

DICHIARAZIONE DI PRESTAZIONE

DoP 0378

per il Sistema a Iniezione fischer FIS EP (ancorante chimico per l'utilizzo nel calcestruzzo)

IT

1. Codice di identificazione unico del prodotto-tipo: DoP 0378
2. Usi previsti: Fissaggio post-installato in calcestruzzo fessurato o non fessurato, vedi appendice, in particolare gli allegati da B1 - B10.
3. Fabbricante: fischerwerke GmbH & Co. KG, Otto-Hahn-Straße 15, 79211 Denzlingen, Germany
4. Mandatario: -
5. Sistemi di VVCP: 1
6. Documento per la valutazione europea: EAD 330499-02-0601, Edition 09/2022
Valutazione tecnica europea: ETA-24/0960; 2024-12-13
Organismo di valutazione tecnica: CSTB - Centre Scientifique et Technique du Bâtiment
Organismi notificati: 2873 TU Darmstadt
7. Prestazioni dichiarate:
Resistenza meccanica e stabilità (BWR 1)
Resistenza caratteristica al carico di tensione (carico statico e quasi-statico):
 - 1) Resistenza alla rottura dell'acciaio: vedi appendice, in particolare gli allegati da C1, C2
 - 2) Resistenza alla rottura del calcestruzzo combinata con sfilamento: vedi appendice, in particolare gli allegati da C3, C4
 - 3) Resistenza alla rottura del cono di calcestruzzo: vedi appendice, in particolare gli allegati da C3
 - 4) Distanza dal bordo per evitare lo splitting sotto carico: vedi appendice, in particolare gli allegati da C3
 - 5) Robustezza: vedi appendice, in particolare gli allegati da C3, C4
 - 6) Massima coppia di installazione: vedi appendice, in particolare gli allegati da B3
 - 7) Distanza dal bordo e interassi minimi, Spessore dell'elemento: vedi appendice, in particolare gli allegati da B5, B6**Resistenza caratteristica al carico di taglio (carico statico e quasi statico):**
 - 8) Resistenza alla rottura dell'acciaio: vedi appendice, in particolare gli allegati da C2
 - 9) Resistenza alla rottura per pry-out: vedi appendice, in particolare gli allegati da C3
 - 10) Resistenza alla rottura del bordo di calcestruzzo: vedi appendice, in particolare gli allegati da C3**Spostamenti con carichi a breve e a lungo termine:**
 - 11) Spostamenti con carichi a breve e a lungo termine: vedi appendice, in particolare gli allegati da C5
 - 12) Resistenza nel calcestruzzo rinforzato con fibre d'acciaio: NPD**Resistenza e spostamenti caratteristici per le categorie di prestazione sismica C1 e C2:**
 - 13) Resistenza al carico di trazione, categoria C1: NPD
 - 14) Resistenza al carico di trazione, categoria C2: NPD
 - 15) Resistenza al carico di taglio, categoria C1: NPD
 - 16) Resistenza al carico di taglio, categoria C2: NPD**Sicurezza in caso di incendio (BWR 2)**
 - 17) Reazione al fuoco: Classe (A1)**Resistenza al fuoco:**
 - 18) Resistenza al fuoco alla rottura dell'acciaio (carico di trazione): NPD
 - 19) Resistenza al legame in condizioni di incendio: NPD
 - 20) Resistenza al fuoco alla rottura dell'acciaio (carico di taglio): NPD**Igiene, salute e ambiente (BWR 3)**
 - 21) Contenuto, emissione e/o rilascio di sostanze pericolose: NPD
8. Documentazione tecnica appropriata e/o documentazione tecnica specifica: -

La prestazione del prodotto sopra identificato è conforme all'insieme delle prestazioni dichiarate. La presente dichiarazione di prestazione è emessa, in conformità al regolamento (UE) n. 305/2011, sotto la sola responsabilità del fabbricante sopra identificato.

Firmato a nome e per conto del fabbricante da:



Dr. Ronald Mihala, Responsabile della gestione dello sviluppo e della produzione
Tumlingen, 2025-02-10



Dieter Pfaff, Capo della Federazione Internazionale della Produzione e Gestione della Qualità

Questa Dichiarazione di Prestazione (DoP) è stata preparata in varie lingue. In caso di contestazioni sull'interpretazione, prevarrà sempre la versione inglese.

L'Appendice include informazioni volontarie e complementari in lingua inglese che superano i requisiti di legge (lingua specificata in modo neutrale).

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Guida alla traduzione delle Caratteristiche Essenziali e dei Parametri di Prestazione per gli Annessi

Mechanical resistance and stability (BWR 1)		
Resistenza meccanica e stabilità (BWR 1)		
Characteristic resistance to tension load (static and quasi-static loading):		
Resistenza caratteristica al carico di tensione (carico statico e quasi-statico):		
1	Resistance to steel failure: Resistenza alla rottura dell'acciaio:	$N_{Rk,s}$ [kN]
2	Resistance to combined pull-out and concrete cone failure: Resistenza alla rottura del calcestruzzo combinata con sfilamento:	τ_{Rk} and/or $\tau_{Rk,100}$ [N/mm ²], ψ_{cr} , ψ_{sus}^0 , $\psi_{sus,100}$ [-] (BF)
	Resistance to pull-out failure: Resistenza alla rottura per sfilamento:	$N_{Rk,p}$ and/or $N_{Rk,p,100}$ [kN], ψ_c [-] (BEF)
3	Resistance to concrete cone failure: Resistenza alla rottura del cono di calcestruzzo:	$c_{cr,N}$ [mm], $k_{cr,N}$, $k_{ucr,N}$ [-]
4	Edge distance to prevent splitting under load: Distanza dal bordo per evitare lo splitting sotto carico:	$c_{cr,sp}$ [mm]
5	Robustness: Robustezza:	Y_{inst} [-]
6	Maximum installation torque: Massima coppia di installazione:	$\max T_{inst}$ [Nm] (BF)
	Installation torque: Coppia di installazione:	T_{inst} [Nm] (BEF)
7	Minimum edge distance, spacing and member thickness: Distanza dal bordo e interassi minimi, Spessore dell'elemento:	c_{min} , s_{min} , h_{min} [mm]
Characteristic resistance to shear load (static and quasi-static loading):		
Resistenza caratteristica al carico di taglio (carico statico e quasi statico):		
8	Resistance to steel failure: Resistenza alla rottura dell'acciaio:	$V_{Rk,s}^0$ [kN], $M_{Rk,s}^0$ [Nm], k_7 [-]
9	Resistance to pry-out failure: Resistenza alla rottura per pry-out:	k_8 [-]
10	Resistance to concrete edge failure: Resistenza alla rottura del bordo di calcestruzzo:	d_{nom} , l_f [mm]
Displacements under short-term and long-term loading:		
Spostamenti con carichi a breve e a lungo termine:		
11	Displacements factors under short-term and long-term loading: Spostamenti con carichi a breve e a lungo termine:	δ_0 , δ_∞ [mm/(N/mm ²)] or [mm/kN]
12	Resistance in steel fibre reinforced concrete: Resistenza nel calcestruzzo rinforzato con fibre d'acciaio:	Description
Characteristic resistance and displacements for seismic performance categories C1 and C2:		
Resistenza e spostamenti caratteristici per le categorie di prestazione sismica C1 e C2:		
13	Resistance to tension for seismic performance category C1 Resistenza al carico di trazione, categoria C1:	$N_{Rk,s,C1}$ [kN] (all) $T_{Rk,C1}$ [N/mm ²] (BF) $N_{Rk,p,C1}$ [kN] (BEF)
14	Resistance to tension and displacements for seismic performance category C2 Resistenza al carico di trazione, categoria C2:	$N_{Rk,s,C2}$ [kN] (all) $T_{Rk,C2}$ [N/mm ²] (BF) $N_{Rk,p,C2}$ [kN] (BEF) $\delta_{N,C2(50\%)}$, $\delta_{N,C2(100\%)}$ [mm] (all)
15	Resistance to shear for seismic performance category C1 Resistenza al carico di taglio, categoria C1:	$V_{Rk,s,C1}$ [kN] (all)
16	Resistance to shear load and displacements for seismic performance category C2 Resistenza al carico di taglio, categoria C2:	$V_{Rk,s,C2}$ [kN] (all) $\delta_{V,C2(50\%)}$, $\delta_{V,C2(100\%)}$ [mm] (all)
Safety in case of fire (BWR 2)		
Sicurezza in caso di incendio (BWR 2)		
17	Reaction to fire Reazione al fuoco:	Class Classe (A1)
Resistance to fire		
Resistenza al fuoco:		
18	Fire resistance to steel failure (tension load): Resistenza al fuoco alla rottura dell'acciaio (carico di trazione):	$N_{Rk,s,fi}$ [kN]
19	Bond resistance under fire conditions: Resistenza al legame in condizioni di incendio:	$k_{fi,p}(\theta)$ [-], $T_{Rk,fi}(\theta)$ [N/mm ²] (BF)
20	Fire resistance to steel failure under shear loading: Resistenza al fuoco alla rottura dell'acciaio (carico di taglio):	$V_{Rk,s,fi}$ [kN], $M_{Rk,s,fi}^0$ [Nm]
Hygiene, health and the environment (BWR 3)		
Igiene, salute e ambiente (BWR 3)		
21	Content, emission and/or release of dangerous substances: Contenuto, emissione e/o rilascio di sostanze pericolose:	Description/Level

European Technical Assessment

**ETA-24/0960
of 13/12/2024**

English translation prepared by CSTB - Original version in French language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Centre Scientifique et Technique du Bâtiment (CSTB)

Trade name:

fischer injection system FIS EP

Product family:

Bonded fasteners for use in concrete

Manufacturer:

fischerwerke GmbH & Co. KG
Otto-Hahn-Straße 15
79211 Denzlingen
Germany

Manufacturing plants:

fischerwerke

This European Technical
Assessment contains:

22 pages including 18 pages of annexes which form an
integral part of this assessment

This European Technical
Assessment is issued in
accordance with Regulation (EU)
No 305/2011, on the basis of:
This Assessment replaces:

EAD 330499-02-0601 Edition 09/2022

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Specific Part

1 Technical description of the product

The fischer injection system FIS EP is a bonded fastener consisting of a cartridge with injection mortar and a steel element.

These steel elements are:

- a reinforcing bar (Rebar) in the range $\phi 10$ to $\phi 20$.
- a fischer Anchor rod FIS A / RG M in the range of M10 to M20.
- a commercial Threaded rod in the range of M10 to M20.

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

The illustration and the description of the product are given in Annexes A.

2 Specification of the intended use

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

The provisions made in this European technical assessment are based on an assumed working life of the fastener of 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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi static loads, Displacements	See Annexes C1 to C5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Fasteners satisfy requirements for Class A1
Resistance to fire	-

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European technical approval, there may be requirements applicable to the products falling within its scope (e.g., transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For Basic requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources, no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission¹, as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Bonded fasteners for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	-	1

5 Technical details necessary for the implementation of the AVCP system, as planned in the relevant EAD

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The control plan including confidential information is not included in the published part of this ETA.

The original French version is signed by:

Loïc Payet

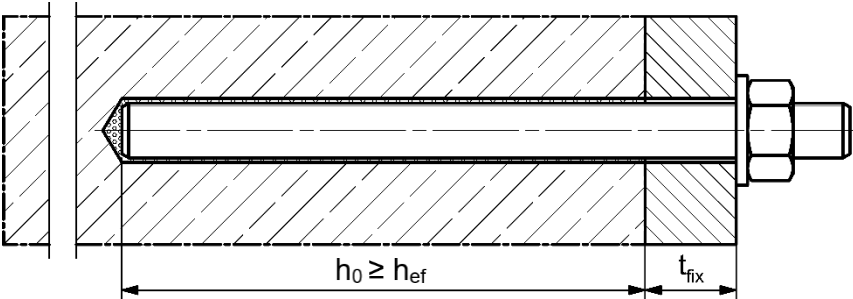
Head of the Structure, Masonry, Partition Division

¹ Official Journal of the European Communities L 254 of 08.10.1996.

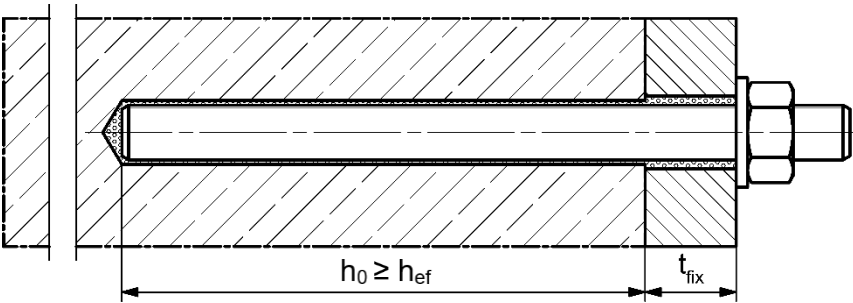
Installed condition

fischer Anchor rod FIS A / RG M (Anchor rod) and
commercial standard Threaded rod (Threaded rod)

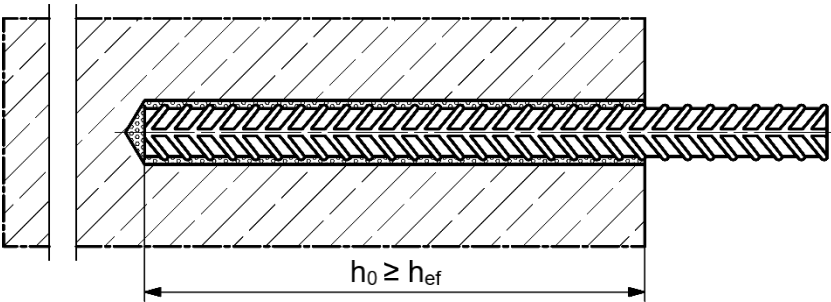
Pre-positioned installation



Push through installation (annular gap filled with mortar)



Reinforcing bar (Rebar)



Figures not to scale

h_0 = drill hole depth
 t_{fix} = thickness of fixture

h_{ef} = effective embedment depth

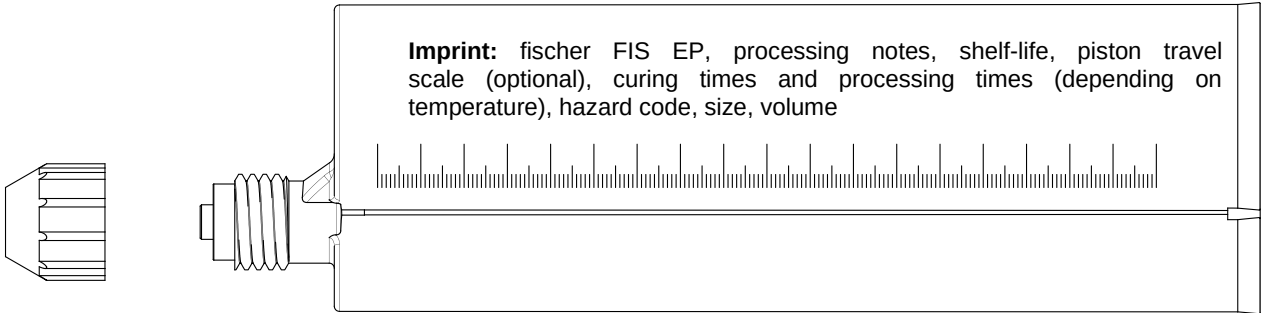
fischer Injection System FIS EP

Product description
Installation conditions

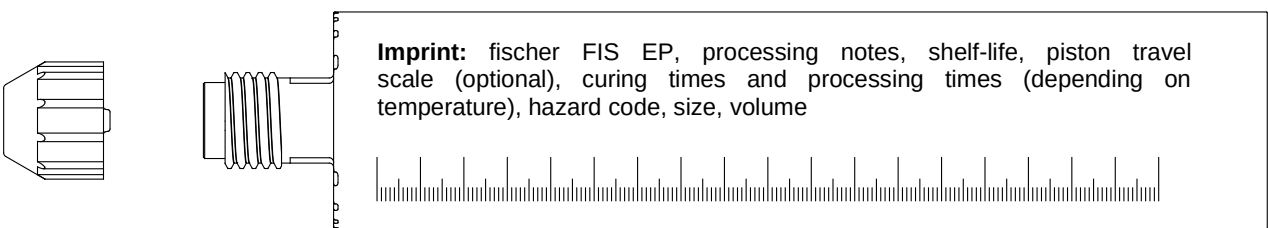
Annex A1

Product description: Overview system components part 1

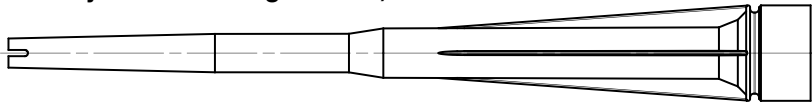
Injection cartridge (shuttle cartridge) with sealing cap; Size: 390 ml, 585 ml



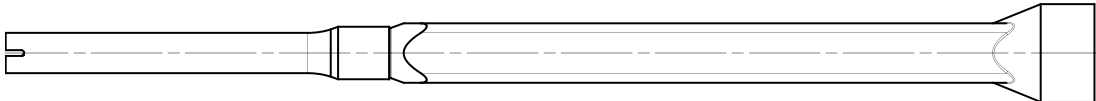
Injection cartridge (coaxial cartridge) with sealing cap; Sizes: 300 ml



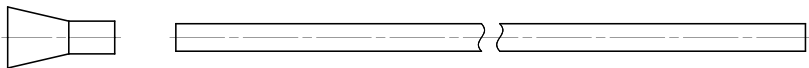
Static mixer FIS MR Plus for Injection cartridge 300ml, 390 ml



Static mixer FIS UMR for Injection cartridges 585 ml



Injection adapter and extension tube Ø 9 for static mixer FIS MR Plus;
Injection adapter and extension tube Ø 9 or Ø 15 for static mixer FIS UMR



Cleaning brush BS



Blow-out pump AB G



Compressed-air cleaning tool ABP



Figures not to scale

fischer Injection System FIS EP

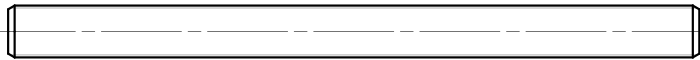
Product description
Overview system components part 1; cartridges / static mixer / accessories

Annex A2

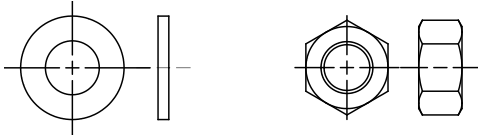
Product description: Overview system components part 2

Anchor rod / Threaded rod

Size: M10, M12, M16, M20



Washer / hexagon nut



Reinforcing bar

Nominal diameter: $\phi 10$, $\phi 12$, $\phi 14$, $\phi 16$, $\phi 20$



Figures not to scale

fischer Injection System FIS EP

Product description
Overview system components part 2; steel components

Annex A3

Table A4.1: Product description: Materials

Part	Designation	Material		
1	Injection cartridge	Mortar, hardener, filler		
	Steel grade	Steel	Stainless steel R	High corrosion resistant steel HCR
		zinc plated (zp, hdg)	acc. to EN 10088-1:2023 Corrosion resistance class CRC III acc. to EN 1993-1-4:2006+A2:2020	acc. to EN 10088-1:2023 Corrosion resistance class CRC V acc. to EN 1993-1-4:2006+A2:2020
2	Anchor rod or Threaded rod	Property class 4.8, 5.8 or 8.8 acc. to EN ISO 898-1:2013 zinc plated $\geq 5 \mu\text{m}$, acc. to EN ISO 4042:2022 or hot dip galvanised $\geq 40 \mu\text{m}$ acc. to EN ISO 10684:2004+AC:2009 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation	Property class 50, 70 or 80 acc. to EN ISO 3506-1:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; 1.4062, 1.4662, 1.4462; acc. to EN 10088-1:2023 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation	Property class 50 or 80 acc. to EN ISO 3506-1:2020 or property class 70 1.4565; 1.4529; acc. to EN 10088-1:2023 $f_{uk} \leq 1000 \text{ N/mm}^2$ $A_5 > 8 \%$ fracture elongation
3	Washer ISO 7089:2000	zinc plated $\geq 5 \mu\text{m}$, acc. to EN ISO 4042:2022 or hot dip galvanised $\geq 40 \mu\text{m}$ acc. to EN ISO 10684:2004+AC:2009	1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; acc. to EN 10088-1:2023	1.4565; 1.4529; acc. to EN 10088-1:2023
4	Hexagon nut	Property class 5 or 8 acc. to EN ISO 898-2:2012 zinc plated $\geq 5 \mu\text{m}$, acc. to EN ISO 4042:2022 or hot dip galvanised $\geq 40 \mu\text{m}$ acc. to EN ISO 10684:2004+AC:2009	Property class 50, 70 or 80 acc. acc. to EN ISO 3506-2:2020 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362; acc. to EN 10088-1:2023	Property class 50, 70 or 80 acc. acc. to EN ISO 3506-2:2020 1.4565; 1.4529 acc. to EN 10088-1:2023
6	Rebar	EN 1992-1-1:2004 and AC:2010, Annex C Bars and de-coiled rods, class B or C with f_{yk} and k according to NDP or NCI according to EN 1992-1-1/NA; $f_{uk} = f_{tk} = k \cdot f_{yk}$ ($A_5 > 8 \%$)		

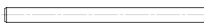
fischer Injection System FIS EP

Product description
Materials

Annex A4

Specifications of intended use part 1

Table B1.1: Overview use and performance categories

Anchorages subject to		FIS EP with ...			
		Anchor rod / Threaded rod 		Reinforcing bar 	
Hammer drilling with standard drill bit 		all sizes			
Static and quasi-static loading, in	uncracked concrete	all sizes	Tables: C1.1 C3.1 C4.1 C4.2	all sizes	Tables: C2.1 C3.1 C4.1 C4.2
Use category	I1 dry or wet concrete	all sizes			
Installation direction		D3 (downward and horizontal and upwards (e.g. overhead))			
Installation temperature		T _{i,min} = +5 °C to T _{i,max} = +40 °C			
Service temperature	Temperature range I	-40 °C to +60 °C		(max. short term temperature +60 °C; max. long term temperature +43 °C)	

fischer Injection System FIS EP

Intended use
Specifications of intended use part 1

Annex B1

Specifications of intended use part 2

Fasteners subject to:

- Static and quasi static loading.

Base material:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A2:2021.
- Strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021.
- uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according EN 1993-1-4:2006+A2:2020 corresponding to corrosion resistance classes Annex A (stainless steel and high corrosion resistant steel).

Design:

- Fasteners are designed under the responsibility of an engineer experienced in fasteners and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- The fasteners are designed in accordance with EN 1992-4:2018 and EOTA Technical Report 055:2018.

Installation:

- Fastener installation is to be carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Fastening depth should be marked and adhered to installation.

fischer Injection System FIS EP

Intended use
Specifications of intended use part 2

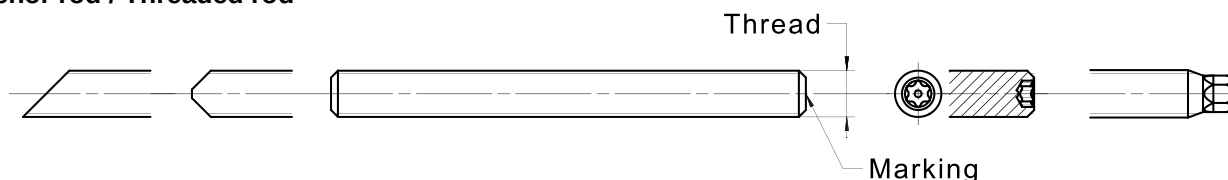
Annex B2

Table B3.1: Installation parameters for Anchor rod / Threaded rods

Anchor rods / Threaded rods			M10	M12	M16	M20
Nominal drill hole diameter	d_0	[mm]	12	14	18	24
Drill hole depth	h_0		$h_0 \geq h_{ef}$			
Effective embedment depth	$h_{ef, min}$		60	70	80	90
	$h_{ef, max}$		200	240	320	400
Simplified spacing and edge distance ¹⁾	$s = c$		45	55	65	85
Diameter of the clearance hole of the fixture	pre-positioned installation d_f push through installation d_f		12 14	14 16	18 20	22 26
Minimum thickness of concrete member	h_{min}		$h_{ef} + 30$		$h_{ef} + 2d_0$	
Maximum installation torque	$\max T_{inst}$	[Nm]	20	40	60	120

¹⁾ Detailed calculation according to Annex B5 and B6.

Anchor rod / Threaded rod



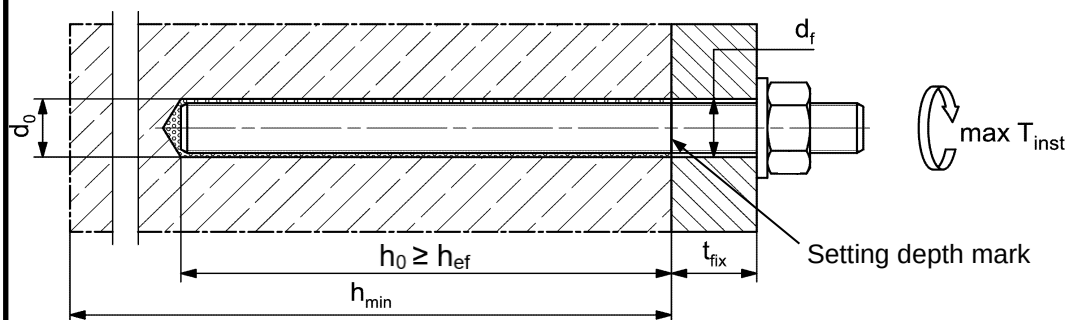
Marking (on random place) anchor rod:

Steel electroplated PC ¹⁾ 8.8	• or +	Steel hot-dip PC ¹⁾ 8.8	•
High corrosion resistant steel HCR PC ¹⁾ 50	•	High corrosion resistant steel HCR PC ¹⁾ 70	-
High corrosion resistant steel HCR PC ¹⁾ 80	(	Stainless steel R property class 50	~
Stainless steel R property class 80	*		

Alternatively: Colour coding according to DIN 976-1: 2016

¹⁾ PC = property class

Installation conditions:



Threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled.

- Material dimensions and mechanical properties according to Annex A 4, Table A4.1
- Inspection certificate 3.1 according to EN 10204:2004, the documents shall be stored
- Setting depth is marked

Figures not to scale

fischer Injection System FIS EP

Intended use
parameters anchor rods

Annex B3

Table B4.1: Installation parameters for Reinforcing bar

Nominal diameter of the rebar ϕ		10 ¹⁾		12 ¹⁾		14	16	20
Nominal drill hole diameter d_0	[mm]	12	14	14	16	18	20	25
Drill hole depth h_0		$h_0 \geq h_{ef}$						
Effective embedment depth $h_{ef,min}$		60		70		75	80	90
$h_{ef,max}$		200		240		280	320	400
Simplified spacing and edge distance ²⁾ $s = c$		45		55		60	65	85
Minimum thickness of concrete member h_{min}		$h_{ef} + 30$			$h_{ef} + 2d_0$			

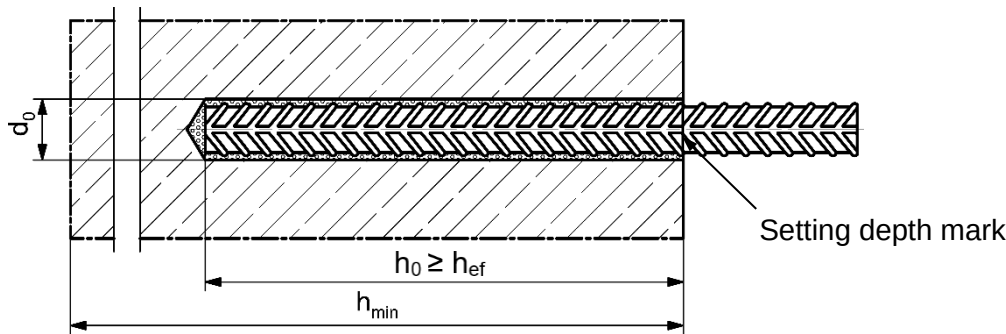
¹⁾ Both drill hole diameters can be used
²⁾ Detailed calculation according to Annex B5 and B6

Reinforcing bar



- The minimum value of related rib area $f_{R,min}$ must fulfil the requirements of EN 1992-1-1:2004+AC:2010
- The rib height must be within the range: $0,05 \cdot \phi \leq h_{rib} \leq 0,07 \cdot \phi$
(ϕ = Nominal diameter of the rebar, h_{rib} = rib height)

Installation conditions:



Figures not to scale

fischer Injection System FIS EP

Intended use
parameters rebars

Annex B4

Table B5.1: Minimum spacing and minimum edge distance for Anchor rods / Threaded rods and Rebars

Anchor rods / Threaded rods		M10	M12	-	M16	M20	
Rebars (nominal diameter)	ϕ	10	12	14	16	20	
Minimum edge distance							
Uncracked concrete	Cmin	[mm]	45	45	45	50	55
Spacing	s		according to Annex B6				
Minimum spacing							
Uncracked concrete	Smin	[mm]	45	55	60	65	85
Edge distance	c		according to Annex B6				
Required projecting area							
Uncracked concrete	A _{sp,req}	[1000 mm²]	13,0	22,0	23,0	24,0	38,5

Splitting failure for minimum edge distance and spacing in dependence of the effective embedment depth h_{ef} .

For the calculation of minimum spacing and minimum edge distance of anchors in combination with different embedment depths and thicknesses of concrete members the following equation shall be fulfilled:

$$A_{sp,req} < A_{sp,t}$$

$A_{sp,req}$ = required projecting area

$A_{sp,t}$ = projecting area (according to Annex B6)

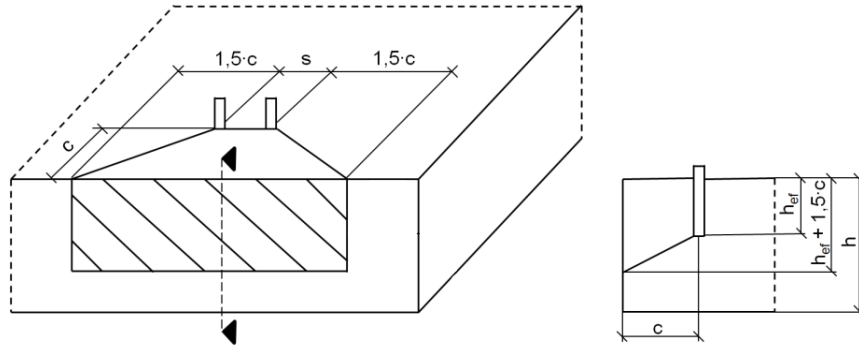
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Intended use

Minimum spacing and edge distance for Anchor rods / Threaded rods and Rebars

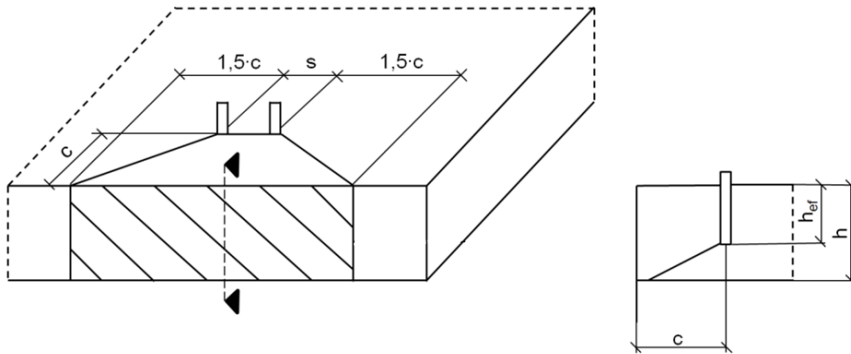
Annex B5

Table B6.1: Projecting area A_{sp} with concrete member thickness $h > h_{ef} + 1,5 \cdot c$ and $h \geq h_{min}$



Single fastener	$A_{sp,t} = (3 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$	[mm ²]	with $c \geq c_{min}$
Group of fastener with $s > 3 \cdot c$	$A_{sp,t} = (6 \cdot c) \cdot (h_{ef} + 1,5 \cdot c)$	[mm ²]	
Group of fastener with $s \leq 3 \cdot c$	$A_{sp,t} = (3 \cdot c + s) \cdot (h_{ef} + 1,5 \cdot c)$	[mm ²]	with $c \geq c_{min}$ and $s \geq s_{min}$

Table B6.2: Projecting area A_{sp} with concrete member thickness $h \leq h_{ef} + 1,5 \cdot c$ and $h \geq h_{min}$



Single fastener	$A_{sp,t} = 3 \cdot c \cdot \text{existing } h$	[mm ²]	with $c \geq c_{min}$
Group of fastener with $s > 3 \cdot c$	$A_{sp,t} = 6 \cdot c \cdot \text{existing } h$	[mm ²]	
Group of fastener with $s \leq 3 \cdot c$	$A_{sp,t} = (3 \cdot c + s) \cdot \text{existing } h$	[mm ²]	with $c \geq c_{min}$ and $s \geq s_{min}$

Edge distance and axial spacing shall be rounded up to at least 5 mm.

Figures not to Scale

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Intended use

Minimum thickness of concrete member and minimum spacing and edge distance for Anchor rods / Threaded rods and Rebars

Annex B6

Table B7.1: Parameters of the cleaning brush BS (steel brush with steel bristles)

The size of the cleaning brush refers to the drill hole diameter

Nominal drill hole diameter	d_0	[mm]	12	14	16	18	20	24	25
Steel brush diameter BS	d_b		14	16	20		25	26	27

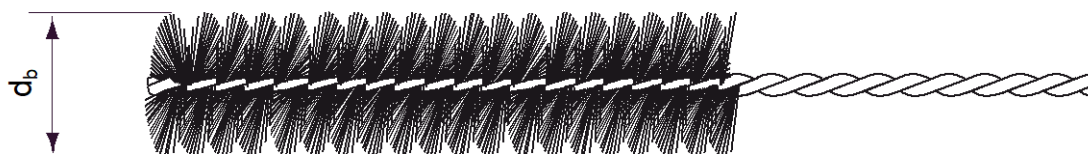


Table B7.2: Conditions for use static mixer without an extension tube

Nominal drill hole diameter	d_0	[mm]	12	14	16	18	20	24	25
Drill hole depth h_0 by using	FIS MR Plus		≤ 90	≤ 120	≤ 140	≤ 150	≤ 160	≤ 190	≤ 210
	FIS UMR		-	≤ 90	≤ 160	≤ 180	≤ 190	≤ 220	

Table B7.3: 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)

Temperature at anchoring base [°C]	Maximum processing time t_{work}	Minimum curing time t_{cure}
> 5 to 10	180 min	96 h
> 10 to 15	90 min	60 h
> 15 to 20	60 min	36 h
> 20 to 30	30 min	24 h
> 30 to 40	15 min	12 h

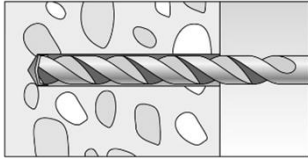
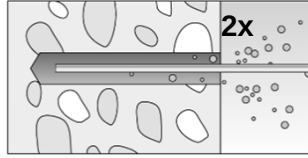
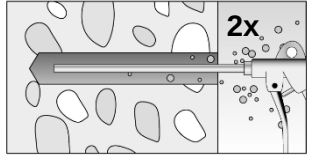
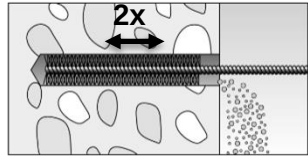
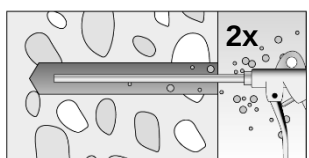
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Intended use
Cleaning brush (steel brush); processing time and curing time

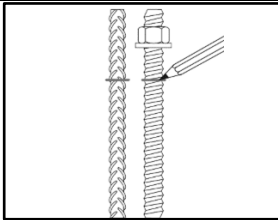
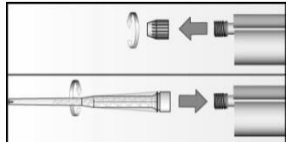
Annex B7

Installation instructions part 1

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

1		Drill the hole. Nominal drill hole diameter d_0 and drill hole depth h_0 see Tables B3.1, B4.1.	
2		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole twice by hand.	 For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ($p \geq 6$ bar).
3		Brush the drill hole twice. For drill hole diameter $d_0 \geq 18$ mm and / or $h_{ef} > 12d$ use a power drill. For deep holes use an extension. Corresponding brushes see Table B7.1.	
4		Clean the drill hole: For $h_{ef} \leq 12d$ and $d_0 < 18$ mm blow out the hole twice by hand.	 For $h_{ef} > 12d$ and / or $d_0 \geq 18$ mm blow out the hole twice with oil-free compressed air ($p \geq 6$ bar).

Preparing

5		Mark the setting depth of the steel element. Only use clean and oil-free anchor elements.	
6		Remove the sealing cap. Screw on the static mixer (the spiral in the static mixer must be clearly visible).	
7			Place the cartridge into the dispenser.
8			Extrude approximately 10 cm of material out until the resin is evenly grey in colour. Do not use mortar that is not uniformly grey.

Go to Step 9

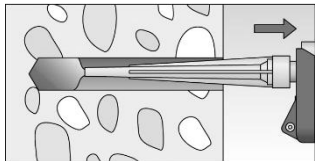
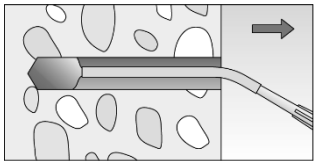
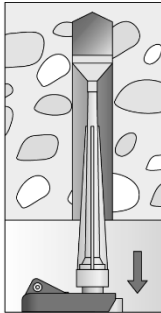
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Intended use
Installation instructions part 1

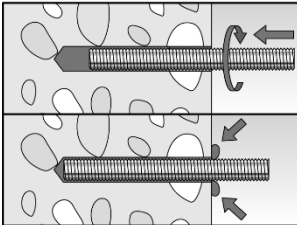
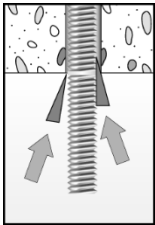
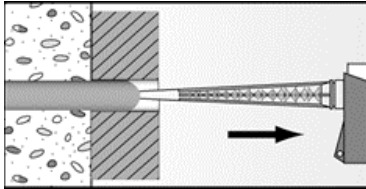
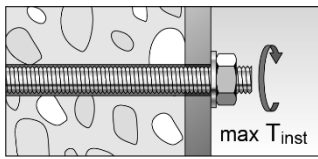
Annex B8

Installation instructions part 2

Injection of the mortar

9	 Fill approximately 2/3 of the drill hole with mortar. Always begin from the bottom of the hole and avoid bubbles.	 The conditions for mortar injection without extension tube can be found in Table B7.2. For deeper drill holes, than those mentioned in Table B7.2, use a suitable extension tube.	 For overhead installation, deep holes ($h_0 > 250$ mm) or drill hole diameter ($d_0 \geq 30$ mm) use an injection-adapter.
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Installation of Anchor rods / Threaded rods

10		Only use clean and oil-free anchor elements. Push the anchor rod with the setting depth mark 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.
	 For overhead installations support the metal part with wedges (e. g. fischer centering wedges) or fischer overhead clips.	 For push through installation fill the annular gap with mortar.
11	 Wait for the specified curing time t_{cure} see Table B7.3.	12  Mounting the fixture $\max T_{inst}$ see Table B3.1.

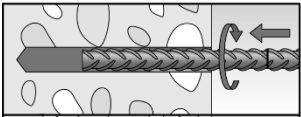
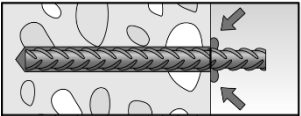
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Intended use
Installation instructions part 2

Annex B9

Installation instructions part 3

Installation Rebars

10		Only use clean and oil-free rebars. Push the rebar with the setting depth mark into the filled hole up to the setting depth mark. Recommendation: Rotation back and forth of the rebar makes pushing easy.
		When the setting depth mark is reached, excess mortar must be emerged from the mouth of the drill hole.
11		Wait for the specified curing time t_{cure} see Table B7.3 .

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Intended use
Installation instructions part 3

Annex B10

Table C1.1: Characteristic resistance to steel failure under tension and shear loading of Anchor rods / Threaded rods

Anchor rod / Threaded rod			M10	M12	M16	M20	
Characteristic resistance to steel failure under tension loading ¹⁾							
Characteristic resistance $N_{Rk,s}$	Steel zinc plated	4.8	[kN]	23,2 (21,4)	33,7	62,8	98,0
		5.8		29,0 (26,8)	42,1	78,5	122,5
		8.8		46,4 (42,8)	67,4	125,6	196,0
	Stainless steel R and high corrosion resistant steel HCR	50		29,0	42,1	78,5	122,5
		70		40,6	59,0	109,9	171,5
		80		46,4	67,4	125,6	196,0
		Partial factors ²⁾					
Partial factor γ_{Ms}	Steel zinc plated	4.8	[-]	1,50			
		5.8		1,50			
		8.8		1,50			
	Stainless steel R and high corrosion resistant steel HCR	50		2,86			
		70		1,87 / fischer HCR: 1,50			
		80		1,60			
		Characteristic resistance to steel failure under shear loading ¹⁾					
without lever arm							
Characteristic resistance $V_{Rk,s}^0$	Steel zinc plated	4.8	[kN]	13,9 (12,8)	20,2	37,6	58,8
		5.8		17,4 (16,0)	25,2	47,1	73,5
		8.8		23,2 (21,4)	33,7	62,8	98,0
	Stainless steel R and high corrosion resistant steel HCR	50		14,5	21,0	39,2	61,2
		70		20,3	29,5	54,9	85,7
		80		23,2	33,7	62,8	98,0
		Ductility factor		k_7	[-]	1,0	
with lever arm							
Characteristic resistance $M_{Rk,s}^0$	Steel zinc plated	4.8	[Nm]	29,9 (26,5)	52,3	132,9	259,6
		5.8		37,3 (33,2)	65,4	166,2	324,6
		8.8		59,8 (53,1)	104,6	265,9	519,3
	Stainless steel R and high corrosion resistant steel HCR	50		37,3	65,4	166,2	324,6
		70		52,3	91,5	232,6	454,4
		80		59,8	104,6	265,9	519,3
		Partial factors ²⁾					
Partial factor γ_{Ms}	Steel zinc plated	4.8	[-]	1,25			
		5.8		1,25			
		8.8		1,25			
	Stainless steel R and high corrosion resistant steel HCR	50		2,38			
		70		1,56 / fischer HCR: 1,25 ³⁾			
		80		1,33			

¹⁾ Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot dip galvanised Threaded rods according to EN ISO 10684:2004+AC:2009.

²⁾ In absence of other national regulations.

³⁾ Only admissible for high corrosion resist. steel HCR, with $f_{yk} / f_{uk} \geq 0,8$ and $A_5 > 12$ % (e.g. Anchor rods).

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Performance

Characteristic resistance to steel failure under tension and shear loading of Anchor rods and Threaded rods

Annex C1

Table C2.1: Characteristic resistance to steel failure under tension and shear loading of rebars

Nominal diameter of the rebar	ϕ	10	12	14	16	20
Characteristic resistance to steel failure under tension loading						
Characteristic resistance	$N_{Rk,s}$	[kN]	$A_S \cdot f_{uk}^{1)}$			
Characteristic resistance to steel failure under shear loading						
Without lever arm						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	$k_6^{2)}) \cdot A_S \cdot f_{uk}^{1)}$			
Ductility factor	k_7	[-]	1,0			
With lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}^{1)}$			

- 1) f_{uk} respectively shall be taken from the specifications of the rebar.
2) In accordance with EN 1992-4:2018 section 7.2.2.3.1
 $k_6 = 0,6$ for fasteners made of carbon steel with $f_{uk} \leq 500 \text{ N/mm}^2$
 $= 0,5$ for fasteners made of carbon steel with $500 < f_{uk} \leq 1000 \text{ N/mm}^2$
 $= 0,5$ for fasteners made of stainless steel

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Performance

Characteristic resistance to steel failure under tension and shear loading of rebars

Annex C2

Size			All sizes					
Tension loading								
Installation factor		γ_{inst}	[-]	See annex C4 to C6				
Factors for the compressive strength of concrete > C20/25								
Increasing factor ψ_c for uncracked concrete $\tau_{Rk(X,Y)} = \psi_c \cdot \tau_{Rk(C20/25)}$	C25/30	[-]	1,05					
	C30/37		1,09					
	C35/45		1,12					
	C40/50		1,16					
	C45/55		1,19					
	C50/60		1,21					
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								
Uncracked concrete		$k_{ucr,N}$	[-]	11,0				
Edge distance		$C_{cr,N}$	[mm]	1,5 h_{ef}				
Spacing		$S_{cr,N}$		2 $C_{cr,N}$				
Factors for sustained tension loading								
Temperature range			[-]	43 °C / 60 °C				
Factor			ψ_{sus}^0	[-]	0,61			
Shear loading								
Installation factor		γ_{inst}	[-]	1,0				
Concrete pry-out failure								
Factor for pry-out failure		k_8	[-]	2,0				
Concrete edge failure								
Effective length of fastener for shear loading		l_f	[mm]	for $d_{nom} \leq 24$ mm: min (h_{ef} ; 12 d_{nom})				
Effective diameter of the fastener d_{nom}								
Size				M10	M12	M16	M20	
Anchor rods and Threaded rods		d_{nom}	[mm]	10	12	16	20	
Size (nominal diameter of the rebar)			ϕ	10	12	14	16	20
Reinforcing bar			d_{nom}	[mm]	10	12	14	20
fischer Injection System FIS EP						Annex C3		
Performance Characteristic resistance to concrete failure under tension / shear loading								

Table C4.1: Characteristic resistance to combined pull-out and concrete failure for Anchor rod / Threaded rod in hammer drilled holes; uncracked concrete

Anchor rod / Threaded rod		M10	M12	M16	M20
Combined pullout and concrete cone failure					
Calculation diameter	d [mm]	10	12	16	20
Uncracked concrete					
Characteristic bond resistance in uncracked concrete C20/25					
<u>Hammer-drilling with standard drill bit (dry or wet concrete)</u>					
Temperature range	I: 43 °C / 60 °C $\tau_{Rk,ucr}$ [N/mm ²]	8,6	8,6	7,7	7,0
Installation factors					
Dry or wet concrete	γ_{inst} [-]	1,2			

Table C4.2: Characteristic resistance to combined pull-out and concrete failure for reinforcing bars in hammer drilled holes; uncracked concrete

Nominal diameter of the bar		ϕ	10	12	14	16	20
Combined pullout and concrete cone failure							
Calculation diameter	d [mm]	10	12	14	16	20	
Uncracked concrete							
Characteristic bond resistance in uncracked concrete C20/25							
<u>Hammer-drilling with standard drill bit (dry or wet concrete)</u>							
Temperature range	I: 43 °C / 60 °C $\tau_{Rk,ucr}$ [N/mm ²]	8,6	8,6	8,0	7,7	7,0	
Installation factors							
Dry or wet concrete	γ_{inst} [-]	1,2					

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Performance

Characteristic resistance to combined pull-out and concrete failure for Anchor rods / Threaded rods and Rebars

Annex C4

Table C5.1: Displacements for Anchor rods and Threaded rods

Anchor rod / Threaded rod		M10	M12	M16	M20
Displacement-Factors for tension loading ¹⁾					
Uncracked concrete; Temperature range I					
δ _{N0} -Factor	[mm/(N/mm²)]	0,08	0,09	0,10	0,11
δ _{N∞} -Factor		0,12	0,13	0,15	0,16
Displacement-Factors for shear loading ²⁾					
Uncracked concrete; Temperature range I					
δ _{V0} -Factor	[mm/kN]	0,15	0,13	0,10	0,08
δ _{V∞} -Factor		0,22	0,19	0,14	0,11

1) Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$$

$$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$$

τ = acting bond strength under tension loading

2) Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$$

$$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$$

V = acting shear loading

Table C5.2: Displacements for reinforcing bars

Nominal diameter of the rebar ϕ		10	12	14	16	20
Displacement-Factors for tension loading ¹⁾						
Uncracked concrete; Temperature range I						
δ_{N0} -Factor	[mm/(N/mm ²)]	0,08	0,09	0,10	0,10	0,11
$\delta_{N\infty}$ -Factor		0,12	0,13	0,14	0,15	0,16
Displacement-Factors for shear loading ²⁾						
Uncracked concrete; Temperature range I						
δ_{V0} -Factor	[mm/kN]	0,15	0,13	0,11	0,10	0,08
$\delta_{V\infty}$ -Factor		0,22	0,19	0,16	0,14	0,11

1) Calculation of effective displacement:

$$\delta_{N0} = \delta_{N0}\text{-Factor} \cdot \tau$$

$$\delta_{N\infty} = \delta_{N\infty}\text{-Factor} \cdot \tau$$

τ = acting bond strength under tension loading

2) Calculation of effective displacement:

$$\delta_{V0} = \delta_{V0}\text{-Factor} \cdot V$$

$$\delta_{V\infty} = \delta_{V\infty}\text{-Factor} \cdot V$$

V = acting shear loading

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Performance

Displacements for Anchor rods / Threaded rods and Rebars

Annex C5