | 50 | | 2,86 | | | | | | | | |
| | | | 70 | | 1,50 ²⁾ / 1,87 | | | | | | | | |
| | | | 80 | | 1,60 | | | | | | | | |
| Bearing capacity under shear load, steel failure | | | | | | | | | | | | | |
| without lever arm | | | | | | | | | | | | | |
| Charact.bearing capacity $V_{Rk,s}$ | Steel zinc plated | Property class | 5.8 | [kN] | 5 | 9 | 15 | 21 | 39 | 61 | 89 | 115 | 141 |
| | | | 8.8 | | 8 | 15 | 23 | 34 | 63 | 98 | 141 | 184 | 225 |
| | Stainless steel A4 and High corrosion resistant steel C | | 50 | | 5 | 9 | 15 | 21 | 39 | 61 | 89 | 115 | 141 |
| | | | 70 | | 7 | 13 | 20 | 30 | 55 | 86 | 124 | 161 | 197 |
| | | | 80 | | 8 | 15 | 23 | 34 | 63 | 98 | 141 | 184 | 225 |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 | | | k_2 | [-] | 1,0 | | | | | | | | |
| with lever arm | | | | | | | | | | | | | |
| Charact. bending moment $M_{Rk,s}$ | Steel zinc plated | Property class | 5.8 | [Nm] | 7 | 19 | 37 | 65 | 166 | 324 | 560 | 833 | 1123 |
| | | | 8.8 | | 12 | 30 | 60 | 105 | 266 | 519 | 896 | 1333 | 1797 |
| | Stainless steel A4 and High corrosion resistant steel C | | 50 | | 7 | 19 | 37 | 65 | 166 | 324 | 560 | 833 | 1123 |
| | | | 70 | | 10 | 26 | 52 | 92 | 232 | 454 | 784 | 1167 | 1573 |
| | | | 80 | | 12 | 30 | 60 | 105 | 266 | 519 | 896 | 1333 | 1797 |
| Partial safety factors¹⁾ | | | | | | | | | | | | | |
| Partial safety factor $\gamma_{Ms,V}$ | Steel zinc plated | Property class | 5.8 | [-] | 1,25 | | | | | | | | |
| | | | 8.8 | | 1,25 | | | | | | | | |
| | Stainless steel A4 and High corrosion resistant steel C | | 50 | | 2,38 | | | | | | | | |
| | | | 70 | | 1,25 ²⁾ / 1,56 | | | | | | | | |
| | | | 80 | | 1,33 | | | | | | | | |
| ¹⁾ In absence of other national regulations ²⁾ Only for fischer FIS A and RG M made of high corrosion-resistant steel C | | | | | | | | | | | | | |
| fischer injection system FIS VL | | | | | | | | | | Annex C 1 | | | |
| Performances Characteristic steel bearing capacity anchor rods | | | | | | | | | | | | | |

| Table C2: Characteristic values for the steel bearing capacity of fischer internal threaded anchors RG MI under tensile / shear load | | | | | | | | | |
|---|-----------------|--|-----------|------------|------------|------------|------------------|------|------|
| Size | | | M8 | M10 | M12 | M16 | M20 | | |
| Bearing capacity under tensile load, steel failure | | | | | | | | | |
| Characteristic bearing capacity with screw | $N_{Rk,s}$ | Property class | 5.8 | [kN] | 19 | 29 | 43 | 79 | 123 |
| | | | 8.8 | | 29 | 47 | 68 | 108 | 179 |
| | | Property class 70 | A4 | | 26 | 41 | 59 | 110 | 172 |
| | | | C | | 26 | 41 | 59 | 110 | 172 |
| Partial safety factors¹⁾ | | | | | | | | | |
| Partial safety factor | $\gamma_{Ms,N}$ | Property class | 5.8 | [-] | 1,50 | | | | |
| | | | 8.8 | | 1,50 | | | | |
| | | Property class 70 | A4 | | 1,87 | | | | |
| | | | C | | 1,87 | | | | |
| Bearing capacity under shear load, steel failure | | | | | | | | | |
| without lever arm | | | | | | | | | |
| Characteristic bearing capacity with screw | $V_{Rk,s}$ | Property class | 5.8 | [kN] | 9,2 | 14,5 | 21,1 | 39,2 | 62,0 |
| | | | 8.8 | | 14,6 | 23,2 | 33,7 | 54,0 | 90,0 |
| | | Property class 70 | A4 | | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
| | | | C | | 12,8 | 20,3 | 29,5 | 54,8 | 86,0 |
| Ductility factor acc. to CEN/TS 1992-4-5:2009 Section 6.3.2.1 | | | k_2 | [-] | 1,0 | | | | |
| with lever arm | | | | | | | | | |
| Characteristic bending moment with screw | $M^0_{Rk,s}$ | Property class | 5.8 | [Nm] | 20 | 39 | 68 | 173 | 337 |
| | | | 8.8 | | 30 | 60 | 105 | 266 | 519 |
| | | Property class 70 | A4 | | 26 | 52 | 92 | 232 | 454 |
| | | | C | | 26 | 52 | 92 | 232 | 454 |
| Partial safety factors¹⁾ | | | | | | | | | |
| Partial safety factor | $\gamma_{Ms,V}$ | Property class | 5.8 | [-] | 1,25 | | | | |
| | | | 8.8 | | 1,25 | | | | |
| | | Property class 70 | A4 | | 1,56 | | | | |
| | | | C | | 1,56 | | | | |
| ¹⁾ In absence of other national regulations | | | | | | | | | |
| fischer injection system FIS VL | | | | | | | Annex C 2 | | |
| Performances | | Characteristic steel bearing capacity of fischer internal threaded anchors RG MI | | | | | | | |

| Table C3: General design factors for the bearing capacity under tensile / shear load; uncracked or cracked concrete | | | | | | | | | | | | |
|--|--------------------------|----------------------------|---------------|----------------------|----------------------|-----|-----|-----|-----|------------------|-----|-----|
| Size | | | | All sizes | | | | | | | | |
| Bearing capacity under tensile load | | | | | | | | | | | | |
| Factors acc. to CEN/TS 1992-4:2009 Section 6.2.2.3 | | | | | | | | | | | | |
| Uncracked concrete | | k_{ucr} | [-] | 10,1 | | | | | | | | |
| Cracked concrete | | k_{cr} | | 7,2 | | | | | | | | |
| Factors for the compressive strength of concrete > C20/25 | | | | | | | | | | | | |
| Increasing factor for τ_{Rk} | C25/30 | | Ψ_c | [-] | 1,05 | | | | | | | |
| | C30/37 | | | | 1,10 | | | | | | | |
| | C35/45 | | | | 1,15 | | | | | | | |
| | C40/50 | | | | 1,19 | | | | | | | |
| | C45/55 | | | | 1,22 | | | | | | | |
| | C50/60 | | | | 1,26 | | | | | | | |
| Splitting failure | | | | | | | | | | | | |
| Edge distance | $h / h_{ef} \geq 2,0$ | | $C_{cr,sp}$ | [mm] | 1,0 h_{ef} | | | | | | | |
| | $2,0 > h / h_{ef} > 1,3$ | | | | 4,6 $h_{ef} - 1,8 h$ | | | | | | | |
| | $h / h_{ef} \leq 1,3$ | | | | 2,26 h_{ef} | | | | | | | |
| Spacing | | $S_{cr,sp}$ | 2 $C_{cr,sp}$ | | | | | | | | | |
| Concrete cone failure acc. to CEN/TS 1992-4-5:2009 Section 6.2.3.2 | | | | | | | | | | | | |
| Edge distance | | $C_{cr,N}$ | [mm] | 1,5 h_{ef} | | | | | | | | |
| Spacing | | $S_{cr,N}$ | | 2 $C_{cr,N}$ | | | | | | | | |
| Bearing capacity under shear load | | | | | | | | | | | | |
| Installation safety factors | | | | | | | | | | | | |
| All installation conditions | | $\gamma_2 = \gamma_{inst}$ | [-] | 1,2 | | | | | | | | |
| Concrete pry-out failure | | | | | | | | | | | | |
| Factor k acc. to TR029 Section 5.2.3.3 resp. k_3 acc. to CEN/TS 1992-4-5:2009 Section 6.3.3 | | $k_{(3)}$ | [-] | 2,0 | | | | | | | | |
| Concrete edge failure | | | | | | | | | | | | |
| The value of h_{ef} (= l_t) under shear load | | | [mm] | min (h_{ef} ; 8d) | | | | | | | | |
| Calculation diameters | | | | | | | | | | | | |
| Size | | | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Anchor rods | | d | [mm] | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| fischer internal threaded anchors RG MI | | d_{nom} | | --- | 12 | 16 | 18 | 22 | 28 | --- | --- | --- |
| fischer injection system FIS VL | | | | | | | | | | Annex C 3 | | |
| Performances General design factors relating to the characteristic bearing capacity under tensile / shear load | | | | | | | | | | | | |

| Table C4: Characteristic values of resistance for anchor rods in hammer drilled holes; uncracked or cracked concrete | | | | | | | | | | | | | |
|---|--------------------|----------------------------|-----------------|----------------------|-----|------|------|-------------------|------|------------------|-----|-----|-----|
| Size | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 | | | | |
| Combined pullout and concrete cone failure | | | | | | | | | | | | | |
| Calculation diameter | d | [mm] | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 | | |
| Uncracked concrete | | | | | | | | | | | | | |
| Characteristic bond resistance in uncracked concrete C20/25 | | | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) | | | | | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{RK,ucr}$ | [N/mm ²] | 9,0 | 11,0 | 11,0 | 11,0 | 10,0 | 9,5 | 9,0 | 8,5 | 8,5 |
| | II: 72 °C / 120 °C | | | | 6,5 | 9,5 | 9,5 | 9,0 | 8,5 | 8,0 | 7,5 | 7,0 | 7,0 |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole) ¹⁾ | | | | | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{RK,ucr}$ | [N/mm ²] | --- | --- | --- | 9,5 | 8,5 | 8,0 | 7,5 | 7,0 | 7,0 |
| | II: 72 °C / 120 °C | | | | --- | --- | --- | 7,5 | 7,0 | 6,5 | 6,0 | 6,0 | 6,0 |
| Installation safety factors | | | | | | | | | | | | | |
| Dry and wet concrete | | $\gamma_2 = \gamma_{inst}$ | [-] | 1,2 | | | | | | | | | |
| Flooded hole | | | | --- | | | | 1,4 ¹⁾ | | | | | |
| Cracked concrete | | | | | | | | | | | | | |
| Characteristic bond resistance in cracked concrete C20/25 | | | | | | | | | | | | | |
| Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete) | | | | | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{RK,cr}$ | [N/mm ²] | --- | --- | 6,0 | 6,0 | 6,0 | 5,5 | --- | --- | --- |
| | II: 72 °C / 120 °C | | | | --- | --- | 5,0 | 5,0 | 5,0 | 5,0 | --- | --- | --- |
| Hammer-drilling with standard drill bit or hollow drill bit (flooded hole) ¹⁾ | | | | | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{RK,cr}$ | [N/mm ²] | --- | --- | --- | 5,0 | 5,0 | 4,5 | --- | --- | --- |
| | II: 72 °C / 120 °C | | | | --- | --- | --- | 4,0 | 4,0 | 4,0 | --- | --- | --- |
| Installation safety factors | | | | | | | | | | | | | |
| Dry and wet concrete | | $\gamma_2 = \gamma_{inst}$ | [-] | 1,2 | | | | | | | | | |
| Flooded hole | | | | --- | | | | 1,4 ¹⁾ | | | | | |
| ¹⁾ Only with coaxial cartridges: 380 ml, 400 ml, 410 ml | | | | | | | | | | | | | |
| fischer injection system FIS VL | | | | | | | | | | Annex C 4 | | | |
| Performances Characteristic values for static or quasi-static action under tensile load for anchor rods (uncracked or cracked concrete) | | | | | | | | | | | | | |

| Table C5: Characteristic values of resistance for fischer internal threaded anchors RG MI in hammer drilled holes; uncracked concrete | | | | | | | | | |
|---|--------------------|----------------------------|-----------------|----------------------|------------|------------------|-----|-------------------|-----|
| Size | | M8 | M10 | M12 | M16 | M20 | | | |
| Combined pullout and concrete cone failure | | | | | | | | | |
| Calculation diameter | d | [mm] | 12 | 16 | 18 | 22 | 28 | | |
| Uncracked concrete | | | | | | | | | |
| Characteristic bond resistance in uncracked concrete C20/25 | | | | | | | | | |
| <u>Hammer-drilling with standard drill bit or hollow drill bit (dry and wet concrete)</u> | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{Rk,ucr}$ | [N/mm ²] | 10,5 | 10,0 | 9,5 | 9,0 | 8,5 |
| | II: 72 °C / 120 °C | | | | 9,0 | 8,0 | 8,0 | 7,5 | 7,0 |
| <u>Hammer-drilling with standard drill bit or hollow drill bit (flooded hole)¹⁾</u> | | | | | | | | | |
| Tem- perature range | I: 50 °C / 80 °C | | $\tau_{Rk,ucr}$ | [N/mm ²] | 10,0 | 9,0 | 9,0 | 8,5 | 8,0 |
| | II: 72 °C / 120 °C | | | | 7,5 | 6,5 | 6,5 | 6,0 | 6,0 |
| Installation safety factors | | | | | | | | | |
| Dry and wet concrete | | $\gamma_2 = \gamma_{inst}$ | [-] | | | | | 1,2 | |
| Flooded hole | | | | | | | | 1,4 ¹⁾ | |
| ¹⁾ Only with coaxial cartridges: 380 ml, 400 ml, 410 ml | | | | | | | | | |
| fischer injection system FIS VL | | | | | | Annex C 5 | | | |
| Performances Characteristic values for static or quasi-static action under tensile load for fischer internal threaded anchors RG MI and reinforcing bars (uncracked concrete) | | | | | | | | | |

| Table C6: Displacements for anchor rods | | | | | | | | | | |
|---|---------------------------|------|------|------|---|------|------|------|------------------|------|
| Size | | M6 | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| Displacement-Factors for tensile load¹⁾ | | | | | | | | | | |
| Uncracked concrete; Temperature range I, II | | | | | | | | | | |
| δ_{N0} -Faktor | [mm/(N/mm ²)] | 0,09 | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,11 | 0,12 |
| $\delta_{N\infty}$ -Faktor | | 0,10 | 0,10 | 0,10 | 0,12 | 0,12 | 0,12 | 0,13 | 0,13 | 0,14 |
| Cracked concrete; Temperature range I, II | | | | | | | | | | |
| δ_{N0} -Faktor | [mm/(N/mm ²)] | --- | --- | 0,12 | 0,12 | 0,13 | 0,13 | --- | --- | --- |
| $\delta_{N\infty}$ -Faktor | | --- | --- | 0,27 | 0,30 | 0,30 | 0,30 | --- | --- | --- |
| Displacement-Factors for shear load²⁾ | | | | | | | | | | |
| Uncracked or cracked concrete; Temperature range I, II | | | | | | | | | | |
| δ_{V0} -Faktor | [mm/kN] | 0,11 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 | 0,08 | 0,07 |
| $\delta_{V\infty}$ -Faktor | | 0,12 | 0,12 | 0,12 | 0,11 | 0,11 | 0,10 | 0,10 | 0,09 | 0,09 |
| ¹⁾ Calculation of effective displacement: $\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$ $\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$ (τ_{Ed} : Design value of the applied tensile stress) | | | | | ²⁾ Calculation of effective displacement: $\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$ $\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$ (V_{Ed} : Design value of the applied shear force) | | | | | |
| Table C7: Displacements for fischer internal threaded anchors RG MI | | | | | | | | | | |
| Size | | M8 | M10 | M12 | M16 | M20 | | | | |
| Displacement-Factors for tensile load¹⁾ | | | | | | | | | | |
| Uncracked concrete; Temperature range I, II | | | | | | | | | | |
| δ_{N0} -Faktor | [mm/(N/mm ²)] | 0,10 | 0,11 | 0,12 | 0,13 | 0,14 | | | | |
| $\delta_{N\infty}$ -Faktor | | 0,13 | 0,14 | 0,15 | 0,16 | 0,18 | | | | |
| Displacement-Factors for shear load²⁾ | | | | | | | | | | |
| Uncracked concrete; Temperature range I, II | | | | | | | | | | |
| δ_{V0} -Faktor | [mm/kN] | 0,12 | 0,12 | 0,12 | 0,12 | 0,12 | | | | |
| $\delta_{V\infty}$ -Faktor | | 0,14 | 0,14 | 0,14 | 0,14 | 0,14 | | | | |
| ¹⁾ Calculation of effective displacement: $\delta_{N0} = \delta_{N0\text{-Faktor}} \cdot \tau_{Ed}$ $\delta_{N\infty} = \delta_{N\infty\text{-Faktor}} \cdot \tau_{Ed}$ (τ_{Ed} : Design value of the applied tensile stress) | | | | | ²⁾ Calculation of effective displacement: $\delta_{V0} = \delta_{V0\text{-Faktor}} \cdot V_{Ed}$ $\delta_{V\infty} = \delta_{V\infty\text{-Faktor}} \cdot V_{Ed}$ (V_{Ed} : Design value of the applied shear force) | | | | | |
| fischer injection system FIS VL | | | | | | | | | Annex C 6 | |
| Performances Displacements for anchor rods and fischer internal threaded anchors RG MI | | | | | | | | | | |