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European Technical Assessment Body for construction products



European Technical Assessment

ETA-19/0201 of 5 November 2025

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family

to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

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

This version replaces

Deutsches Institut für Bautechnik

Chemofast Injection System EP 1000 for concrete

Bonded fasteners and bonded expansion fasteners for use in concrete

CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich

DEUTSCHLAND

CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich DEUTSCHLAND

49 pages including 3 annexes which form an integral part of this assessment

EAD 330499-02-0601, Edition 12/2023

ETA-19/0201 issued on 28 April 2025

DIBt | Kolonnenstraße 30 B | 10829 Berlin | GERMANY | Phone: +493078730-0 | FAX: +493078730-320 | Email: dibt@dibt.de | www.dibt.de Z158532.25 8.06.01-213/24

European Technical Assessment ETA-19/0201

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Specific Part

1 Technical description of the product

The "Chemofast Injection system EP 1000 for concrete" is a bonded anchor consisting of a cartridge with injection mortar Chemofast Injection mortar EP 1000 and a steel element according to Annex A 3 to Annex A 5.

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 and/or 100 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 resistance to tension load (static and quasi-static loading)	See Annex C 1 to C 6, C 8 to C 11, C 13 to C 16, B 3					
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 7, C 12, C 17					
Displacements under short-term and long-term loading	See Annex C 18 to C 20					
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 21 to C 28					

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 29 to C 31

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330499-02-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 5 November 2025 by Deutsches Institut für Bautechnik

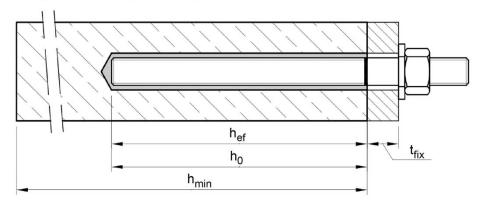
Dipl.-Ing. Beatrix Wittstock Head of Section *beglaubigt:* Stiller

Z158532.25 8.06.01-213/24

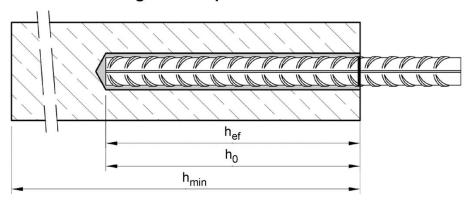


Installation threaded rod M8 up to M30

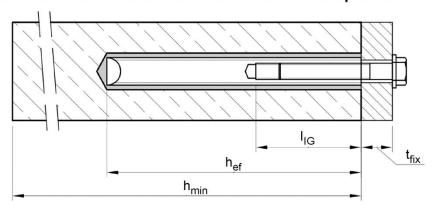
prepositioned installation or push through installation (annular gap filled with mortar)



Installation reinforcing bar Ø8 up to Ø40



Installation internal threaded anchor rod IG-M6 up to IG-M20



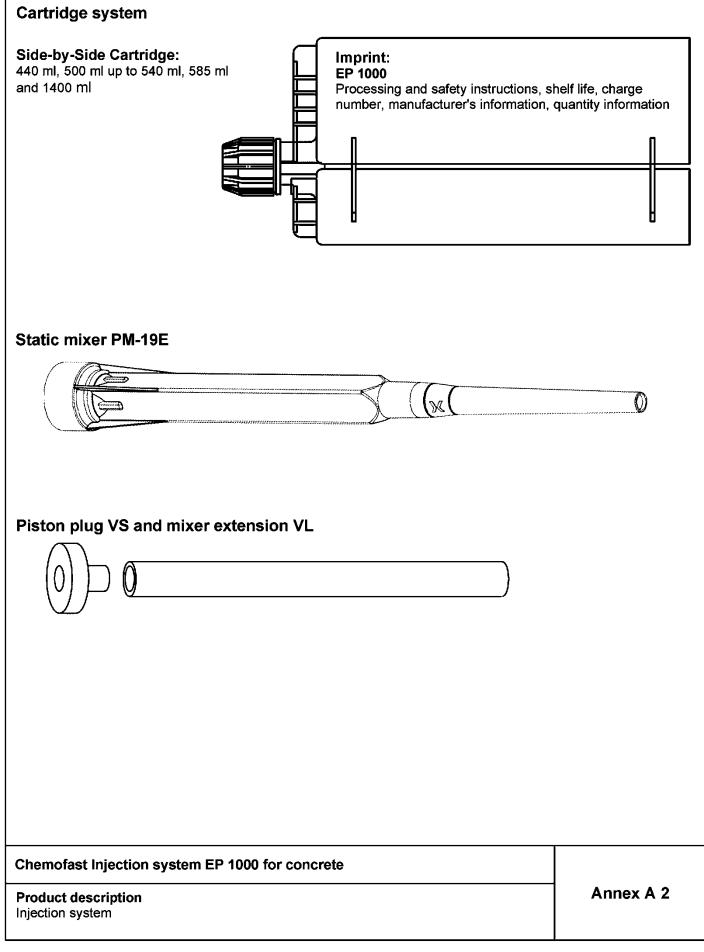
 t_{fix} = thickness of fixture h_0 = drill hole depth

 h_{ef} = effective embedment depth I_{IG} = thread engagement length

h_{min} = minum thickness of member

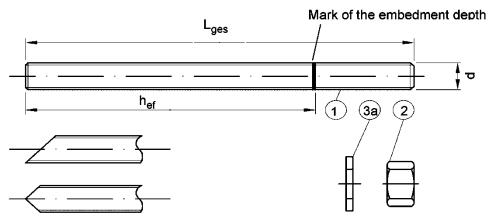
Chemofast Injection system EP 1000 for concrete Product description Installed condition Annex A 1







Threaded rod M8 up to M30 with washer and hexagon nut

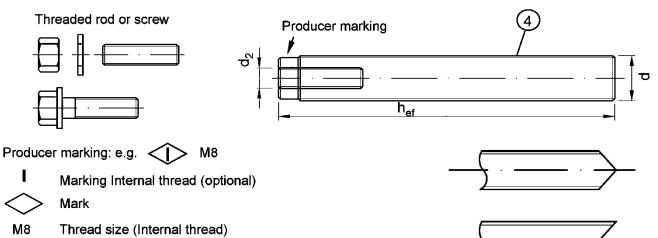


Commercial standard rod with:

- Materials, dimensions and mechanical properties acc. to Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004. The document shall be stored.
- Marking of embedment depth

For hot dip galvanized elements, the requirements with regards to the combination of nuts and rods according to EN ISO 10684:2004+AC:2009 Annex F shall be considered.

Internal threaded rod IG-M6 to IG-M20



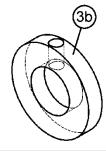
Filling washer VFS

A4

HCR

-8

Mixer reduction nozzle MR





Chemofast Injection system EP 1000 for concrete

additional mark for stainless steel

additional mark for property class 8.8

additional mark for high-corrosion resistance steel

Product description

Threaded rod; Internal threaded rod Filling washer; Mixer reduction nozzle

Annex A 3



Parı	Designation	Material				
		acc. to EN ISO 683-4:2	2018	or FN 10263:2017)		
		pm acc. to EN ISO				
- h				1:2022 and EN ISO 10684:	:2004+AC:2009 or	
- sl	nerardized ≥ 4	15 µm acc. to EN ISO	176			
		Property class		Characteristic steel	Characteristic steel	Elongation at
		- Topony older		ultimate tensile strength	yield strength	fracture
				f _{uk} = 400 N/mm²	f _{yk} = 240 N/mm²	A ₅ > 8%
1	Threaded rod			f _{uk} = 400 N/mm ²	f _{yk} = 320 N/mm ²	A ₅ > 8%
		acc. to EN ISO 898-1:2013	5.6	f _{uk} = 500 N/mm ²	f _{yk} = 300 N/mm ²	A ₅ > 8%
		EN 130 690-1.2013	5.8	f _{uk} = 500 N/mm ²	f _{yk} = 400 N/mm ²	A ₅ > 8%
			8.8	f _{uk} = 800 N/mm ²	f _{yk} = 640 N/mm²	$A_5 \ge 12\%^{3}$
				for anchor rod class 4.6 o	r 4.8	•
2	Hexagon nut	acc. to EN ISO 898-2:2022	<u>5</u>	for anchor rod class 5.6 o	r 5.8	
				for anchor rod class 8.8		
3a	Washer			galvanised or sherardized		===:
		, ,		EN ISO 7089:2000, EN ISC		7094:2000)
3b	Filling washer	Steel, zinc plated, ho	t-dip	galvanised or sherardized		Ter g
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel	Elongation at fracture
4	Internal threaded					
4		4-	5.8		yield strength	
4	anchor rod	acc. to		f _{uk} = 500 N/mm ²	f _{yk} = 400 N/mm ²	A ₅ > 8%
	anchor rod	EN ISO 898-1:2013	8.8	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ²	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ²	
Stai Stai	anchor rod nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1	8.8 .431 .457	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² o EN 10088-1:2023) o EN 10088-1:2023)	A ₅ > 8%
Stai Stai	anchor rod nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45	8.8 .431 .457	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² to EN 10088-1:2023) to EN 10088-1:2023) to EN 12023)	A ₅ > 8% A ₅ > 8%
Stai Stai	anchor rod nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1	8.8 .431 .457	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² to EN 10088-1:2023) to EN 10088-1:2023) to EN 2023) Characteristic steel	A ₅ > 8% A ₅ > 8% Elongation at
Stai Stai Higl	anchor rod nless steel A2 (Maternless steel A4 (Matern corrosion resistance)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45	8.8 .431 .457 29 o	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² to EN 10088-1:2023) to EN 10088-1:2023) to EN 12023)	A ₅ > 8% A ₅ > 8%
Stai Stai Higl	anchor rod nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to	8.8 .431 .457 29 or	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength	A ₅ > 8% A ₅ > 8% Elongation at fracture
Stai Stai Higl	anchor rod nless steel A2 (Maternless steel A4 (Matern corrosion resistance)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class	8.8 .431 .457 29 or	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ²	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² to EN 10088-1:2023) to EN 10088-1:2023) -1:2023) Characteristic steel yield strength f _{yk} = 210 N/mm ²	$A_5 > 8\%$ $A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$
Stai Stai Higl	anchor rod nless steel A2 (Maternless steel A4 (Matern corrosion resistance)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020	8.8 .431 .457 29 or	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ²	fyk = 400 N/mm² fyk = 640 N/mm² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength fyk = 210 N/mm² fyk = 450 N/mm²	$A_5 > 8\%$ $A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$ $A_5 \ge 12\%$
Stai Stai HigI	anchor rod nless steel A2 (Materials steel A4 (Materials st	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 acc. to	8.8 .431 .457 29 or 50 70 80 50	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to 1 / 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ² f _{uk} = 800 N/mm ² for anchor rod class 50	fyk = 400 N/mm² fyk = 640 N/mm² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength fyk = 210 N/mm² fyk = 450 N/mm²	$A_5 > 8\%$ $A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^3$
Stai Stai Higl	anchor rod nless steel A2 (Maternless steel A4 (Matern corrosion resistance)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020	50 70 80 70	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ² f _{uk} = 800 N/mm ² for anchor rod class 50 for anchor rod class 70	fyk = 400 N/mm² fyk = 640 N/mm² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength fyk = 210 N/mm² fyk = 450 N/mm²	$A_5 > 8\%$ $A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^3$
Stai	anchor rod nless steel A2 (Materials steel A4 (Materials st	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020	50 70 80 50 70 80	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to 1 / 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ² f _{uk} = 800 N/mm ² for anchor rod class 50	f _{yk} = 400 N/mm ² f _{yk} = 640 N/mm ² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ²	A ₅ > 8% A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³) A ₅ ≥ 12% ³)
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Stai Stai Higl	anchor rod nless steel A2 (Material nless steel A4 (Material nless steel nless	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20	8.8 .431 .457 29 or 70 80 70 80 1.43 1.44 9 or 1	f _{uk} = 500 N/mm ² f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ² f _{uk} = 800 N/mm ² for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 807 / 1.4311 / 1.4567 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO	fyk = 400 N/mm² fyk = 640 N/mm² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength fyk = 210 N/mm² fyk = 450 N/mm² fyk = 600 N/mm²	A ₅ > 8% A ₅ > 8% Elongation at fracture A ₅ \geq 8% A ₅ \geq 12% A ₅ \geq 12% 1:2023 1:2023 7094:2000)
Stai Stai Higl	anchor rod nless steel A2 (Material nless steel A4 (Material nless steel nless ste	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20 Stainless steel A4, H	8.8 .431 .457 29 or 70 80 50 70 80 1.43 1.44 9 or 1 9 or 1	f _{uk} = 500 N/mm² f _{uk} = 800 N/mm² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm² f _{uk} = 700 N/mm² f _{uk} = 800 N/mm² for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 807 / 1.4311 / 1.4567 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel	fyk = 400 N/mm² fyk = 640 N/mm² o EN 10088-1:2023) o EN 10088-1:2023) -1:2023) Characteristic steel yield strength fyk = 210 N/mm² fyk = 450 N/mm² fyk = 600 N/mm² -541, acc. to EN 10088578, acc. to EN 100882023 -7093:2000 or EN ISO	A ₅ > 8% A ₅ > 8% Elongation at fracture A ₅ \geq 8% A ₅ \geq 12% ³) A ₅ \geq 12% ³) 1:2023 1:2023 7094:2000)

³⁾ A₅ > 8% fracture elongation if no use for seismic performance category C2

⁴⁾ Property class 80 only for stainless steel A4 and HCR

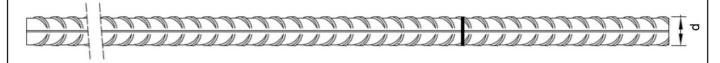
Chemofast Injection system EP 1000 for concrete	
Product description Materials threaded rod, Internal threaded anchor rod and filling washer	Annex A 4

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English translation prepared by DIBt



Reinforcing bar: ø8 up to ø40



Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010 Rib height of the bar shall be in the range $0.05d \le h_{rib} \le 0.07d$ (d: Nominal diameter of the bar; h_{rib} : Rib height of the bar)

Table A2: Materials Reinforcing bar

Part Designation Material Rebar	
Dohar	
Kepai	
Reinforcing steel according to EN 1992-1-1:2004+AC:2010, Annex C Bars and rebars from ring class B or C f_{yk} and k according to NDP or NCI according to EN 1992-1-1 $f_{uk} = f_{tk} = k \cdot f_{yk}$	NA

Chemofast Injection system EP 1000 for concrete

Product description
Materials reinforcing bar

Annex A 5



Specification of the intend		1)					
Fasteners subject to (Static a	-	e 50 years	Working	ı life 100 years			
	ir	n concrete C20/25 to od in concrete C20/25	C90/105 without f	ibers			
Base material	uncracked concrete	cracked concrete	uncracked concrete	cracked concrete			
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to Ø8 to	M30, Ø32, DIG-M20	M: Ø:	M8 to M30, Ø8 to Ø32, M6 to IG-M20			
HD: Hammer drilling CD: Compressed air drilling	Ø36 to Ø40	No performance assessed	Ø36 to Ø40	No performance assessed			
DD: Diamond drilling	M8 to M30, Ø8 to Ø40, IG-M6 to IG-M20	M16 to M30 ⁴⁾ IG-M10 to IG-M20 ⁴⁾	M8 to M30, Ø8 to Ø40, IG-M6 to IG-M	No performance assessed			
Temperature Range:	l: -40°C to +40°C ¹⁾ l: -4						
Fasteners subject to (seismi	c action):						
	Performance Category C1 Perform						
Base material	Cracked and	C20/25 to C50/6	/60 without fibers				
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to ∅8 to	1 2 to M 30					
DD: Diamond drilling	No performar	nce assessed	No perfori	mance assessed			
Temperature Range:	I: - 40°C II: - 40°C III: - 40°C	to +72°C ²⁾	II: - 40°	°C to +40°C ¹⁾ °C to +72°C ²⁾ °C to +80°C ³⁾			
Fasteners subject to (fire exp	oosure):						
Base material	Cracked an	d uncracked concrete	C20/25 to C50/6	0 without fibers			
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling		M8 to ∅8 to IG-M6 to	Ø32,				
DD: Diamond drilling		No performar	ice assessed				
Temperature Range:		I: - 40°C : II: - 40°C : III: - 40°C :	to +72°C ²⁾				
1) (max. long-term temperature +24°C 2) (max. long-term temperature +50°C 3) (max. long-term temperature +60°C 4) only C20/25 to C50/60 and without 5) with fibers only by hammer (HD), h	C and max. short-term to C and max. short-term to fibers	remperature +72°C) remperature +80°C)	CD)				
Chemofast Injection system E	P 1000 for concret	e					
Intended use Specifications				Annex B 1			
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Base materials:

- Compacted, reinforced or unreinforced normal weight concrete with strength classes C20/25 to C90/105 according to EN 206:2013 + A2:2021.
- Steel fiber reinforced concrete according to EN 206:2013 + A2:2021 with steel fibers according to EN 14889-1:2006, section 5, group 1, with a maximum fiber content of 80kg/m³.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006 + A1:2015 corresponding to corrosion resistance class:
 - Stainless steel Stahl A2 according to Annex A 4, Table A1: CRC II
 - Stainless steel Stahl A4 according to Annex A 4, Table A1: CRC III
 - High corrosion resistance steel HCR according to Annex A 4, Table A1: CRC V

Design:

- 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.).
- Fasteners are designed under the responsibility of an engineer experienced in fasteners and concrete work.
- The fasteners are designed in accordance to EN 1992-4:2018 and Technical Report TR 055, Edition February 2018.
- Fasteners in steel fiber reinforced concrete may be designed in accordance with EN 1992-4:2018. All performance parameters are to be applied as for normal concrete of strength classes C20/25 to C50/60 without fibers.
- The fasteners under fire exposure are designed in accordance to Technical Report TR 082, Edition June 2023.

Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- Hole drilling by hammer (HD), hollow (HDB), compressed air (CD) or diamond drill mode (DD).
- Overhead installation allowed.
- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Chemofast Injection system EP 1000 for concrete

Intended use
Specifications (Continued)

Annex B 2

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Table B1: Installation parameters for threaded rod													
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30		
Diameter of elemen	t	d = d _{nom}	[mm]	8	10	12	16	20	24	27	30		
Nominal drill hole di	ameter	d ₀	[mm]	10	12	14	18	22	28	30	35		
Effective and death		h _{ef,min}	[mm]	60	60	70	80	90	96	108	120		
Effective embedmer	h _{ef,max}	[mm]	160	200	240	320	400	480	540	600			
Diameter of clearance hole in	Prepositioned ins	to the total the second of the	[mm]	9	12	14	18	22	26	30	33		
the fixture	Push through i	to the second se	[mm]	12	14	16	20	24	30	33	40		
Maximum installatio	n torque	max T _{inst}	[Nm]	10	20	40 ¹⁾	60	100	170	250	300		
Minimum thickness	of member	h _{min}	[mm]	_ ~	+ 30 m : 100 mr			h _{ef} + 2d ₀					
Minimum spacing		s _{min}	[mm]	40	50	60	75	95	115	125	140		
Minimum edge dista	nce	c _{min}	[mm]	35	40	45	50	60	65	75	80		

¹⁾ Maximum installation torque for M12 with steel Grade 4.6 is 35 Nm

Table B2: Installation parameters for reinforcing bar

Reinforcing bar			Ø	8 ¹⁾	ø ·	10 ¹⁾	ø 1	12 ¹⁾	Ø 14	Ø 16	Ø 20	Ø	24 ¹⁾	Ø	25 ¹⁾	Ø 28	Ø 32	Ø 36	Ø 40
Diameter of element	d = d _{nom}	[mm]	8	8	1	0	1	2	14	16	20	2	4	2	!5	28	32	36	40
Nominal drill hole diameter	d ₀	[mm]	10	12	12	14	14	16	18	20	25	30	32	30	32	35	40	45	52/55
Effective embedment	h _{ef,min}	[mm]	6	0	6	0	7	0	75	80	90	9	6	10	00	112	128	144	160
depth	h _{ef,max}	[mm]		60	-	00	24	10	280	320	400	48	30	50	00	560	640	720	800
Minimum thickness of member	h _{min}	[mm]	h	ef ⁺ 10	30 00 m		≥					r	l _{ef} +	2d	0				
Minimum spacing	s _{min}	[mm]	4	10	5	0	6	0	70	75	95	12	20	1:	20	130	150	180	200
Minimum edge distance	c _{min}	[mm]	3	35	4	0	4	5	50	50	60	7	0	7	0	75	85	180	200

¹⁾ both nominal drill hole diameter can be used

Table B3: Installation parameters for Internal threaded anchor rod

Internal threaded anchor rod			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Internal diameter of anchor rod	d ₂		6	8	10	12	16	20
Outer diameter of anchor rod1)	$d = d_{nom}$	[mm]	10	12	16	20	24	30
Nominal drill hole diameter	d ₀	[mm]	12	14	18	22	28	35
Effective embedment depth	h _{ef,min}	[mm]	60	70	80	90	96	120
Effective embedment depth	h _{ef,max}		200	240	320	400	480	600
Diameter of clearance hole in the fixture	d _f ≤		7	9	12	14	18	22
Maximum installation torque	max T _{inst}	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	I _{IG}	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h _{min}	[mm]	٥.	30 mm 0 mm	h _{ef} + 2d ₀			
Minimum spacing	s _{min}	[mm]	50	60	75	95	115	140
Minimum edge distance	c _{min}	[mm]	40	45	50	60	65	80
4) 1450	*			•		**	•	•

1) With metric threads

Chemofast Injection system EP 1000 for concrete

Intended use

Installation parameters

Annex B 3



	Table B4: Parameter cleaning and installation tools													
Threaded i	Re- inforcing bar	Internal threaded anchor rod		bit - Ø HD, HDB.				on direction and use f piston plug						
	•			CD		ı.,			•		T			
[mm]	[mm]	[mm]		nm]	DD 10	[mm]	[mm]							
M8	8	10.140		10	RB10	11,5	10,5							
M10	8 / 10	IG-M6		12	RB12	13,5	12,5		No plug required					
M12	10 / 12 12	IG-M8		14	RB14	15,5	14,5							
- M16	14	- IC M10		l6 l8	RB16	17,5	16,5	1/010						
M16	16	IG-M10		20	RB18 RB20	20,0	18,5 20,5	VS18 VS20	-					
M20	-	- IG-M12		22	RB22	24,0	20,5	VS20 VS22	-					
IVIZU	20	10-10112		25	RB25	27,0	25,5	VS25	-		all			
M24		IG-M16		28	RB28	30,0	28,5	VS28	h _{ef} >	h _{ef} >				
M27	24 / 25	10-10110		30	RB30	31,8	30,5	VS30	250 mm	250 mm				
10127	24 / 25	_		32	RB32	34,0	32,5	VS32	-					
M30	28	IG-M20		35	RB35	37,0	35,5	VS35	-					
-	32	-		10	RB40	43,5	40,5	VS40	1					
-	36			15	RB45	47,0	45,5	VS45						
-		_	52	-	RB52	54,0	52,5	VS52	all	all	all			
-	40	-	-	55	RB55	58,5	55,5	VS55	1					

Compressed air tool

(min 6 bar)



Brush RB



Brush extension RBL

Centring aid

CA-Cap



Piston Plug VS







Chemofast Injection system EP 1000 for concrete

Intended use

Cleaning and installation tools

Annex B 4

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Table B5: Installation parameters Centring aid												
Threaded rod			M10	M12	M16	M20	M24					
Internal threaded anchor rod			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16					
Centring aid CA-Ring / CA-Cap			CA-M10	CA-M12	CA-M16	CA-M20	CA-M24					
Centring aid CA-Ring	h _{Ring}	[mm]	6,5	8,0	9,0	9,0	12,0					
Centring aid CA-Cap	h _{Cap}	[mm]	8,0	10,0	12,0	14,0	16,0					
Drill hole depth	h ₀	[mm]	h ₀ ≥ h _{nom} + 3 mm									
Minimum thickness of member	h _{min}	[mm]	h _{nom} + 30 m	m ≥ 100 mm		h _{nom} + 2d ₀						

The effective embedment depth her is reduced by the height all centering ring used.

$$h_{ef} = h_{nom} - h_{Cap} - n \cdot h_{Ring} \ge h_{ef,min}$$

n = number of used certring rings

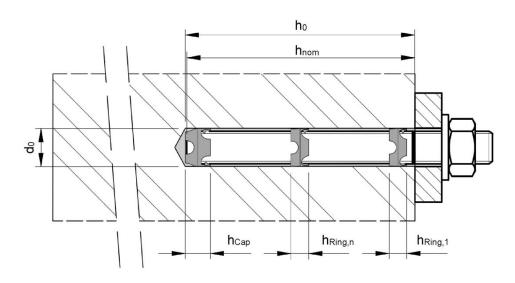


Table B6: Working and curing time

Temperature in base material			Maximum working time	Minimum curing time ¹⁾		
	Т		t _{work}	t _{cure}		
+ 0°C	to	+ 4 °C	80 min	144 h		
+ 5°C	to	+ 9 °C	80 min	48 h		
+ 10 °C	to	+ 14 °C	60 min	28 h		
+ 15°C	to	+ 19 °C	40 min	18 h		
+ 20 °C	to	+ 24 °C	30 min	12 h		
+ 25 °C	to	+ 34 °C	12 min	9 h		
+ 35 °C	to	+ 39 °C	8 min	6 h		
	+ 40 °C		8 min	4 h		
Cartridge temperature			+5°C to +40°C			

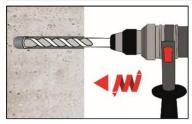
¹⁾ The minimum curing time is only valid for dry base material. In wet base material the curing time must be doubled.

Chemofast Injection system EP 1000 for concrete	
Intended use Parameter Centring aid Working time and curing time	Annex B 5

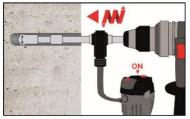


Installation instructions

Drilling of the bore hole (HD, HDB, CD)



Hammer drilling (HD) / Compressed air drilling (CD)
Drill a hole to the required embedment depth.
Drill bit diameter according to Table B1, B2 or B3.
Aborted drill holes shall be filled with mortar.
Proceed with Step 2.



D. Hollow drill bit system (HDB) (see Annex B 4)
Drill a hole to the required embedment depth.

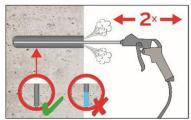
Drill bit diameter according to Table B1, B2 or B3.

The hollow drilling system removes the dust and cleans the bore hole. Proceed with Step 3.

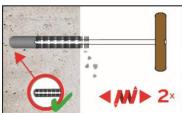
Attention! Standing water in the bore hole must be removed before cleaning.

Compressed Air Cleaning (CAC):

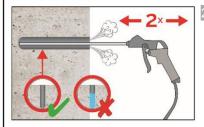
All diameter in cracked and uncracked concrete



Blow the bore hole clean minimum 2x with compressed air (min. 6 bar, oil-free) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)



Brush the bore hole minimum 2x with brush RB according to Table B4 over the entire embedment depth in a twisting motion. (If necessary, a brush extension RBL shall be used.)



Finally blow the bore hole clean minimum 2x with compressed air (min. 6 bar, oil-free) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

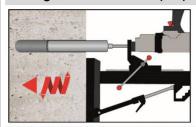
Cleaned bore hole has to be protected against re-contamination in an appropriate way, If necessary, repeat cleaning process directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

Chemofast Injection system EP 1000 for concrete	
Intended use Installation instructions	Annex B 6



Installation instructions (continuation)

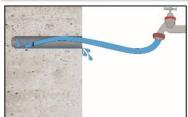
Drilling of the bore hole (DD)



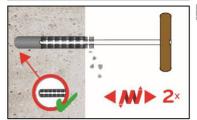
Diamond drilling (DD)
Drill a hole to the required embedment depth required
Drill bit diameter according to Table B1, B2 or B3.
Aborted drill holes shall be filled with mortar.
Proceed with Step 2.

Flush & Compressed Air Cleaning (SPCAC):

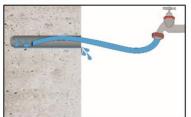
All diameter in uncracked concrete



Flushing with water until clear water comes out.

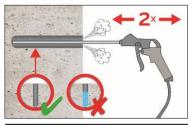


Brush the bore hole minimum 2x with brush RB according to Table B4 over the entire embedment depth in a twisting motion. (If necessary, a brush extension RBL shall be used.)

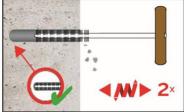


Flushing again with water until clear water comes out.

Attention! Standing water in the bore hole must be removed before proceeding.



Blow the bore hole clean minimum 2x with compressed air (min. 6 bar, oil-free) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)



2e. Brush the bore hole minimum 2x with brush RB according to Table B4 over the entire embedment depth in a twisting motion. (If necessary, a brush extension RBL shall be used.)

Chemofast Injection system EP 1000 for concrete

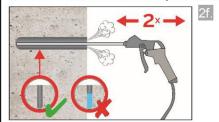
Intended use

Installation instructions (continuation)

Annex B 7

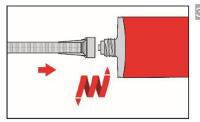


Installation instructions (continuation)



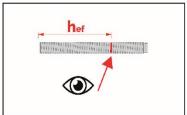
Finally blow the bore hole clean minimum 2x with compressed air (min. 6 bar, oil-free) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

Cleaned bore hole has to be protected against re-contamination in an appropriate way, If necessary, repeat cleaning process directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.



Screw on static-mixing nozzle PM-19E and load the cartridge into an appropriate dispensing tool.

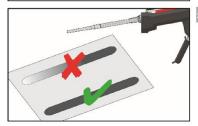
For every working interruption longer than the maximum working time t_{work} (Annex B 5) as well as for new cartridges, a new static-mixer shall be used.



4.

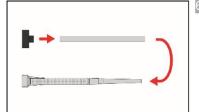
Mark embedment depth on the anchor rod.

The anchor rod shall be free of dirt, grease, oil or other foreign material.



Not proper mixed mortar is not sufficient for fastening.

Dispense and discard mortar until an uniform grey or red colour is shown (at least 3 full strokes).



Piston plugs VS and mixer nozzle extensions VL shall be used according to Table B4 for the following applications:

- Horizontal and vertical downwards direction: Drill bit-Ø d₀ ≥ 18 mm and embedment depth h_{ef} > 250mm
- Vertical upwards direction: Drill bit-Ø d₀ ≥ 18 mm

Assemble mixing nozzle, mixer extension and piston plug before injecting mortar.



Injecting mortar without piston plug VS:

Starting at bottom of the hole and fill the hole up to approximately two-thirds with adhesive. (If necessary, a mixer nozzle extension shall be used.) Slowly withdraw of the static mixing nozzle avoid creating air pockets Observe the temperature related working time t_{work} (Annex B 5).

Chemofast Injection system EP 1000 for concrete Intended use Installation instructions (continuation) Annex B 8



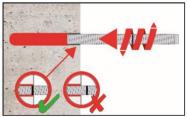
Installation instructions (continuation)



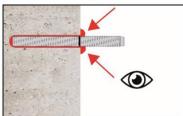
7b. Injecting mortar with piston plug VS:

Starting at bottom of the hole and fill the hole up to approximately two-thirds with adhesive. (If necessary, a mixer nozzle extension shall be used.) During injection the piston plug is pushed out of the bore hole by the back pressure of the mortar.

Observe the temperature related working time t_{work} (Annex B 5).



Insert the anchor rod while turning slightly up to the embedment mark.

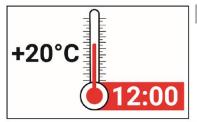


Annular gap between anchor rod and base material must be completely filled with mortar. In case of push through installation the annular gap in the fixture must be filled with mortar also.

Otherwise, the installation must be repeated starting from step 7 before the maximum working time \mathbf{t}_{work} has expired.

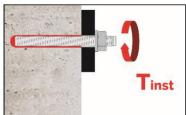


For application in vertical upwards direction the anchor rod shall be fixed (e.g. wedges).



Temperature related curing time t_{cure} (Annex B 5) must be observed.

Do not move or load the fastener during curing time.



Install the fixture by using a calibrated torque wrench. Observe maximum installation torque (Table B1 or B3).

In case of static requirements (e.g. seismic), fill the annular gab in the fixture with mortar (Annex A 2). Therefore replace the washer by the filling washer VFS and use the mixer reduction nozzle MR.

Chemofast Injection system EP 1000 for concrete

Intended use

Installation instructions (continuation)

Annex B 9



Table C1: Characteristic values for steel tension resistance and steel shear resistance of threaded rods												
Th	readed rod		M8	M10	M12	M16	M20	M24	M27	M30		
Cr	oss section area	A _s	[mm²]	36,6	58	84,3	157	245	353	459	561	
Characteristic tension resistance, Steel failure 1)												
St	eel, Property class 4.6 and 4.8	N _{Rk,s}	[kN]	15 (13)	23 (21)	34	63	98	141	184	224	
St	eel, Property class 5.6 and 5.8	N _{Rk,s}	[kN]	18 (17)	29 (27)	42	78	122	176	230	280	
St	eel, Property class 8.8	$N_{Rk,s}$	[kN]	29 (27)	46 (43)	67	125	196	282	368	449	
St	ainless steel A2, A4 and HCR, class 50	N _{Rk,s}	[kN]	18	29	42	79	123	177	230	281	
St	ainless steel A2, A4 and HCR, class 70	N _{Rk,s}	[kN]	26	41	59	110	171	247	_3)	_3)	
St	ainless steel A4 and HCR, class 80	N _{Rk,s}	[kN]	29	46	67	126	196	282	_3)	_3)	
Cł	naracteristic tension resistance, Partial fac	tor ²⁾		_								
St	eel, Property class 4.6 and 5.6	γ _{Ms,N}	[-]				2,0)				
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,N}	[-]				1,	5				
St	ainless steel A2, A4 and HCR, class 50	γMs,N	[-]				2,8	6				
St	ainless steel A2, A4 and HCR, class 70	γMs,N	[-]	1,87								
	ainless steel A4 and HCR, class 80	γ _{Ms,N}	[-]	1,6								
Cł	naracteristic shear resistance, Steel failure	, 1)		1	1			r	ı	ı		
=	Steel, Property class 4.6 and 4.8	V ⁰ _{Rk,s}	[kN]	9 (8)	14 (13)	20	38	59	85	110	135	
rarm	Steel, Property class 5.6 and 5.8	V ⁰ Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168	
eve eve	Steel, Property class 8.8	V ⁰ Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224	
Ħ	Stainless steel A2, A4 and HCR, class 50	V ⁰ Rk,s	[kN]	9	15	21	39	61	88	115	140	
Without lever	Stainless steel A2, A4 and HCR, class 70	V ⁰ Rk,s	[kN]	13	20	30	55	86	124	_3)	_3)	
>	Stainless steel A4 and HCR, class 80	V ⁰ Rk,s	[kN]	15	23	34	63	98	141	_3)	_3)	
	Steel, Property class 4.6 and 4.8	M ⁰ _{Rk,s}	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900	
arm	Steel, Property class 5.6 and 5.8	M ⁰ _{Rk,s}	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123	
lever a		M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797	
를 글	Otaliness steel 712, 714 and 11011, siass so	M ⁰ Rk,s	[Nm]	19	37	66	167	325	561	832	1125	
	Stainless steel A2, A4 and HCR, class 70	M ⁰ _{Rk,s}	[Nm]	26	52	92	232	454	784	_3)	_3)	
	Stainless steel A4 and HCR, class 80	M ⁰ _{Rk,s}	[Nm]	30	59	105	266	519	896	_3)	_3)	
Cł	naracteristic shear resistance, Partial facto											
St	eel, Property class 4.6 and 5.6	γ _{Ms,V}	[-]				1,6	7				
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,V}	[-]				1,2	:5				
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,V}	[-]				2,3	8				
St	ainless steel A2, A4 and HCR, class 70	γMs,V	[-]				1,5	6				
St	ainless steel A4 and HCR, class 80	$\gamma_{Ms,V}$	[-]				1,3	3				
4	 											

¹⁾ Values are only valid for the given stress area A_s. 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.

³⁾ Fastener type not part of the ETA

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values for steel tension resistance and steel shear resistance of threaded rods	Annex C 1

²⁾ in absence of national regulation



Table C2:	Characteristic values of tension loads under static and quasi-static action for a working life of 50 and 100 years									
Fastener				All Fastener type and sizes						
Concrete cone f	ailure									
Uncracked concr	ete	k _{ucr,N}	[-]	11,0						
Cracked concrete	k _{cr,N}	[-]	7,7							
Edge distance		c _{cr,N}	[mm]	1,5 h _{ef}						
Axial distance		s _{cr,N}	[mm]	2 c _{cr,N}						
Splitting			•							
	h/h _{ef} ≥ 2,0			1,0 h _{ef}						
Edge distance	2,0 > h/h _{ef} > 1,3	C _{cr,sp}	[mm]	$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right)$						
	h/h _{ef} ≤ 1,3			2,4 h _{ef}						
Axial distance	•	s _{cr,sp}	[mm]	2 c _{cr,sp}						

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 50 and 100 years	Annex C 2



Table		racteristic va working life			s und	der st	atic a	nd q	uasi-:	static	actio	on
Thread	ed rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa			T.,		ı							
	teristic tension res	sistance	N _{Rk,s}	[kN]					ee Tab	le C1)		
Partial f			γ _{Ms,N}	[-]				see Ta	able C1			
	ned pull-out and		d assessed CO	VOE in house	الداء مماسا	1 a d / 1 1 C	3\ a.a.d			و ما السام ما	ممامطا	(OD)
	teristic bond resist	ance in uncracked	d concrete C20	∥25 in nami 			,					
Temperature range	l: 24°C/40°C	Dry, wet concrete or		[N] (ma ma 21	20	20	19	19	18	17	16	16
empe ran	II: 50°C/72°C	flooded bore hole	[†] Rk,ucr	[N/mm²]	15 6,5	15 6,5	15 6,5	6,0	13 6,0	13 5,5	12 5,5	12 5,5
			d assessed CO)/05 in hame					, i			3,3
Characi	teristic bond resist	ance in uncracke	a concrete C20	J/25 in namr	I					<u>, , , , , , , , , , , , , , , , , , , </u>		
<u>в</u> 1: 24°С/40°С	Dry or wet			17	16	16	16	15	14	14	13	
rar	II: 50°C/72°C	concrete			14	14	14	13	13	12	12	11
ture	III:60°C/80°C		TDI:	[N/mm²]	6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
Temperature range	l: 24°C/40°C	flood	TRk,ucr	[[twittin]	16	16	16	15	15	14	14	13
dui	II: 50°C/72°C	☐ flooded bore ☐ hole			14	14	14	13	13	12	12	11
Te	III:60°C/80°C				6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
	teristic bond resist nammer drilled hol			5 in hamme	r drilled	holes	(HD) ,	compre	essed a	ir drille	d hole:	s (CD)
	I: 24°C/40°C	Dry, wet	^T Rk,cr		7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
Temperature range	II: 50°C/72°C	concrete or flooded bore		[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Terr	III:60°C/80°C	hole			5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
	ion factor in cracke id in hammer drille				er drille	ed hole	s (HD),	compr	essed	air drille	ed hole	es
ıtur e	I: 24°C/40°C	Dry, wet			0,80							
nperatur range	II: 50°C/72°C	concrete or	Ψ ⁰ sus	[-]	0,68							
Temp e ra	III:60°C/80°C	_ flooded bore hole	, sus		0,70							
	ing factors for	≤ C50/60			(f _{ck} / 20) ^{0,1}							
concret		> C50/60	Ψο	[-]	1,1							
Charact	teristic bond resist	tance depending	τ _{Rk,ucr} =				Ψο	τRk,u	ıcr,(C20/	25)		
	concrete strength		τ _{Rk,cr} =						cr,(C20/2			
	te cone failure o	r Splitting										
	nt parameter htion factor							see Ta	able C2			
	and wet concrete ((HD; HDB. CD)						1	,0			
for flooded bore hole (HD; HDB, CD)			^γ inst	[-]					,2			
Chem	nofast Injection	system EP 100	0 for concre	te								
Chara	rmances acteristic values o working life of 50			d quasi-stat	ic actio	on				Anne	x C 3	}



Table		racteristic va a working life			ls und	der st	atic a	and q	uasi-	static	actio	on
Thread					М8	M10	M12	M16	M20	M24	M27	M30
Steel fa		*****	I NI	T (1.5.17	I		Λ. ε	(or o	oo Tab	lo (C1)		
	teristic tension res	sistance	N _{Rk,s}	[kN]			A _s • I		ee Tab	ie CT)		
	Partial factor $\gamma_{Ms,N}$ [- Combined pull-out and concrete failure							see 1	able C1			
	•	tance in uncracke	d concrete C20)/25 in hami	ner dril	led (HC)) and	compre	ssed a	ir drilled	1 holes	: (CD)
	I: 24°C/40°C	Dry, wet	011010101010		20	20	19	19	18	17	16	16
Temperature range	II: 50°C/72°C	concrete or flooded bore	^τ Rk,ucr,100	[N/mm²]	15	15	15	14	13	13	12	12
Tem	III:60°C/80°C	hole			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
Charac	teristic bond resis	tance in uncracke	d concrete C20)/25 in hami	ner dril	led hole	es with	hollow	drill bit	t (HDB)		
<u>o</u>	I: 24°C/40°C				17	16	16	16	15	14	14	13
ang.	II: 50°C/72°C	Dry or wet concrete		[N]/mam 21	14	14	14	13	13	12	12	11
Temperaturerange	III:60°C/80°C	- wholete			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
erati	I: 24°C/40°C		^τ Rk,ucr,100	[N/mm²]	16	16	16	15	15	14	14	13
E G	II: 50°C/72°C	flooded bore			14	14	14	13	13	12	12	11
<u>°</u>	ि				6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
		tance in cracked cles with hollow dril		5 in hamme	r drilled	holes	(HD) ,	compre	essed a	air drille	d hole	s (CD)
	I: 24°C/40°C	Dry, wet concrete or flooded bore	^τ Rk,cr,100	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5
Temperature range	II: 50°C/72°C				5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5
Tem _r	III:60°C/80°C	hole			5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
		ed and uncracked ed holes with hollo			er drille	ed hole:	s (HD)	compi	essed	air drille	ed hole	S
	I: 24°C/40°C	Dry, wet			0,80							
mperatur range	II: 50°C/72°C	concrete or	0		0,68							
Temp e ra	III: 60°C/80°C	_ flooded bore hole	Ψ ⁰ sus,100	[-]	0,70							
	sing factors for	≤ C50/60							20) ^{0,1}			
concret	•	> C50/60	Ψc	[-]					,1			
Charac	teristic bond resis	tance depending	τ _{Rk,ucr,100} =	1			Ψc •	^τ Rk,ucr	,100,(C2	20/25)		
	concrete strength		τ _{Rk,cr,100} =					-	100,(C2	-		
Concre	ete cone failure o	r Splitting	, , ,					,,	7(-2			_
	nt parameter							see Ta	able C2			
	ation factor	/UD: UDB CD\		1	<u> </u>			4	0			
	for dry and wet concrete (HD; HDB, CD) for flooded bore hole (HD; HDB, CD)			[-]		1,0						
	,	,=, .=,		•	'			•	,-			
Chem	nofast Injection	system EP 100	0 for concre	te								
Chara		of tension loads u O years (threaded		d quasi-stat	ic actio	on				Anne	x C 4	ļ



	working life	OI SU YEAR	>									
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30	
Steel failure	iotonoo	N	FLANT			Δ . f	. (or e	ee Tabl	A (°1)			
Characteristic tension res Partial factor	istance	N _{Rk,s}	[kN]				see Ta		01)			
Combined pull-out and	concrete failure	^γ Ms,N	[-]				see ra	ble C1				
Characteristic bond resist		d concrete C2	0/25 in diam	ond dri	lled hol	es (DD	<u>, </u>					
	Dry, wet		John Glam	15	14	14	13	12	12	11	11	
II: 50°C/72°C III: 60°C/80°C	concrete or flooded bore	τ _{Rk,ucr}	[N/mm²]	12	12	11	10	9,5	9,5	9,0	9,0	
는 III:60°C/80°C	hole			5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0	
Characteristic bond resist	ance in cracked c	oncrete C20/2	25 in diamon	d drille	d holes	(DD)						
e l: 24°C/40°C	Dry, wet						5,5	5,5	5,5	5,5	5,4	
II: 50°C/72°C III: 60°C/80°C	concrete or flooded bore	^τ Rk,cr	[N/mm²]	1) 4,			4,6	4,6	4,6	4,6	4,5	
<u> </u>	hole			2,4				2,3	2,4	2,4	2,3	
Reduction factor in uncra	cked concrete C2	0/25 in diamor	nd drilled hol	es (DD)							
1: 24°C/40°C	Dry, wet concrete or			0,77								
range range II: 50°C/72°C	flooded bore	Ψ ⁰ sus	[-]	0,72								
<u></u> III:60°C/80°C				0,								
Increasing factors for	≤ C50/60	Ψ _{c,ucr}	[-]				(f _{ck} / 2					
concrete	> C50/60	,						,2				
	≤ C50/60	Ψ _{c,cr}	[-]					20) ^{0,4}				
Characteristic bond resist on the concrete strength							ucr ^{• τ} Rk,ucr,(C20/25) c,cr ^{• τ} Rk,cr,(C20/25)					
Concrete cone failure o	r Splitting	TAN,OI				,	OI IXX	,01,(020	20)			
Relevant parameter							see Ta	ble C2				
Installation factor												
for dry and wet concrete (•	γ _{inst}	[-]				1,	,0				
for flooded bore hole (DD 1) no performance assess		· 11/31	.,		1,2				1,4			
Chemofast Injection Performances Characteristic values o				ic actio	on				Anne	ex C 5		



Table		racteristic va working life			s und	der st	atic a	and q	uasi-	static	actio	on .
Threade	ed rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ilure											
Charact	eristic tension res	sistance	N _{Rk,s}	[kN]			$A_{s} \cdot f$	_{uk} (or s	ee Tab	le C1)		
Partial fa	actor		γ _{Ms,N}	[-]				see Ta	ble C1			
Combin	ed pull-out and	concrete failure										
Charact	eristic bond resis	tance in uncracke	d concrete C20	0/25 in diam	ond dri	lled ho	es (DD))				
	I: 24°C/40°C	Dry, wet			15	14	14	13	12	12	11	11
	II: 50°C/72°C	concrete or flooded bore	τ _{Rk,ucr,100}	[N/mm²]	11	11	10	10	9,5	9,0	8,5	8,5
Ten	III:60°C/80°C hole				5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0
Reduction	on factor in uncra	cked concrete C2	0/25 in diamor	nd drilled hole	es (DD)						
ture	l: 24°C/40°C	Dry, wet			0,73							
Temperature range	II: 50°C/72°C	concrete or flooded bore	Ψ ⁰ sus,100	[-]	0,70							
Tem	III:60°C/80°C	hole			0,72							
Increasi	ng factors for	≤ C50/60		.,	(f _{ck} / 20) ^{0,2}							
concrete	•	> C50/60	Ψc	[-]	1,2							
	eristic bond resis concrete strength		τ _{Rk,ucr,100} =		Ψc * ^τ Rk,ucr,100,(C20/25)							
Concret	te cone failure o	r Splitting										
	nt parameter							see Ta	ble C2			
	tion factor			1								
	and wet concrete	· /	γ_{inst}	[-]	1,0							
ioi iloou	flooded bore hole (DD)			1,2 1,4								

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (threaded rod)	Annex C 6



Table C7: Characteristic for a working					nder s	tatic a	nd qu	asi-st	atic acti	on
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm				,		•			•	,
Characteristic shear resistance Steel, strength class 4.6, 4.8 and 5.6, 5.8	V ⁰ _{Rk,s}	[kN]			0,6 •	A _s • f _{uk}	(or see	Table C	1)	
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all strength classes	V ⁰ _{Rk,s}	[kN]			0,5 •	A _s ∙ f _{uk}	(or see	Table C	1)	
Partial factor	γ _{Ms,V}	[-]	see Table C1							
Ductility factor	k ₇	[-]	1,0							
Steel failure with lever arm										
Characteristic bending moment	M ⁰ Rk,s	[Nm]			1,2 • 1	W _{el} • f _{ul}	(or see	Table C	C1)	
Elastic section modulus	W _{el}	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γ _{Ms,V}	[-]				see	Table C	:1		
Concrete pry-out failure										
Factor	k ₈	[-]					2,0			
Installation factor	γ _{inst}	[-]					1,0			
Concrete edge failure	-	-								
Effective length of fastener	I _f	[mm]	_	m	nin(h _{ef} ; 1	2 · d _{nor}	_n)	_	min(h _{ef} ;	300mm)
Outside diameter of fastener	d _{nom}	[mm]	8 10 12 16 20 24 27 30						30	
Installation factor	γ_{inst}	[-]	1,0							

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (threaded rod)	Annex C 7



Table C8:		eristic value rking life of			oads un	ider sta	tic and	quasi-s	tatic ac	tion
Internal threa	ded anchor rods	 S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure1)						•	•	•	•	
Characteristic	tension resistanc	e. 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123
	teel, strength class 8.8		N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.8 and 8.8			γMs,N	[-]			1	,5	l	
	tension resistanc									
	HCR, Strength cla		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γMs,N	[-]			1,87	•	•	2,86
Combined pu	II-out and concr	ete cone failu	<u> </u>							
Characteristic	bond resistance	in uncracked co	oncrete C	20/25 in h	ammer dr	illed (HD)	and comp	ressed air	r drilled ho	les (CD)
I: 24°C/40°C Dry, wet					20	19	19	18	17	16
Temperature	II: 50°C/72°C	concrete or flooded bore	τ _{Rk,ucr}	[N/mm²]	15	15	14	13	13	12
range	III:60°C/80°C	hole	,		6,5	6,5	6,0	6,0	5,5	5,5
Characteristic	bond resistance		oncrete C	20/25 in h			· ·			, , , , , , , , , , , , , , , , , , ,
	I: 24°C/40°C				16	16	16	15	14	13
	II: 50°C/72°C	Dry or wet concrete			14	14	13	13	12	11
Temperature	III:60°C/80°C	Concrete	7	[NI/mm2]	6,5	6,5	6,0	6,0	5,5	5,5
range	I: 24°C/40°C	flooded bore	^τ Rk,ucr	[N/mm²]	16	16	15	15	14	13
	II: 50°C/72°C				14	14	13	13	12	11
	III:60°C/80°C				6,5	6,5	6,0	6,0	5,5	5,5
	bond resistance r drilled holes wit			/25 in ham	mer drille	d holes (H	HD), comp	ressed air	drilled ho	les (CD)
	l: 24°C/40°C	Dry, wet		cr [N/mm²]	7,0	8,5	8,5	8,5	8,5	8,5
Temperature	II: 50°C/72°C	concrete or	^τ Rk,cr		6,0	7,0	7,0	7,0	7,0	7,0
range	III:60°C/80°C	flooded bore hole			5,0	5,0	4,5	4,5	4,5	4,5
	or in cracked and	uncracked co				· ·				
(CD) and in na	mmer drilled hole I: 24°C/40°C	Dry, wet	arııı bit (Hi │	лв) 				80		
Temperature	II: 50°C/72°C	concrete or	0	,			•			
range		flooded bore	Ψ ⁰ sus	[-]			•	68		
	III:60°C/80°C	hole						70		
Increasing fac	tors for concrete	≤ C50/60	Ψς	[-]			(f _{ck} / :	20) ^{0,1}		
moreaching rac		> C50/60	10	1 1			1	,1		
Characteristic	bond resistance	depending on		τ _{Rk,ucr} =			Ψ c * τ _{Rk,ι}	ucr,(C20/25)	!	
the concrete strength class				τ _{Rk,cr} =				cr,(C20/25)		
	e failure or Split	tting								
Relevant para							see Ta	able C2		
Installation fa		IDD 45:	T	 						
	t concrete (HD; H		γ _{inst}	[-]				,0		
	e hole (HD; HDB (incl. nut and was	·						,2		

Deastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod.

The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

²⁾ For IG-M20 strength class 50 is valid

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (Internal threaded anchor rod)	Annex C 8



Table C9:		eristic value			ads und	der stat	ic and	quasi-s	tatic ac	tion
Internal threa	ded anchor rod	s			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure1)										
Characteristic	tension resistance	ce, 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength	n class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor,	strength class 5.8	3 and 8.8	γMs,N	[-]			1	,5		
Characteristic tension resistance, Stainless						-00	44	50	440	101
Steel A4 and HCR, Strength class 70 ²⁾			N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γMs,N	[-]			1,87			2,86
Combined pu	ıll-out and concı	rete cone failu	re							
Characteristic	bond resistance	in uncracked c	oncrete C20	0/25 in ha	mmer drill	led (HD) a	and comp	ressed air	drilled ho	les (CD)
	I: 24°C/40°C Dry, wet				20	19	19	18	17	16
Temperature	II: 50°C/72°C	concrete or flooded bore	τ _{Rk.ucr.100}	[N/mm²]	15	15	14	13	13	12
range	III:60°C/80°C	hole	1111,461,166		6,5	6,5	6,0	6,0	5,5	5,5
Characteristic	bond resistance		oncrete C20)/25 in hai					· ·	
	I: 24°C/40°C				16	16	16	15	14	13
	II: 50°C/72°C	Dry or wet concrete			14	14	13	13	12	11
Temperature	III:60°C/80°C	concrete	_	[N1/mmm2]	6,5	6,5	6,0	6,0	5,5	5,5
range	I: 24°C/40°C	flandad bass	^τ Rk,ucr,100	[[N/[[[[]]]	16	16	15	15	14	13
	II: 50°C/72°C	flooded bore hole			14	14	13	13	12	11
	III:60°C/80°C	Tiole			6,5	6,5	6,0	6,0	5,5	5,5
	bond resistance			5 in hamn	ner drilled	holes (H	D), compr	essed air	drilled ho	les (CD)
and in hamme	er drilled holes wit		t (HDB)				T			
Temperature	I: 24°C/40°C	Dry, wet concrete or	^τ Rk,cr,100	[N/mm²]	6,5	7,5	7,5	7,5	7,5	7,5
range	II: 50°C/72°C	flooded bore			5,5	6,5	6,5	6,5	6,5	6,5
	III:60°C/80°C	hole			5,0	5,0	4,5	4,5	4,5	4,5
	tor in cracked and ammer drilled hol				mer drille	ed holes (HD), comp	oressed a	ir drilled h	oles
_	I: 24°C/40°C	Dry, wet					0,	80		
Temperature range	II: 50°C/72°C	concrete or flooded bore	Ψ ⁰ sus,100	[-]			0,	68		
range	III:60°C/80°C	hole		1			0,	70		
		≤ C50/60					(f _{ck} /)	20) ^{0,1}		
Increasing fac	tors for concrete	> C50/60	Ψс	[-]				,1		
Characteristic	bond resistance		τ _{Rk}	ucr,100 =		Ψ	[/] c ^{• τ} Rk,ucr	25.0	25)	
the concrete s		depending on		c,cr,100 =			^γ c • ^τ Rk.cr.			
Concrete con	e failure or Spli	tting	130	τ,στ, του			1 111,01,	100,(020/2	<u> </u>	
Relevant para							see Ta	able C2		
Installation fa	2.00020.0020.00									
for dry and we	et concrete (HD; H	HDB, CD)	ν: ι	[-]				,0		
1- (1)	re hole (HD; HDE		γinst					,2		
1) Fastenings	(incl. nut and was	her) must comp	ly with the a	ppropriate	material a	and prope	rty class of	f the intern	al threade	d rod.

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded roc The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

²⁾ For IG-M20 strength class 50 is valid

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (Internal threaded anchor rod)	Annex C 9



1,0

1,4

1 4 4 4		rking life of		1	10	10	10	10 1110	10 1116	10	
Internal threa Steel failure1)	ded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
	tension resistance	e 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123	
Steel, strength		,e, <u>0.0</u> 8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196	
	strength class 5.8		γ _{Ms,N}	[-]	10	21		,5	121	100	
<u> </u>	Characteristic tension resistance, Stainless							•			
	HCR, Strength cla	•	N _{Rk,s}	[kN]	14	26	41	59	110	124	
Partial factor			γ _{Ms,N}	[-]			1,87			2,86	
	II-out and conci										
Characteristic	bond resistance	in uncracked c	oncrete C2	0/25 in dia	mond dril	led holes	(DD)				
	I: 24°C/40°C	Dry, wet	τ _{Rk,ucr} [N		14	14	13	12	12	11	
Temperature range	II: 50°C/72°C	concrete or flooded bore		[N/mm²]	12	11	10	9,5	9,5	9,0	
	III:60°C/80°C	hole			5,5	5,0	4,5	4,5	4,5	4,0	
Characteristic	bond resistance i	n cracked cond	crete C20/2	25 in diamo	nd drilled	holes (D	D)				
	I: 24°C/40°C	Dry, wet			3)		5,5	5,5	5,5	5,4	
Temperature range	II: 50°C/72°C	concrete or flooded bore	^τ Rk,cr	[N/mm²]			4,6	4,6	4,6	4,5	
	III:60°C/80°C	hole					2,4	2,3	2,4	2,3	
Reduction fact	or in uncracked c	concrete C20/2	5 in diamor	nd drilled h	oles (DD)						
	I: 24°C/40°C	Dry, wet			0,77						
Temperature range	II: 50°C/72°C	concrete or flooded bore	$\psi^0_{ m sus}$	[-]	0,72						
	III:60°C/80°C	hole			0,72						
		≤ C50/60					(f _{ck} / 2	20) ^{0,2}			
Increasing fact	tors for concrete	> C50/60	Ψc,ucr	[-]	1,2						
≤ C50/60		≤ C50/60	Ψc,cr	[-]			(f _{ck} / 2	20) ^{0,4}			
Characteristic	bond resistance	depending on		τ _{Rk,ucr} =		Ψ	′c,ucr ° τ _{RI}	c,ucr,(C20/2	25)		
the concrete s	trength class			τ _{Rk,cr} =			Ψc,cr * ^τ Rl	c,cr,(C20/25	5)		
	e failure or Spli	tting									
Relevant para							see Ta	ble C2			
Installation fa	ctor										

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod. The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

 γ_{inst}

[-]

1,2

for dry and wet concrete (DD)

for flooded bore hole (DD)

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 10
Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (Internal threaded anchor rod)	

²⁾ For IG-M20 strength class 50 is valid

³⁾ no performance assessed



Table C11		eristic value king life of			ıds und	ler stat	ic and d	quasi-s	tatic ac	tion
Internal threa	ded anchor rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20		
Steel failure ¹⁾	ı									
Characteristic tension resistance, 5.8			N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength class 8.8			N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.8 and 8.8 Y _{Ms,N} [-]				[-]	1,5					
Characteristic tension resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾			N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γ _{Ms,N}	[-]	1,87					2,86
Combined pu	III-out and concr	ete cone failu	re							
Characteristic	bond resistance i	n uncracked c	oncrete C20	0/25 in dia	mond dril	led holes	(DD)			
	I: 24°C/40°C	Dry, wet			14	14	13	12	12	11
Temperature range	II: 50°C/72°C	concrete or flooded bore	^τ Rk,ucr,100	[N/mm²]	11	10	10	9,5	9,0	8,5
	III:60°C/80°C	hole			5,5	5,0	4,5	4,5	4,5	4,0
Reduction fact	or in uncracked o	oncrete C20/2	5 in diamon	d drilled h	oles (DD)	1	•			

range	11. 00 0//2 0	flooded bore	*RK,UCF, 100	[''			0,0	0,0	0,0		
_	III:60°C/80°C	hole			5,5	5,0	4,5	4,5	4,5	4,0		
Reduction fact	or in uncracked o	concrete C20/25	in diamon	d drilled h	oles (DD)							
	I: 24°C/40°C	Dry, wet					0,	73				
Temperature range	II: 50°C/72°C	concrete or flooded bore	Ψ ⁰ sus,100	[-]	0,70							
•	III:60°C/80°C	hole			0,72							
Increasing feet	solution of the state of the s		NI.	r 1	(f _{ck} / 20) ^{0,2}							
increasing raci	iors for concrete	> C50/60	Ψ_{c}	[-]	1,2							
Characteristic the concrete s	bond resistance of trength class	depending on	^τ Rk,	$\tau_{Rk,ucr,100} = \qquad \qquad \Psi c \cdot \tau_{Rk,ucr,100,(C20/25)}$				25)				
Concrete con	e failure or Spli	tting										
Relevant para	meter						see Ta	able C2				
Installation fa	ictor											
for dry and wet concrete (DD) for flooded bore hole (DD)		2/	F 3	1,0								
		γ inst	[-]	1,2	2		1	,4				
1) Fastenings	(incl. nut and was	her) must comp	ly with the a	opropriate	material a	nd proper	ty class of	f the intern	al threade	ed rod.		

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under static and quasi-st for a working life of 100 years (Internal threaded anchor rod)	Annex C 11 atic action

²⁾ For IG-M20 strength class 50 is valid



1,0

Internal threaded anchor rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20		
Steel failure without lever arm ¹	<u> </u>				10	1,5		1.5	10
Characteristic shear resistance.	5.8	V ⁰ _{Rk,s}	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V ⁰ _{Rk,s}	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]			•	1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾		V ⁰ _{Rk,s}	[kN]	7	13	20	30	55	40
Partial factor γ _{Ms,V}			[-]		1,56				
Ductility factor k ₇			[-]				1,0		
Steel failure with lever arm ¹⁾		•							
Characteristic bending moment,	5.8	M ⁰ _{Rk,s}	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M ⁰ Rk,s	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]		•	•	1,25	•	•
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 ²⁾		M ⁰ _{Rk,s}	[Nm]	11	26	52	92	233	456
Partial factor		$\gamma_{Ms,V}$	[-]			1,56			2,38
Concrete pry-out failure									
Factor		k ₈	[-]				2,0		
Installation factor γ_{inst} [-]			[-]	[-] 1,0					
Concrete edge failure		•	•						
Effective length of fastener			[mm]		mine	(h _{ef} ; 12 • o	d _{nom})		min(h _{ef} ; 300n
Outside diameter of fastener		d _{nom}	[mm]	10	12	16	20	24	30

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod. The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

[-]

 γ_{inst}

Installation factor

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 12
Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (Internal threaded anchor rod)	

²⁾ For IG-M20 strength class 50 is valid



Table C13:	Characte for a wor					load	s un	ders	static	and	qua	si-st	atic a	actio	n		
Reinforcing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40		
Steel failure																	
Characteristic tensi resistance	on	N _{Rk,s}	[kN]						A _s ·	f _{uk} 1)							
Cross section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804	1018	1256		
Partial factor		γMs,N	[-]						1,4	4 2)		311					
Combined pull-ou	t and concre	Bibliothic Michigan															
Characteristic bond	l resistance i	n uncracked	d concret	e C20	/25 in	hamm	er (HI	D) and	comp	resse	d air d	rilled l	noles (CD)			
ı : 1: 24°C/40°C	Dry, wet			16	16	16	16	16	16	15	15	15	15	15	15		
II: 50°C/72°C	concrete or	τ _{Rk,ucr}	[N/mm²]	12	12	12	12	12	12	12	12	11	11	11	11		
□ E HII: 60°C\80°C	flooded	TXK,UGI		5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	4,5	4,5		
111.00 0/00 0		Lincracker	l concret	,								,		7,0	٦,٥		
Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) I: 24°C/40°C _																	
e II: 50°C/72°C	Dry, wet			12	12	12	11	11	11	11	11	11	11				
	concrete			5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0				
i: 24°C/40°C		^τ Rk,ucr	[N/mm²]	13	13	13	13	13	13	13	13	13	13	3	3)		
□ II: 50°C/72°C	flooded			11	11	11	11	11	11	11	11	11	11				
III: 60°C/80°C	bore hole			5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0				
Characteristic bond and in hammer drill					in ha	immer	drilled	holes	s (HD)	, comp	oresse	d air c	drilled I	noles	(CD)		
1: 24°C/40°C	I: 24°C/40°C Dry, wet			7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5				
1: 24°C/40°C 1: 50°C/72°C 1: 50°C/80°C 1: 5	concrete or	^τ Rk,cr	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	3)			
III: 60°C/80°C flooded		IXK,G		4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	-			
Reduction factor in (CD) and in hamme	cracked and er drilled hole				25 in h	namme	50.50		es (HC	16 E)	npress	sed air	drilled	holes	5		
l: 24°C/40°C									0,	80							
II: 50°C/72°C	and flooded bore hole	Ψ ⁰ sus	[-]	0,68													
III:60°C/80°C	DOTE HOLE								0,								
Increasing factors	≤ C50/60		.,						$(f_{ck} / 2$	20) ^{0,1}							
for concrete	> C50/60	Ψc	[-]						1	,1							
Characteristic bond		τ	Rk,ucr =					$\Psi_{\mathbf{c}}$	• τ _{Rk.u}	cr.(C20)/25)						
depending on the c	oncrete		τ _{Rk,cr} =	Ψc • τRk,ucr,(C20/25) Ψc • τRk,cr,(C20/25)													
strength class Concrete cone fail	luro or Splitt		*KK,CI					ΨC	*KK,C	cr,(C20	(25)						
Relevant paramete		ung							see Ta	hle C	2						
Installation factor		CD)						,	000 16		_						
for dry and wet con								1	,0					1	,2		
for flooded bore ho		γ inst	[-]						,2						3)		
1) f _{uk} shall be take		ecifications of	of reinford	ing ba	rs												
2) in absence of na 3) no performance	itional regulat																
Chemofast Inje	ction syste	em EP 100	0 for co	oncre	te												
Performances Characteristic va for a working life				tic and	d quas	si-stati	c acti	on				Ar	nnex	C 13	3		



Table C14:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic	actio	n		
Reinforcing bar		_ _			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40		
Steel failure																	
Characteristic tensi resistance		N _{Rk,s}	[kN]						A _s ·	f _{uk} 1)							
Cross section area		A_s	[mm²]	50	79	113	154	201	314	452	491	616	804	1018	1256		
Partial factor		γMs,N	[-]						1,4	4 2)							
Combined pull-ou	t and concre	ete failure		•													
Characteristic bond	l resistance i	nuncracked	concret	e C20)/25 in	hamn	ner (HI	D) and	comp	resse	d air d	rilled l	noles ((CD)			
i. a l: 24°C/40°C				16	16	16	16	16	16	15	15	15	15	15	15		
II: 50°C/72°C	concrete or flooded	τRk,ucr,100	[N/mm²]	12	12	12	12	12	12	12	12	11	11	11	11		
III:60°C/80°C		, .		5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	4,5	4,5		
Characteristic bond		n uncracked	l concret	e C20)/25 in	hamm				th holl	ow dri	l bit (F	HDB)				
										13	13						
and the second s	Dry or wet concrete			12	12	12	11	11	11	11	11	11	11				
i: 24°C/40°C	001101010	⁷ Rk,ucr,100	[N/mm²]	5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	,	3)		
<u> </u>	flooded	TKK,GCI, 100			13	13	13	13	13	13	13	13	13		•		
III: 60°C/72°C	bore hole			11 5,5	11 5,5	11 5,5	11 5,5	11 5,5	11 5,5	11 5,0	11 5,0	11 5,0	11 5,0				
Characteristic bond	l Lresistance i	l n cracked c	oncrete (<u> </u>							l holes	(CD)		
and in hammer drill							ui iii o		· ()	, 00111		u un u	iiiiou i	10.00	(02)		
l: 24°C/40°C	Dry, wet			6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5				
1: 24°C/40°C 1: 50°C/72°C 1: 60°C/80°C	concrete or	^τ Rk,cr,100	[N/mm²]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	;	3)		
III: 60°C\80°C	flooded	144,01,100		4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	1			
		uncracked	concrete									-		l hole:	 S		
Reduction factor in cracked and uncracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)																	
1. a l: 24°C/40°C									0,	80							
II: 50°C/72°C	concrete or flooded	Ψ ⁰ sus,100	[-]						0,0	68							
111:60°C/80°C	bore hole	0.0,.00							0,	70							
	≤ C50/60																
Increasing factors for concrete	> C50/60	Ψc	[-]		(f _{ck} / 20) ^{0,1}												
Characteristic bond		_															
depending on the c		^τ Rk,u	cr,100 =					Ψς • 1	Rk,ucr	,100,(C	20/25)						
strength class			cr,100 =					Ψ c *	^τ Rk,cr,	100,(C	20/25)						
Concrete cone fail		ting		1													
Relevant parameter		יחי		<u> </u>					see Ta	ible C							
Installation factor for dry and wet con		טי) 		Ι				4	^					1	2		
for flooded bore hol		γ_{inst}	[-]						,0 ,2						,2 3)		
1) f _{uk} shall be take		ecifications o	f reinford	ina ba	ars				, <u>~</u>					<u>'</u>	-1		
2) in absence of na 3) no performance	itional regulati			5 -													
Chemofast Inje	ction syste	em EP 100	0 for co	oncre	te												
Performances Characteristic va for a working life				tic and	d quas	si-stat	ic acti	on				Ar	nnex	C 14			



Table C15:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic a	actio	n
Reinforcing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Steel failure															
Characteristic tensi resistance	ion	N _{Rk,s}	[kN]						A _s ·	f _{uk} 1)					
Cross section area		A_s	[mm²]	n²] 50 79 113 154 201 314 452 491 616 8							804	1018	1256		
Partial factor		γ _{Ms,N}	[-]	1,4 ²⁾											
Combined pull-ou	t and concr	ete failure													
Characteristic bond	l resistance i	n uncracked	concret	e C20	/25 in	diamo	nd dri	lled ho	oles (D)D)					
				14	13	13	13	12	12	11	11	11	11	11	10
	concrete or flooded	^τ Rk,ucr	[N/mm²]	11	11	10	10	10	9,5	9,5	9,5	9,0	9,0	8,5	8,5
[년 III:60°C/80°C	bore hole			5,0	5,0	5,0	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0	4,0
	Reduction factor in uncracked concrete C20/25 in						s (DD)							
일 I: 24°C/40°C	Dry, wet		[-]	0,77											
III: 50°C/72°C	concrete or flooded	$\Psi^0_{\sf sus}$		0,72											
[발] III:60.C\80.C	bore hole								0,	72					
Increasing factors	≤ C50/60		.,						(f _{ck} / 2	20) ^{0,2}					
for concrete	> C50/60	Ψc,ucr	[-]						1	,2					
•	Characteristic bond resistance lepending on the concrete trength class							Ψc,uc	r • ^T Rk	,ucr,(C	20/25)				
Concrete cone fai	lure or Split	ting													
Relevant paramete							see Ta	ble C	2						
Installation factor															
For flooded bere help			[-]					1	,0					+	,2
for flooded bore ho	or flooded bore hole			1,2 1,4									[3	3)	

¹⁾ f_{uk} shall be taken from the specifications of reinforcing bars

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 15
Characteristic values of tension loads under static and quasi-static action	
for a working life of 50 years (reinforcing bar)	

²⁾ in absence of national regulation

³⁾ no performance assessed



Table C16:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic a	actio	n
Reinforcing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Steel failure															
Characteristic tens resistance	ion	N _{Rk,s}	[kN]						A _s ·	f _{uk} 1)					
Cross section area		A_s	[mm²]									1018	1256		
Partial factor		γMs,N	[-]						1,	4 2)					
Combined pull-ou	t and concr	ete failure		<u> </u>											
Characteristic bond	d resistance i	n uncracked	concret	e C20	/25 in	diamo	nd dri	lled ho	oles (D)D)					
말 I: 24°C/40°C Dry, wet				14	13	13	13	12	12	11	11	11	11	11	10
III: 50°C/72°C	concrete or flooded	τRk,ucr,100		11	10	10	10	9,5	9,0	9,0	9,0	8,5	8,5	8,0	8,0
[년 III:60°C/80°C	bore hole			5,0	5,0	5,0	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0	4,0
Reduction factor in	Reduction factor in uncracked concrete C20/25 ir						s (DD)							
일 I: 24°C/40°C	Dry, wet			0,73											
III: 50°C/72°C	concrete or flooded	Ψ ⁰ sus,100	[-]	0,70											
[발] III:60°C/80°C	bore hole								0,	72					
Increasing factors	≤ C50/60		.,						(f _{ck} / 2	20) ^{0,2}					
for concrete	> C50/60	Ψc,ucr	[-]						1	,2					
Characteristic bond resistance depending on the concrete strength class							,	ν _{c,ucr} •	˙ ^τ Rk,u	cr,100,	(C20/25	5)			
Concrete cone fai															
Relevant parameter									see Ta	ble C	2				
Installation factor															
	or dry and wet concrete							1.	,0						,2
for flooded bore ho	le	γinst	"		1	,2				1	,4				3)

¹⁾ f_{uk} shall be taken from the specifications of reinforcing bars

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 16
Characteristic values of tension loads under static and quasi-static action	
for a working life of 100 years (reinforcing bar)	

²⁾ in absence of national regulation

³⁾ no performance assessed



Table C17: Character a working										•				
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Steel failure without lever arm														
Characteristic shear resistance	V ⁰ _{Rk,s}	[kN]						0,5	• A _s • 1	: 1) uk				
Cross section area	As	[mm²]	50	50 79 113 154 201 314 452 491 616 804 1018 125								1256		
Partial factor	γ _{Ms,V}	[-]	1,5 ²⁾											
Ductility factor	k ₇	[-]	1,0											
Steel failure with lever arm			•											
Characteristic bending moment	M ⁰ Rk,s	[Nm]						1,2	W _{el} •	f _{uk} 1)				
Elastic section modulus	W _{el}	[mm³]	50	98	170	269	402	785	1357	1534	2155	3217	4580	6283
Partial factor	γ _{Ms,V}	[-]							1,5 ²⁾					
Concrete pry-out failure	•	•												
Factor	k ₈	[-]							2,0					
Installation factor	γ _{inst}	[-]							1,0					
Concrete edge failure	•	'												
Effective length of fastener	I _f	[mm]	min(h _{ef} ; 12 · d _{nom}) min(h _{ef} ; 300mm)											
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	14	16	20	24	25	28	32	36	40
Installation factor	γ_{inst}	[-]		1,0										

¹⁾ f_{uk} shall be taken from the specifications of reinforcing bars

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 17
Characteristic values of shear loads under static and quasi-static action	
for a working life of 50 and 100 years (reinforcing bar)	

²⁾ in absence of national regulation



Table C18:	Displacements under tension load ¹⁾ in hammer drilled holes (HD), comp. air
	drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete un	der static and	d quasi-static act	ion for a	workin	g life of	50 and	100 year	rs		
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
Temperature range II:	$\delta_{ m N0}$ -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
50°C/72°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Cracked concrete unde	r static and q	uasi-static actior	ı for a w	orking l	ife of 50	and 100) years			
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082
24°C/40°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229
	δ_{N0} -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229

¹⁾ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor τ ; $\delta_{N\infty} = \delta_{N\infty}$ -factor τ ; τ : action bond stress for tension

Displacements under tension load¹⁾ in diamond drilled holes (DD) Table C19:

Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30	
Cracked and uncracked	l concrete un	der static and qu	asi-stat	ic action	for a w	orking l	ife of 50	years			
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015	
24°C/40°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025	
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018	
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070	
Temperature range III: 60°C/80°C	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018	
	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070	
Uncracked concrete un	der static and	d quasi-static act	ion for a	workin	g life of	100 yea	rs				
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015	
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027	
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018	
50°C/72°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051	
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018	
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051	
1) Calculation of the displ	Calculation of the displacement: Sur = Sur factor, et . Sur = Sur factor, et . et estion hand strong for tonging										

¹⁾ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$; $\delta_{N\infty} = \delta_{N\infty}$ -factor $\cdot \tau$; τ : action bond stress for tension

Displacements under shear load¹⁾ for all drilling methods Table C20:

All temperature	Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
7 th temperature 70	Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years										
ranges 8, factor [mm/kN] 0.00 0.08 0.08 0.06 0.05 0.05 0.05	All temperature ranges	δ _{V0} -factor	[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
		$\delta_{V\infty}$ -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05

¹⁾ Calculation of the displacement $\delta v_0 = \delta v_0$ -factor $\cdot V$; $\delta v_\infty = \delta v_\infty$ -factor $\cdot V$; V: action shear load

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Displacements under static and quasi-static action for a working life of 50 and 100 years (threaded rod) Annex C 18



	drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)											
Internal threaded and	Internal threaded anchor rods					IG-M12	IG-M16	IG-M20				
Uncracked concrete under static and quasi-static action for a working life of 50 and 100 years												
Temperature range I: δ_{N0} -factor		[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041				

Internal threaded ancho	r roas		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Uncracked concrete un	der static and	quasi-static actio	n for a wo	rking life	of 50 and 1	00 years		
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,039	0,040	0,044	0,047	0,051	0,055
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,049	0,051	0,055	0,059	0,064	0,070
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,039	0,040	0,044	0,047	0,051	0,055
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,049	0,051	0,055	0,059	0,064	0,070
Cracked concrete unde	r static and qu	asi-static action	for a work	ing life of	50 and 100	years		
Temperature range I:	δ _{N0} -factor	[mm/(N/mm²)]	0,071	0,072	0,074	0,076	0,079	0,082
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,171
Temperature range II:	δ _{N0} -factor	[mm/(N/mm²)]	0,095	0,096	0,099	0,102	0,106	0,110
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,229
Temperature range III:	δ _{N0} -factor	[mm/(N/mm²)]	0,095	0,096	0,099	0,102	0,106	0,110
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,229

[mm/(N/mm²)] 0,154 0,163 0,172 0,181 0,189

Displacements under tension load¹⁾ in diamond drilled holes (DD) Table C22:

Internal threaded anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Cracked and uncracked	concrete unde	r static and qua	si-static a	ction for a	working lif	fe of 50 ye	ars	
Temperature range I:	$\delta_{ m N0}$ -factor	[mm/(N/mm²)]	0,012	0,012	0,013	0,014	0,014	0,015
24°C/40°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]	0,019	0,019	0,020	0,022	0,023	0,025
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,053	0,055	0,058	0,062	0,065	0,070
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,053	0,055	0,058	0,062	0,065	0,070
Uncracked concrete und	der static and q	uasi-static actio	n for a wo	rking life o	of 100 year	S		
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,012	0,012	0,013	0,014	0,014	0,015
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,021	0,021	0,023	0,024	0,025	0,027
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
50°C/72°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,039	0,040	0,043	0,045	0,047	0,051
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,039	0,040	0,043	0,045	0,047	0,051

¹⁾ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor τ ; $\delta_{N\infty} = \delta_{N\infty}$ -factor τ ; τ : action bond stress for tension

Table C23: Displacements under shear load¹⁾ for all drilling methods

	Internal threaded	d anchor rods	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
7 il comporatore 70	Uncracked and o	racked concrete	under static an	ıd quasi-sta	tic action f	or a working	g life of 50 a	and 100 yea	rs
ranges $\delta_{V\infty}$ -factor [mm/kN] 0,10 0,09 0,08 0,08 0,06 0,06	All temperature	δ _{V0} -factor	[mm/kN]	0,07	0,06	0,06	0,05	0,04	0,04
	ranges	$\delta_{V_{\infty}}$ -factor	[mm/kN]	0,10	0,09	0,08	0,08	0,06	0,06

¹⁾ Calculation of the displacement $\delta_{V0} = \delta_{V0}$ -factor V; $\delta_{V\infty} = \delta_{V\infty}$ -factor V; V: action shear load

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Displacements under static and quasi-static action for a working life of 50 and 100 years (Internal threaded anchor rod) Annex C 19

¹⁾ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor τ ; $\delta_{N\infty} = \delta_{N\infty}$ -factor τ ; τ : action bond stress for tension



Table C24:	Table C24: Displacements under tension load ¹⁾ in hammer drilled holes (HD), comp. air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)													
Reinforcing bar	r		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	0 Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Uncracked con	crete under	static and qua	asi-sta	tic act	ion for	a wor	king li	fe of	50 and	100 ye	ars			•
Temp range	δ_{N0} -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,031	0,033	0,03	5 0,038	0,038	0,040	0,043	0,045	0,047
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,031	0,033	0,03	5 0,038	0,038	0,040	0,043	0,045	0,047
Temp range	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,042	0,044	0,04	7 0,051	0,051	0,054	0,058	0,060	0,063
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,053	0,055	0,05	9 0,065	0,065	0,068	0,072	0,074	0,079
Temp range	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,042	0,044	0,04	7 0,051	0,051	0,054	0,058	0,060	0,063
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,053	0,055	0,05	9 0,065	0,065	0,068	0,072	0,074	0,079
Cracked concre	Cracked concrete under static and quasi-static action for a working life of 50 and 100 years													
Temp range	δ_{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,073	0,074	0,07	6 0,079	0,079	0,081	0,084		
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,15	5 0,171	0,171	0,181	0,194		
Temp range	δ_{N0} -factor	[mm/(N/mm²)]	_	+	+			+				+	1	
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]											,	2)
Temp range	δ_{N0} -factor	[mm/(N/mm²)]		_									-	
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]											4	
1) Calculation of 2) No performan Table C25:	ice assessed	ment: δ _{NO} = δ _N		·		_{δν∞} -fac						tension		
Reinforcing bar	r		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Uncracked con	crete under	static and qua	asi-sta	tic act	ion for	a wor	king li	fe of	50 year	'S			ı	
Temp range	δ _{NO} -factor	[mm/(N/mm²)]	0,008	0,009	0,009	0,01	0,011	0,01	2 0,013	0,013	0,014	0,015	0,016	0,017
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,018	0,018	0,019	0,020	0,021	0,02	4 0,027	0,027	0,028	0,031	0,032	0,034
Temp range	δ_{NO} -factor	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,01	4 0,015	0,015	0,016	0,018	0,019	0,020
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]		_			_	_	_					
Temp range	δ _{N0} -factor	[mm/(N/mm²)]	+ -				 			+	+ -	<u> </u>		
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,048	0,051	0,054	0,058	0,061	0,06	8 0,076	0,076	0,081	0,088	0,090	0,097
Uncracked con		static and qua	asi-sta	tic act	ion for	a wor	king li	fe of	100 yea	ars	<u> </u>	1		
Temp range		[mm/(N/mm²)]									0,014	0,015	0,016	0,017
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]		1							+ -			
Temp range	δ _{N0} -factor	[mm/(N/mm²)]					_				_			
II: 50°C/72°C	δ _{N∞} -factor	[mm/(N/mm²)]				-	-	+			+	+		
Temp range	δ _{N0} -factor	[mm/(N/mm²)]			+	_	_	+	_		+			
III: 60°C/80°C	δ _{N∞} -factor	[mm/(N/mm²)]	+ -	<u> </u>			 				+ -	<u> </u>		
1) Calculation of Table C26:	the displacer	, ,,,	₁₀ -factor	· τ;	δ _{N∞} =	δ _{N∞} -fac	tor · τ;	τ: «	action b	ond stre	ess for	tension	1	<u>, , , , , , , , , , , , , , , , , , , </u>
Reinforcing bar	-									r		Ø 32	α 2e l	CX 40
Uncracked and														₩ 4U
	δ _{V0} -factor							0,04			0,03		0,03	0.03
All temperature ranges		 			-									0,03
1) Calculation of	δ _{V∞} -factor					,06 0 δ _{∨∞} -fac	<u> </u>	0,05	0,05 action s		0,04 ad	0,04	0,04	0,04
Chemofast Ir	· .			•		υ γ∞-ια υ		, v .	actions	sileal lo	au			
Displacements	Performances Displacements under static and quasi-static action for a working life of 50 and 100 years (reinforcing bar)							,	Anne	k C 2	0			



Tabl		aracteristic va rformance cat							on			
Thread	led rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ailure											
Charac	teristic tension re	sistance	N _{Rk,s,eq,C1}	[kN]	1,0 · N _{Rk,s}							
Partial	factor		γ _{Ms,N}	[-]				see Ta	able C1			
Combi	ned pull-out and	l concrete failure										
		stance in cracked a hammer drilled ho				hamm	er drille	ed hole	s (HD)	, compi	essed	air
fure	I: 24°C/40°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
range range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Ten	III:60°C/80°C	hole	^τ Rk,eq,C1	[N/mm²]	5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
Increasing factors for concrete			Ψc	[-]	1,0							
	teristic bond resis	stance depending class	,	Ψc • τRk,eq,C1,(C20/25)								
Installa	ation factor											
for dry	and wet concrete	V: [-]		1,0								
for floo	ded bore hole (Hi	γ _{inst} [-]		1,2								

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years (threaded rod)	Annex C 21



Tabl		acteristic val ormance cat										
Thread	led rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ailure											
Charac	teristic tension resis	stance	N _{Rk,s,eq,C1}	[kN]	1,0 • N _{Rk,s}							
Partial 1	factor	γ _{Ms,N}	[-]				see Ta	able C1				
Combi	ned pull-out and co	oncrete failure										
	cteristic bond resistat holes (CD) and in ha					hamm	er drille	ed hole	s (HD)	, compi	ressed	air
ture	I: 24°C/40°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,eq,C1	[N/mm²]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5
Ten	III:60°C/80°C	hole	^τ Rk,eq,C1	[N/mm²]	5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
Increasing factors for concrete		Ψc	[-]	1,0								
Characteristic bond resistance depending on the concrete strength class			τ	Rk,eq,C1 =	Ψc * ^τ Rk,eq,C1,(C20/25)							
Installa	ation factor											
	and wet concrete (H	γ _{inst} [-]		1,0								
for floo	ded bore hole (HD; I	γ _{inst}	1,2									

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 100 years (threaded rod)	Annex C 22



Table C29:	Table C29: Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years												
Threaded rod M8 M10 M12 M16 M20 M24 M27 M30													
Steel failure													
Characteristic she (Seismic C1)	tic shear resistance $V_{Rk,s,eq,C1}$ [kN] $0.70 \cdot V_{Rk,s}^0$												
Partial factor		γ _{Ms,V}	[-]	see Table C1									
Factor for annula	ar gap	$\alpha_{\sf gap}$	[-]	[-] 0,5 (1,0) ¹⁾									

¹⁾ Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended.

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 23
Characteristic values of shear loads under seismic action (performance category C1)	
for a working life of 50 and 100 years (threaded rod)	



1,2

Tabl		aracteristic rformance o									n			
Reinfo	rcing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel f	ailure													
Charac	cteristic tension re	esistance	N _{Rk,s,eq,C1}	[kN]					1,0 • A	s • f _{uk}	1)			
Cross	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial	factor		γ _{Ms,N}	[-]					1,	42)				
Combined pull-out and concrete failure														
	cteristic bond resi holes (CD) and in						in har	nmer o	drilled	holes	(HD), d	compre	essed	air
ture	l: 24°C/40°C		^τ Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
Tem	III:60°C/80°C	hole	^τ Rk,eq,C1	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
Increas	sing factors for co	ncrete	Ψс	[-]					1	,0				
	Characteristic bond resistance depending on the concrete strength class			Rk,eq,C1 =	Ψc * ^τ Rk,eq,C1,(C20/25)									
Installa	ation factor													
for dry CD)	and wet concrete	γinst	[-]	1,0										

 $^{^{1)}}$ f_{uk} shall be taken from the specifications of reinforcing bars

for flooded bore hole (HD; HDB, CD)

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years (reinforcing bar)	Annex C 24

²⁾ in absence of national regulation



Table C31:	Characteristic values of tension loads under seismic action
	(performance category C1) for a working life of 100 years

	VI.		,	,		•	•		•					
Reinfo	rcing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel f	ailure													
Charac	cteristic tension re	esistance	N _{Rk,s,eq,C1}	[kN]	1,0 • A _s • f _{uk} ¹⁾									
Cross	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial	factor		γ _{Ms,N}	[-]					1,	4 ²⁾				,
Combi	ined pull-out and	l concrete failu	ire											
	cteristic bond resist holes (CD) and in						in har	nmer o	drilled	holes	(HD), (compre	essed	air
ture	l: 24°C/40°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,eq,C1	[N/mm²]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
Ten	III:60°C/80°C	hole	^τ Rk,eq,C1	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
Increa	sing factors for co	ncrete	Ψc	[-]	1,0									
	characteristic bond resistance epending on the concrete strength $\tau_{Rk,eq,C1} = \psi_c \cdot \tau_{Rk,eq,C1,(C20/25)}$													
Install	ation factor													
for dry and wet concrete (HD; HDB, CD) γ _{inst} [-]			[-]	1,0										
for floo	ded bore hole (H	D; HDB, CD)							1	,2				

¹⁾ \mathbf{f}_{uk} shall be taken from the specifications of reinforcing bars

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 100 years (reinforcing bar)	Annex C 25

²⁾ in absence of national regulation



Table C32: Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years													
Reinforcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure													
Characteristic shea	ar resistance	V _{Rk,s,eq,C1}	[kN]					0,35	· A _s ·	$f_{uk}^{1)}$			
Cross section area	1	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	Partial factor $\gamma_{Ms,V}$ [-] 1,5 $^{2)}$												
Factor for annular gap α_{gap} [-] $0.5 (1.0)^{3}$													

¹⁾ $\mathbf{f}_{\mathbf{u}\mathbf{k}}$ shall be taken from the specifications of reinforcing bars

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (reinforcing bar)	Annex C 26

²⁾ in absence of national regulation

³⁾ Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended.



Threac	ded rod				M12	M16	M20	M24	M27	M30
Steel f	ailure			•		•				
Steel, s Stainle	cteristic tension restrength class 8.8 ss Steel A4 and ⊢ th class ≥70	,	N _{Rk,s,eq,C2}	[kN]			1,0 •	N _{Rk,s}		
Partial			γ _{Ms,N}	[-]			see Ta	able C1		
Combi	ned pull-out and	concrete failure								
	cteristic bond resis holes (CD) and in					hammer (drilled hol	es (HD), d	compresse	ed air
ture	I: 24°C/40°C	Dry, wet	τ _{Rk,eq,C2}	[N/mm²]	5,8	4,8	5,0	5,1	4,8	5,0
Temperature range	II: 50°C/72°C	concrete and flooded bore	τ _{Rk,eq,C2}	[N/mm²]	5,0	4,1	4,3	4,4	4,1	4,3
Tem	III:60°C/80°C	hole	τ _{Rk,eq,C2}	[N/mm²]	1,9	1,6	1,6	1,7	1,5	1,6
ncreas	sing factors for cor	ncrete	Ψς	[-]	•		1	,0		
	cteristic bond resis		τ	Rk,eq,C2 =		γ	^γ c • ^τ Rk,ec	q,C2,(C20/2	5)	
Installa	ation factor									
or dry	and wet concrete	(HD; HDB, CD)	γ	[-]			1	,0		
for floo	ded bore hole (HD); HDB, CD)	γinst	[-]			1	,2		

Table C34: Characteristic values of shear loads under seismic action (performance category C2) for a working life of 50 and 100 years

Threaded rod				M16	M20	M24	M27	M30
Steel failure								
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	V _{Rk,s,eq,C2}	[kN]			0,70 •	V ⁰ _{Rk,s}		
Partial factor	γ _{Ms,V}	[-]			see Ta	able C1		
Factor for annular gap	$\alpha_{\sf gap}$	[-]			0,5 (1,0) ¹⁾		

¹⁾ Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended.

Chemofast Injection system EP 1000 for concrete	
Performances	Annex C 27
Characteristic values of tension and shear loads under seismic action	
(performance category C2) for a working life of 50 and 100 years (threaded rod)	



Table C35: Displacements under tension load (threaded rod)									
Threaded rod			M12	M16	M20	M24	M27	M30	
Uncracked and cracked concrete under seismic action (performance category C2) for a working life of 50 and 100 years									
All tomporature rongs	$\delta_{N,eq,C2(50\%)} = \\ \delta_{N,eq,C2(DLS)}$	[mm]	0,21	0,24	0,27	0,36	0,92	0,70	
All temperature range	$\delta_{\text{N,eq,C2(100\%)}} = \\ \delta_{\text{N,eq,C2(ULS)}}$	[mm]	0,54	0,51	0,54	0,63	1,70	0,92	

Table C36: Displacements under shear load (threaded rod)

Threaded rod			M12	M16	M20	M24	M27	M30
Uncracked and cracked concrete under seismic action (performance category C2) for a working life of 50 and 100 years								
All temperature renges	$\delta_{V,eq,C2(50\%)} = \\ \delta_{V,eq,C2(DLS)}$	[mm]	3,1	3,4	3,5	4,2	4,0	3,8
All temperature ranges	$\delta_{V,eq,C2(100\%)} = \delta_{V,eq,C2(ULS)}$	[mm]	6,0	7,6	7,3	10,9	11,1	11,2

Chemofast Injection system EP 1000 for concrete	
Performances Displacements under seismic action (performance category C2) for a working life of 50 and 100 years (threaded rod)	Annex C 28

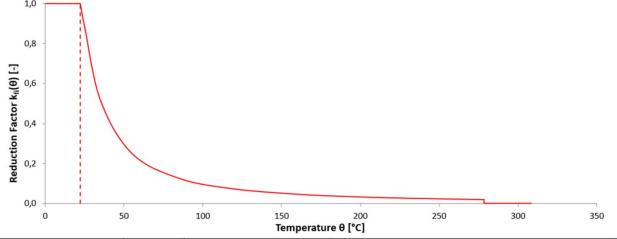


Table C37: Characteristic values of tension and shear loads under fire exposure in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Threaded rod					M8	M10	M12	M16	M20	M24	M27	M30
Steel failure												
Characteristic tension resistance; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher			Fire	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2
	N _{Rk,s,fi}	[LAI]	exposure time [min]	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1
		[kN]		90	0,7	1,0	1,6	3,0	4,7	6,7	8,7	10,7
				120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9

Characteristic bond resistance in cracked and uncracked concrete C20/25 up to C50/60 under fire conditions for a given temperature θ

			θ < 23°C	1,0
Temperature reduction factor	$k_{fi,p}(\theta)$	[-]	23°C ≤ θ ≤ 278°C	150,28 • θ -1,598 ≤ 1,0
	19672		θ > 278°C	0,0



remperature of c													
Characteristic bond resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$	[N/mm²]			$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1)}$								
Steel failure without lever arm													
Characteristic shear resistance; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher			Fire	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2	
	V	[LAI]	exposure time [min]	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1	
	▼ Rk,s,fi	[kN]		90	0,7	1,0	1,6	3,0	4,7	6,7	8,7	10,7	
				120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9	
Steel failure with lever arm					50 9								
Characteristic bending			Fire	30	1,1	2,2	4,7	12,0	23,4	40,4	59,9	81,0	
moment; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher	N40	[Nm]	ovnosuro	60	0,9	1,8	3,5	9,0	17,5	30,3	44,9	60,7	
	M ⁰ _{Rk,s,fi} [[[ווווו]	ume	90	0,7	1,3	2,5	6,3	12,3	21,3	31,6	42,7	
			[min]	120	0,5	1,0	1,8	4,7	9,1	15,7	23,3	31,5	

¹⁾ $\tau_{Rk,cr,(C20/25)}$ characteristic bond resistance for cracked concrete for concrete strength class C20/25 for the relevant temperature range and working life.

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension and shear loads under fire exposure (threaded rod)	Annex C 29

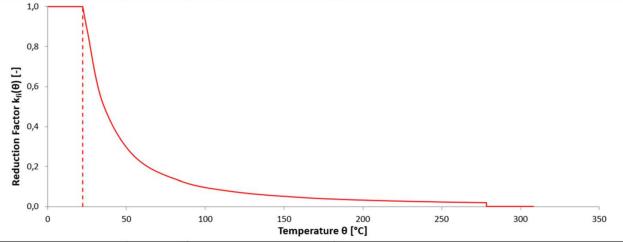


Table C38: Characteristic values of tension and shear loads under fire exposure in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Internal threaded anchor rods					IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure										
Characteristic tension resistance; Steel, Stainless Steel A4 and HCR, strength class 5.8 and 8.8 resp. 70			Fire	30	0,3	1,1	1,7	3,0	5,7	8,8
	N _{Rk,s,fi}	TI.A.IT	exposure time [min]	60	0,2	0,9	1,4	2,3	4,2	6,6
		[kN]		90	0,2	0,7	1,0	1,6	3,0	4,7
				120	0,1	0,5	0,8	1,2	2,2	3,4

Characteristic bond resistance in cracked and uncracked concrete C20/25 up to C50/60 under fire conditions for a given temperature θ

			θ < 23°C	1,0
Temperature reduction factor	$k_{fi,p}(\theta)$	[-]	23°C ≤ θ ≤ 278°C	150,28 • θ ^{-1,598} ≤ 1,0
	5504		θ > 278°C	0,0



				•								
Characteristic bond resistance for a given temperature (<i>θ</i>)	$\tau_{Rk,fi}(\theta)$	[N/mm²]			$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1)}$							
Steel failure without lever arm												
Characteristic shear			Fire	30	0,3	1,1	1,7	3,0	5,7	8,8		
resistance; Steel, Stainless	V	[kN]	ovnosuro	60	0,2	0,9	1,4	2,3	4,2	6,6		
Steel A4 and HCR, strength	$V_{Rk,s,fi}$			90	0,2	0,7	1,0	1,6	3,0	4,7		
class 5.8 and 8.8 resp. 70				120	0,1	0,5	0,8	1,2	2,2	3,4		
Steel failure with lever arm												
Characteristic bending moment; Steel, Stainless			Fire	30	0,2	1,1	2,2	4,7	12,0	23,4		
	N/O	[Nm]	ovnocuro	60	0,2	0,9	1,8	3,5	9,0	17,5		
Steel A4 and HCR, strength	M ⁰ _{Rk,s,fi}	[ניזורו <u>]</u>	time	90	0,1	0,7	1,3	2,5	6,3	12,3		
rciass 5 & and 8 & resp. 70	1	I	i imini t									

τ_{Rk,cr,(C20/25)} characteristic bond resistance for cracked concrete for concrete strength class C20/25 for the relevant temperature range and working life.

Chemofast Injection system EP 1000 for concrete	
Performances Characteristic values of tension and shear loads under fire exposure (internal threaded anchor rod)	Annex C 30

120

0,1

0,5

1,0

1,8

4,7

9,1



hamn	acteristic	d ho	les (HD)	, comp	ress	ed a								
drille	d holes v	with I	nollow d	rill bit	(HDE	,	C 12	~ 14	~ 16	~ 20	C 24	Ø 25	~ 20	~ 22
Steel failure					20	טו ש	Ø 12	Ø 14	Ø 10	Ø 20	Ø 24	Ø 25	Ø 20	Ø 32
Otto landio				30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	16,1
Ob ana stanistia tanais n			Fire	60	0,5	1,0	1,7	2,3	3,0	4,7	6,8	7,4	9,2	12,1
Characteristic tension resistance; BSt 500	$N_{Rk,s,fi}$	[kN]		90	0,4	0,8	1,5	2,0	2,6	4,1	5,9	6,4	8,0	10,5
			time [min]	120	0,3	0,6	1,1	1,5	2,0	3,1	4,5	4,9	6,2	8,0
Characteristic bond resi	⊥ istance in o	cracke	d and unc										,	,
given temperature θ														
Temperature reduction			θ < 2	060						,0				
factor	$k_{fi,p}(\theta)$	[-]	25°C ≤ θ					176,	37 · θ		≤ 1,0			
1,0			θ > 27	78°C					0	,0				
Reduction Factor k _{ii} (θ) [-]														
0	50	1	00	150 Temper	ature θ	200 [°C]		250		3	00		350	
Characteristic bond resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$		[N/mm²]	l	$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,}$						(C20/25) ¹⁾			
Steel failure without leve	er arm											-		
			Fire	30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	16,1
Characteristic shear resistance; BSt 500	$V_{Rk,s,fi}$	[kN]	exposure	60	0,5	1,0	1,7	2,3	3,0	4,7	6,8	7,4	9,2	12,1
resistance, bot 500	9020 30		time [min]	90	0,4	0,8	1,5	2,0	2,6	4,1	5,9	6,4	8,0	10,5
Steel failure with lever a	rm		.c	120	0,3	0,6	1,1	1,5	2,0	3,1	4,5	4,9	6,2	8,0
Steer failure with lever a				30	0,6	1,8	4,1	6,5	9,7	18,8	32,6	36,8	51,7	77,2
Characteristic bending			Fire	60	0,5	1,5	3,1	4,8	7,2	14,1	24,4	27,6	38,8	57,9
moment; BSt 500	M ⁰ Rk,s,fi	[Nm]	exposure time [min]	90	0,4	1,2	2,6	4,2	6,3	12,3		23,9	33,6	
				120	0,3	0,9	2,0	3,2	4,8	9,4	16,3	18,4	25,9	38,6
1) $ au_{ m Rk,cr,(C20/25)}$ characte temperature range and			ce for crack	ed concr	ete for			0						
Chemofast Injection Performances Characteristic values of					expos	sure (ı	einfor	cing b	oar)		Aı	nnex	C 3	ľ