



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-19/0201 of 12 June 2024

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

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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 25 February 2022



European Technical Assessment ETA-19/0201

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English translation prepared by DIBt

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Z95632.23 8.06.01-197/22



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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 and 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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4 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 12 June 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock

Head of Section

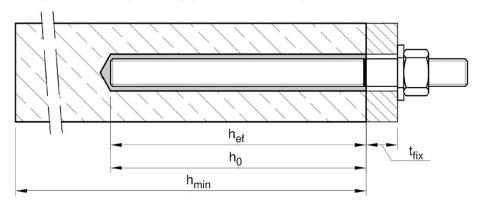
Stiller

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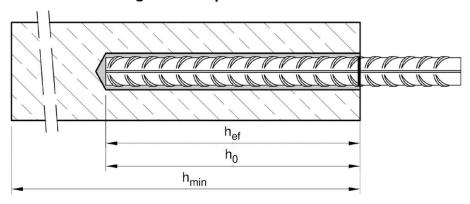


Installation threaded rod M8 up to M30

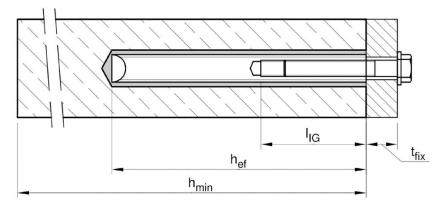
prepositioned installation or push through installation (annular gap filled with mortar)



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

 I_{IG}

h_{ef} = effective embedment depth

= thread engagement length

 h_{min} = minum thickness of member

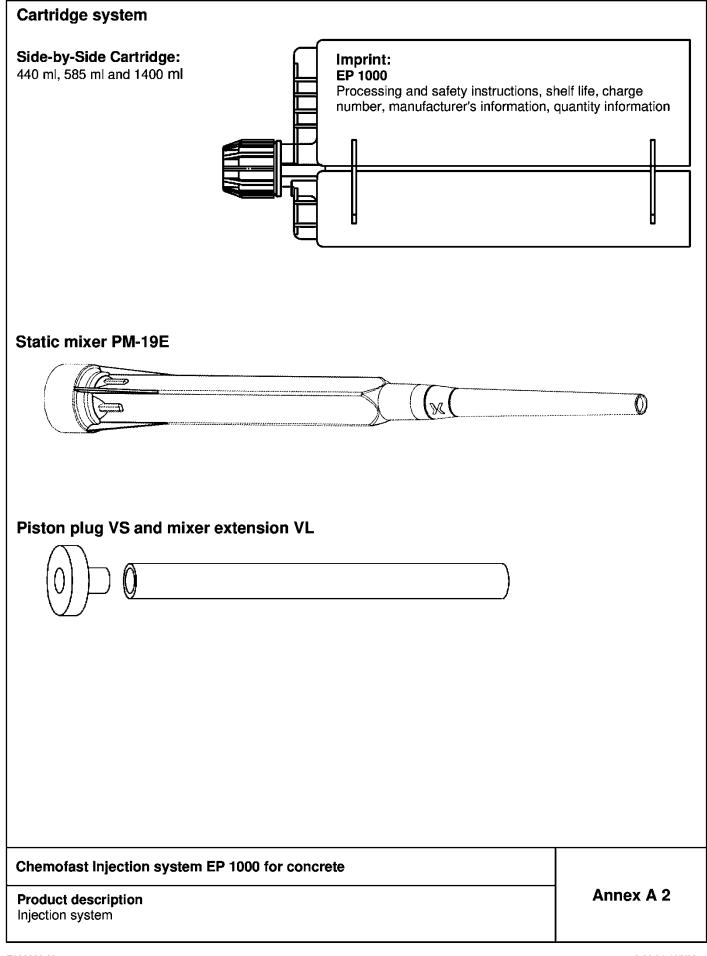
Chemofast Injection system EP 1000 for concrete

Product description

Installed condition

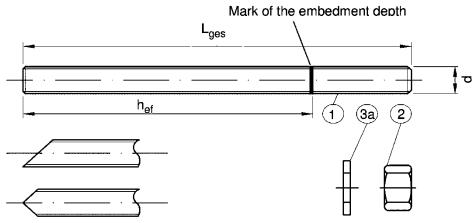
Annex A 1







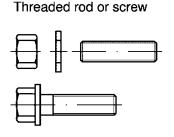
Threaded rod M8 up to M30 with washer and hexagon nut

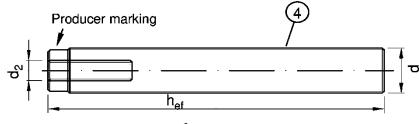


Commercial standard rod with:

- 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

Internal threaded rod IG-M6 to IG-M20





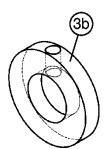
Marking Internal thread

Mark

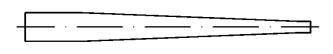
M8 Thread size (Internal thread)
A4 additional mark for stainless steel

HCR additional mark for high-corrosion resistance steel

Filling washer VFS



Mixer reduction nozzle MR



Chemofast Injection system EP 1000 for concrete

Product description

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

Annex A 3



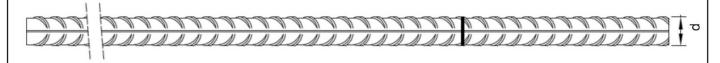
	t Designation	Material										
		acc. to EN ISO 683-4:2										
		5 μm acc. to EN ISO		2:2022 or 1:2022 and EN ISO 10684:	0004 - A C+0000 or							
		15 μm acc. to EN ISO			2004+AC.2009 0f							
	Ticiaidized	1	1700	Characteristic steel	Characteristic steel	Elongation at						
		Property class		ultimate tensile strength	yield strength	fracture						
			4.6	f _{uk} = 400 N/mm ²	f _{vk} = 240 N/mm ²	A ₅ > 8%						
	Threaded rod			f _{uk} = 400 N/mm ²	f _{yk} = 320 N/mm ²	A ₅ > 8%						
	Tilleaded Tod	acc. to		f _{uk} = 500 N/mm ²	f _{vk} = 300 N/mm ²	A ₅ > 8%						
		EN ISO 898-1:2013		f _{uk} = 500 N/mm ²	f _{vk} = 400 N/mm ²	A ₅ > 8%						
				f _{uk} = 800 N/mm²	f _{vk} = 640 N/mm ²	$A_5 \ge 12\%^{3}$						
_			4	for anchor rod class 4.6 or	r 4.8							
2	Hexagon nut acc. to		5		for anchor rod class 5.6 or 5.8							
		EN ISO 898-2:2022	8	for anchor rod class 8.8								
a Ba	Washer			galvanised or sherardized								
		+ · · ·		N ISO 7089:2000, EN ISO	7093:2000 or EN ISO 7	094:2000)						
3b	Filling washer	Steel, zinc plated, ho	it-dip	galvanised or sherardized		let it is						
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture						
	Internal threaded	4-	5.8	f _{uk} = 500 N/mm ²	f _{vk} = 400 N/mm ²	A ₅ > 8%						
	anchor rod	acc. to EN ISO 898-1:2013			f _{vk} = 640 N/mm ²	A ₅ > 8%						
to:	inless steel A2 /Mate			1 / 1.4567 or 1.4541, acc. to	7.	1,15,200						
				1 / 1.4367 of 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to								
				r 1.4565, acc. to EN 10088								
		Property class		Characteristic steel	Characteristic steel	Elongation at						
		Troperty class		ultimate tensile strength	yield strength	fracture						
	Threaded rod ¹⁾⁴⁾		50	f _{uk} = 500 N/mm²	f _{yk} = 210 N/mm ²	A ₅ ≥ 8%						
		acc. to EN ISO 3506-1:2020	70	f _{uk} = 700 N/mm²	f _{yk} = 450 N/mm ²	$A_5 \ge 12\%^{3)}$						
			80	f _{uk} = 800 N/mm ²	f _{yk} = 600 N/mm ²	$A_5 \ge 12\%^{3)}$						
		+		for anchor rod class 50	·							
		to	50									
	Hexagon nut ¹⁾⁴⁾	acc. to	70	for anchor rod class 70								
	Hexagon nut ¹⁾⁴⁾	EN ISO 3506-1:2020	70 80	for anchor rod class 70 for anchor rod class 80								
?	Hexagon nut ¹⁾⁴⁾	EN ISO 3506-1:2020 A2: Material 1.4301 /	70 80 71.43	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4								
		EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 /	70 80 71.43 71.44	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4	578, acc. to EN 10088-1							
	Hexagon nut ¹⁾⁴⁾ Washer	EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529	70 80 / 1.43 / 1.44 9 or 1	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1	578, acc. to EN 10088-1 : 2014	:2014						
Ba	Washer	A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452! (e.g.: EN ISO 887:20	70 80 / 1.43 / 1.44 9 or 1 006, E	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO	578, acc. to EN 10088-1 : 2014	:2014						
Ba		A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452! (e.g.: EN ISO 887:20 Stainless steel A4, H	70 80 / 1.43 / 1.44 9 or 1 006, E	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO orrosion resistance steel	578, acc. to EN 10088-1 : 2014 : 7093:2000 or EN ISO 7	:2014						
2 Ba	Washer Filling washer	A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452! (e.g.: EN ISO 887:20	70 80 / 1.43 / 1.44 9 or 1 006, E	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO	578, acc. to EN 10088-1 : 2014	:2014						
Ba	Washer Filling washer Internal threaded	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 Property class	70 80 / 1.43 / 1.44 9 or 1 006, E	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO orrosion resistance steel Characteristic steel	578, acc. to EN 10088-1 : 2014 : 7093:2000 or EN ISO 7 Characteristic steel	:2014 094:2000) Elongation at						
a b	Washer Filling washer	A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452! (e.g.: EN ISO 887:20 Stainless steel A4, H	70 80 / 1.43 / 1.44 9 or 1 006, E ligh c	for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO orrosion resistance steel Characteristic steel ultimate tensile strength	578, acc. to EN 10088-1 : 2014 : 7093:2000 or EN ISO 7 Characteristic steel yield strength	:2014 094:2000) Elongation at fracture						

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



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

Designation	Material
ar	
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/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$
	Reinforcing steel according to

Chemofast Injection system EP 1000 for concrete

Product description
Materials reinforcing bar

Annex A 5



Specification of the intend				
Fasteners subject to (Static	and quasi-static loa Working life	<u> </u>	Workina li	ife 100 years
Base material	uncracked concrete	cracked concrete	uncracked concre	
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to M Ø8 to Ø IG-M6 to I	3 32,	Ø81	to M30, to Ø32, 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	No performance assessed	M8 to M30, Ø8 to Ø40, IG-M6 to IG-M20	No performance assessed
Temperature Range:	II: - 40 C 1	+40 C ¹⁾ to +72 C ²⁾ to +80 C ³⁾	I: - 40 C II: - 40 C III: - 40 C	to +72 C ²⁾
Fasteners subject to (seismi	c action):			
	Performance C	Category C1	Performanc	e Category C2
Base material	Cracked and uncr	acked concrete	Cracked and ur	ncracked concrete
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to M ⊘8 to 9	= -	M12	to M30
DD: Diamond drilling	No performano	e assessed	No performa	ance assessed
Temperature Range:	II: -40 C t	to +40 C ¹⁾ to +72 C ²⁾ to +80 C ³⁾	l: - 40 C II: - 40 C III: - 40 C	to +72 C ²⁾
Fasteners subject to (fire exp	oosure):			
Base material		Cracked and unc	cracked concrete	
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling		M8 to Ø8 to IG-M6 to	Ø32,	
DD: Diamond drilling		No performar	nce assessed	
Temperature Range:		I: - 40 C II: - 40 C III: - 40 C	to +72 C ²⁾	
1) (max. long-term temperature +24°(2) (max. long-term temperature +50°(3) (max. long-term temperature +60°6	C and max. short-term ter	mperature +72°C)		
Chemofast Injection system E	P 1000 for concrete			
Intended use Specifications				Annex B 1
			<u> </u>	



Base materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+A2:2020 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
- 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



Table B1:	Installation pa	arameters	for thre	eaded	rod						
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Diameter of element	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 embedmer	at donth	h _{ef,min}	[mm]	60	60	70	80	90	96	108	120
Effective embedmer	п аерт	h _{ef,max}	[mm]	160	200	240	320	400	480	540	600
Diameter of clearance hole in	Prepositioned ins		[mm]	9	12	14	18	22	26	30	33
the fixture	Push through i		[mm]	12	14	16	20	24	30	33	40
Maximum installatio	n torque	max T _{inst}	[Nm]	10	20	401)	60	100	170	250	300
Minimum thickness	of member	h _{min}	[mm]	_	_f + 30 m : 100 mr			ŀ	n _{ef} + 2do)	
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 1	(10 ¹)	Ø 1	12 ¹⁾	Ø 14	Ø 16	Ø 20	Ø2	24 ¹⁾	Ø	25 ¹⁾	Ø 28	Ø 32	Ø 36	Ø 40
Diameter of element	d = d _{nom}	[mm]		8	1	0	1	2	14	16	20	2	4	2	25	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	1(00	112	128	144	160
depth	h _{ef,max}	[mm]		60	20		24	10	280	320	400	48	30	50	00	560	640	720	800
Minimum thickness of member	h _{min}	[mm]	h	ef ⁺ 10	1 06 m 0		≥					h	ef +	2d	0				
Minimum spacing	s _{min}	[mm]	4	0	5	0	6	0	70	75	95	12	20	1:	20	130	150	180	200
Minimum edge distance	c _{min}	[mm]	3	5	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	[mm]	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}	[mm]	200	240	320	400	480	600
Diameter of clearance hole in the fixture	d _f ≤	[mm]	7	9	12	14	18	22
Maximum installation torque	max T _{inst}	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	l _{IG}	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h _{min}	[mm]	•	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
1) 14001	*			•		**	•	•

1) With metric threads

Chemofast Injection system EP 1000 for concrete

Intended use

Installation parameters

Annex B 3



				pmann	Hickory				
Threaded Rod	Re- inforcing	Internal threaded	d ₀ Drill bit - Ø HD,	d _b Brush - Ø	d _{b,min} min.	Piston plug	The second second of the second secon	on direction piston plu	
[mama]	bar	anchor rod	DD HDB, CD		Brush - Ø			→	1
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]				
M8	8 / 10	IC MC	10	RB10 11,5	10,5	-			
M10		IG-M6	12	RB12 13,5	12,5	+	No plug	required	
M12	10 / 12	IG-M8	14	RB14 15,5	14,5	-	,	120	
-	12	-	16	RB16 17,5	16,5	1/0/2			
M16	14	IG-M10	18	RB18 20,0	18,5	VS18	-		
-	16	:-	20	RB20 22,0	20,5	VS20	1		
M20	-	IG-M12	22	RB22 24,0	22,5	VS22	1	h _{ef} >	
-	20	1=	25	RB25 27,0	25,5	VS25	h _{ef} >		
M24	:=	IG-M16	28	RB28 30,0	28,5	VS28		I I	all
M27	24 / 25	72	30	RB30 31,8	30,5	VS30	250 mm	250 mm	
:=:	24 / 25	1-	32	RB32 34,0	32,5	VS32			
M30	28	IG-M20	35	RB35 37,0	35,5	VS35	1		
-	32	-	40	RB40 43,5	40,5	VS40	1		
-	36	-	45	RB45 47,0	45,5	VS45			
=		_	52 -	RB52 54,0	52,5	VS52	all	all	all
	40					V. 7.7/			
01 0 10	•	allation to	- 55 55	RB55 58,5	55,5	VS55 VS55	_ all	all	all
HDB – Ho	ollow drill bit			RB55 58,5		VS55 Il system c and a class sure of 253 's).	onsists of He s M hoover v	eller Duster E	Expert um
Compress (min 6 bar) Brush RB	sed air tool	system	ols	RB55 58,5	55,5 The hollow dril hollow drill bit a negative press 150 m³/h (42 l/	VS55 Il system cand a classure of 253(s).	onsists of He s M hoover v hPa and a f	eller Duster E	Expert um



Table B5:	Worki	ng and curing	time	
Tempera	ture in bas	se material	Maximum working time	Minimum curing time ¹⁾
	Т		t _{work}	t _{cure}
+ 0 °C	to	+ 4°C	90 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
Cartr	idge tempe	erature	+5°C to	+40°C

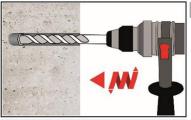
The minimum curing time is only valid for dry base material.
 In wet base material the curing time must be doubled.

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



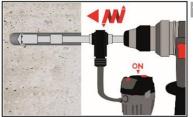
Installation instructions

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.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.

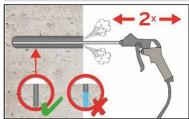
The hollow drilling system removes the dust and cleans the bore hole.

Proceed with Step 3.

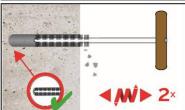
Attention! Standing water in the bore hole must be removed before cleaning.

Compressed Air Cleaning (CAC):

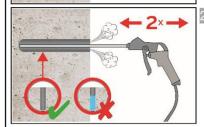
All diameter in cracked and uncracked concrete



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.)

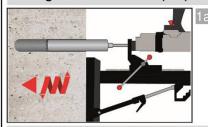
Cleaned bore hole has to be protected against re-contamination in an appropriate way, If necessary, repeat cleaning process directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

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

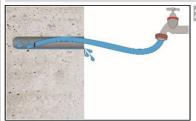
Drill bit diameter according to Table B1, B2 or B3.

Aborted drill holes shall be filled with mortar.

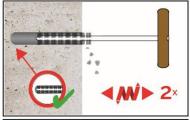
Proceed with Step 2.

Flush & Compressed Air Cleaning (SPCAC):

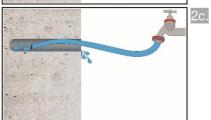
All diameter in uncracked concrete



2a. Flushing with water until clear water comes out.

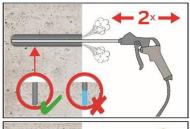


Brush the bore hole minimum 2x with brush RB according to Table B4 over the entire embedment depth in a twisting motion. (If necessary, a brush extension RBL shall be used.)

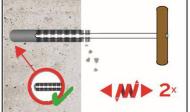


Flushing again with water until clear water comes out.

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



2d. 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

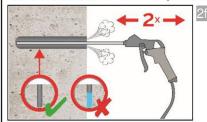
Intended use

Installation instructions (continuation)

Annex B 7

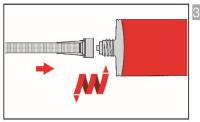


Installation instructions (continuation)



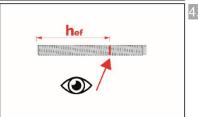
Finally blow the bore hole clean minimum 2x with compressed air (min. 6 bar, oil-free) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

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.



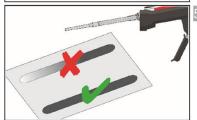
Screw on static-mixing nozzle PM-19E and load the cartridge into an appropriate dispensing tool.

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.



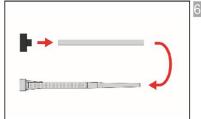
Mark embedment depth on the anchor rod.

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 $d_0 \ge 18$ mm and embedment depth $h_{ef} > 250$ mm
- Vertical upwards direction: Drill bit-Ø d₀ ≥ 18 mm

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



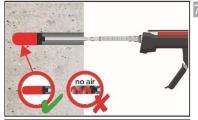
Injecting mortar without piston plug VS:

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



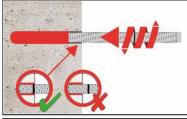
Installation instructions (continuation)



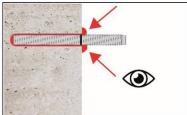


Starting at bottom of the hole and fill the hole up to approximately two-thirds with adhesive. (If necessary, a mixer nozzle extension shall be used.) During injection the piston plug is pushed out of the bore hole by the back pressure of the mortar.

Observe the temperature related working time twork (Annex B 5).



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

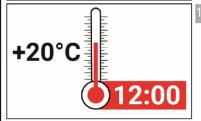


Annular gap between anchor rod and base material must be completely filled with mortar. In case of push through installation the annular gap in the fixture must be filled with mortar also.

Otherwise, the installation must be repeated starting from step 7 before the maximum working time $t_{\rm work}$ 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



T	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	As	[mm²]	36,6	58	84,3	157	245	353	459	561
Cł	naracteristic tension resistance, Steel failu	re 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)
⊢	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	5			
\vdash	ainless steel A2, A4 and HCR, class 50	γ _{Ms,N}	[-]				2,8				
St	ainless steel A2, A4 and HCR, class 70	γ _{Ms,N}	[-]	1,87							
	ainless steel A4 and HCR, class 80	γ _{Ms,N}	[-]				1,6	3			
Cr	naracteristic shear resistance, Steel failure	, 1)	·	1	1					i	í
۱E	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	Steel, Property class 8.8	V ⁰ Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
Ĭ	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
	Steel, Property class 8.8	M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
h lever	Stainless steel A2, A4 and HCR, class 50	M ⁰ _{Rk,s}	[Nm]	19	37	66	167	325	561	832	1125
¥	Stainless steel A2, A4 and HCR, class 70	М 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)
Cr	naracteristic shear resistance, Partial facto										
St	eel, Property class 4.6 and 5.6	γ _{Ms,V}	[-]	1,67							
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,V}	[-]	1,25							
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,V}	[-]	2,38							
Sta	ainless steel A2, A4 and HCR, class 70	γ _{Ms,V}	[-]	1,56							
Sta	ainless steel A4 and HCR, class 80	γ _{Ms,V}	[-]				1,3	3			
- 41	Name of the Control o										

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



Threac	led rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel f	ailure											
Charac	teristic tension res	sistance	N _{Rk,s}	[kN]				_{ık} (or s		le C1)		
Partial			γMs,N	[-]				see Ta	ıble C1			
	ned pull-out and			20/25 : 1			(1.15)					
Charac (CD)	teristic bond resis	tance in uncracke	d concrete C	20/25 in hamn	ner dril	led hol	es (HD	and c	ompres	ssed all	drilled	holes
	I: 24°C/40°C	Dry, wet			20	20	19	19	18	17	16	16
Temperature range	II: 50°C/72°C	concrete and flooded bore	τ _{Rk,ucr}	[N/mm²]	15	15	15	14	13	13	12	12
	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 C	20/25 in hamr	ner dril	led hol	es with	hollow	drill bi	t (HDB)		
ge	I: 24°C/40°C	D			17	16	16	16	15	14	14	13
ran	II: 50°C/72°C	Dry, wet concrete			14	14	14	13	13	12	12	11
nre	III:60°C/80°C		_	[N]/mama21	6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
erati	I: 24°C/40°C	10 m m m	^τ Rk,ucr	[N/mm²]	16	16	16	15	15	14	14	13
Temperature range	II: 50°C/72°C	flooded bore hole			14	14	14	13	13	12	12	11
Te	III:60°C/80°C	Tiole			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
	teristic bond resis hammer drilled ho			/25 in hamme	r drilled	holes	(HD) ,	compre	essed a	air drille	d holes	s (CD)
<u>re</u>	I: 24°C/40°C	Dry, wet	^τ 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 and flooded bore		[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Tem	III:60°C/80°C	hole			5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
	tion factor ψ^0_{sus} in CD) and in hamme				hamme	er drille	d holes	(HD),	compre	essed a	ir drille	ed
<u> </u>	I: 24°C/40°C		Thollow arm	bit (FIDB)	0,80							
Temperatu range	II: 50°C/72°C	Dry, wet concrete and flooded bore	Ψ ⁰ sus	[-]	0,68							
Temp	III:60°C/80°C	hole			0,70							
Increas	sing factors for cor	ıcrete	Ψ _C	[-]	(f _{ck} / 20) ^{0,1}							
	teristic bond resis		τ _{Rk,ucr} =				Ψc	• τ _{Rk,u}	cr,(C20/	(25)		
on the	concrete strength	class	τ _{Rk,cr} =		Ψc • τRk,cr,(C20/25)							
	ete cone failure							_				
	nt parameter							see Ta	ible C2			
Splittir Releva	nt parameter							see Ta	ble C2			
	ation factor							300 10	.5.5 02			
for dry	and wet concrete	(HD; HDB, CD)	٠, .	r.1				1	,0			
for floo	ded bore hole (HD	; HDB, CD)	γinst	[-]				1	,2			
Chen	nofast Injection	system EP 100	0 for conc	rete								
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (threaded rod)					1	Anne	x C 3	1				



Tabl		racteristic val			s und	der st	atic a	and q	uasi-	static	actio	on
Thread	ded rod				М8	M10	M12	M16	M20	M24	M27	M30
Steel f	ailure			_								
Charac	teristic tension res	istance	N _{Rk,s}	[kN]			A _s · f	_{uk} (or s	ee Tab	le C1)		
Partial	factor		γ _{Ms,N}	[-]				see Ta	able C1			
	ned pull-out and											
Charac (CD)	teristic bond resist	ance in uncracked	d concrete C20)/25 in hamr	ner dril	led hol	es (HD) and c	ompres	ssed ai	r drilled	l holes
ature e	I: 24°C/40°C	Dry, wet			20	20	19	19	18	17	16	16
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,ucr,100	[N/mm ²]	15	15	15	14	13	13	12	12
<u> </u>	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 resist	ance in uncracked	d concrete C20)/25 in hamr	ner dril	led hol	es with	hollow	drill bi	(HDB)	
eg	I: 24°C/40°C	Dmat			17	16	16	16	15	14	14	13
lan(II: 50°C/72°C	Dry, wet concrete			14	14	14	13	13	12	12	11
l e	III:60°C/80°C		_	[N] /ma ma 21	6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
erat	I: 24°C/40°C		^τ Rk,ucr,100	[N/mm²]	16	16	16	15	15	14	14	13
Temperaturerange	II: 50°C/72°C	flooded bore hole			14	14	14	13	13	12	12	11
₽	III:60°C/80°C	11016			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5
	teristic bond resist hammer drilled hol			5 in hamme	r drilled	holes	(HD) ,	compre	essed a	ir drille	d hole:	s (CD)
<u>e</u>	I: 24°C/40°C	Dry, wet concrete and flooded bore	^τ Rk,cr,100 [N	[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	III:60°C/80°C	hole			5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5
I	tion factor ψ ⁰ sus,10	-			in har	nmer d	rilled h	oles (H	D), cor	npress	ed air d	drilled
—	CD) and in hamme	er arilled noles with	nollow arill bi	T (HDB)								
Temperature range	I: 24°C/40°C	Dry, wet concrete and	0	.,	0,80							
mpe ran	II: 50°C/72°C	flooded bore hole	Ψ ⁰ sus,100	[-]	0,68							
<u> </u>	III:60°C/80°C				0,70							
Increas	sing factors for con	crete	Ψ _c	[-]				(t _{ck} / 2	20) 0,1			
	teristic bond resist		^τ Rk,ucr,100 =				Ψ _C •	^τ Rk,ucr	ucr,100,(C20/25)			
	concrete strength	ciass	τ _{Rk,cr,100} =				Ψ _C •	τ _{Rk,cr,}	100,(C2	0/25)		
	ete cone failure Int parameter							see Ta	able C2			
Splittir	•							See 16	ible 02			
	nt parameter							see Ta	ble C2			
	ation factor											
	and wet concrete		γ _{inst}	[-]					,0			
for floo	ded bore hole (HD	; HDB, CD)	1 IIISI	[[]				1	,2			
Chen	nofast Injection	system EP 100	0 for concre	te								
Chara	Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (threaded rod)							Anne	ex C 4	ļ		



	for a	racteristic va a working life						_				
Thread					M8	M10	M12	M16	M20	M24	M27	M30
Steel fa		.:	l NI	FL-N IZ			Λ . f	/or c	oo Tab	lo (C1)		
	teristic tension res	sistance	N _{Rk,s}	[kN]					ee Tab	ie Ci)		
Partial f			γ _{Ms,N}	[-]				see la	able C1			
	ned pull-out and		-1) (DE in all and		III I I	(DD					
	teristic bond resist	tance in uncracke	d concrete C20)/25 in diam	ona arı	llea noi	es (DL)) 				
ture	I: 24°C/40°C	Dry, wet			15	14	14	13	12	12	11	11
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,ucr	[N/mm²]	12	12	11	10	9,5	9,5	9,0	9,0
Ten	III:60°C/80°C hole				5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0
Reducti	ion factor ψ ⁰ sus in	uncracked concre	ete C20/25 in d	liamond drill	ed hole	s (DD)						
ture	I: 24°C/40°C	Dry, wet			0,77							
Temperature range	II: 50°C/72°C	concrete and	Ψ ⁰ sus	[-]	0,72							
Tem	III:60°C/80°C	hole			0,72							
Increas	ing factors for con	ıcrete	Ψ _C	[-]				(f _{ck} / :	20) ^{0,2}			
	teristic bond resist concrete strength		τ _{Rk,ucr} =		Ψc * ^τ Rk,ucr,(C20/25)							
Concre	ete cone failure											
Relevar	nt parameter							see Ta	able C2			
Splittin												
	nt parameter							see Ta	ble C2			
	tion factor											
	and wet concrete ded bore hole (DD		γ _{inst}	[-]		1,2		<u>1</u>	,0	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 50 years (threaded rod)	Annex C 5



	for a	racteristic va a working life										
Thread					M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	anure teristic tension res	viotonoo	N	[kN]			Δ • f	. (or s	ee Tab	(C1) جا		
		sistance	N _{Rk,s}				′'s '		able C1	10 01)		
Partial	ned pull-out and	aanavata failuva	γ _{Ms,N}	[-]				see 1a	able C i			
	teristic bond resist		d concrete C20	3/25 in diam	and dri	lled hal	<u>ος</u> (ΠΓ	1)				
		lance in uncracke	CONCIETE OZ	J/23 III diaini			,	ĺ	40	40		
ਊ "	I: 24°C/40°C	Dry, wet			15	14	14	13	12	12	11	11
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,ucr,100	[N/mm²]	11	11	10	10	9,5	9,0	8,5	8,5
	III:60°C/80°C	hole			5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0
Reduct	ion factor ψ ⁰ sus,10	₀₀ in uncracked co	ncrete C20/25	in diamond	drilled	holes (DD)					
	l: 24°C/40°C	Dry, wet	Ψ ⁰ sus,100		0,73							
Temperature range	II: 50°C/72°C	concrete and flooded bore		[-]	0,70							
Tem	III:60°C/80°C	hole			0,72							
Increas	sing factors for con	ncrete	Ψ _C	[-]				(f _{ck} /	20) 0,2			
	teristic bond resist		τ _{Rk,ucr,100} =	Ψc * ^τ Rk,ucr,100,(C20/25)								
Concre	ete cone failure											
Relevant parameter						see Table C2						
Splittin												
<u> </u>	nt parameter							see Ta	able C2			
	ation factor	(DD)	1	1								
	and wet concrete ded bore hole (DD	 	γ _{inst}	[-]	1,0							

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	ınd 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, V ⁰ _{Rk,s} [kN]				0,6 ⋅ A _s ⋅ f _{uk} (or see Table C1)							
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 C1)								
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 _{uk}	(or see	Table C	21)		
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]	min(h _{ef} ; 12 · d _{nom}) min(h _{ef} ; 300mm)								
Outside diameter of fastener	d _{nom}	[mm]	8 10 12 16 20 24 27 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: Characteristic values of tension loads under static and quasi-static action for a working life of 50 years											
Internal threa	ded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure1)											
Characteristic	tension resistanc	e, <u>5.8</u>	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	3 and 8.8	γMs,N	[-]			1	,5			
	Characteristic tension resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾			[kN]	14	26	41	59	110	124	
Partial factor	TOTI, OHONGHI OK	200 7 0	γMs,N	[-]			1,87			2,86	
Combined pu	II-out and conci	ete cone failui									
•	bond resistance			20/25 in h	ammer dr	illed holes	(HD) and	compres	sed air dril	led hole:	
_	I: 24°C/40°C	Dry, wet			20	19	19	18	17	16	
Temperature	II: 50°C/72°C	concrete and flooded bore	^τ Rk,ucr	[N/mm ²]	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	l	ncrete C	20/25 in h		-				· · ·	
	I: 24°C/40°C				16	16	16	15	14	13	
	II: 50°C/72°C	Dry, wet concrete			14	14	13	13	12	11	
	III:60°C/80°C	Concrete	τ _{Rk,ucr}	[N/mm²]	6,5	6,5	6,0	6,0	5,5	5,5	
range	I: 24°C/40°C	flooded bore	*HK,UCT	[]	16	16	15	15	14	13	
	II: 50°C/72°C	hole			14	14	13	13	12	11	
III:60°C/80°C Characteristic bond resistance in cracked con				(OE :- b	6,5	6,5	6,0	6,0	5,5	5,5	
	r drilled holes wit			/25 in nam	ımer arılle	ea noies (F	ال), comp	ressed air	arillea no	ies (GD)	
and in namine	I: 24°C/40°C	Dry, wet	(11 <i>00)</i>		7,0	8,5	8,5	8,5	8,5	8,5	
Temperature	II: 50°C/72°C	concrete and	^τ Rk,cr	[NI/mama2]	6,0	· ·			· ·		
range	-	flooded bore		[N/mm²]		7,0	7,0	7,0	7,0	7,0	
	III:60°C/80°C	hole			5,0	5,0	4,5	4,5	4,5	4,5	
	tor ψ ⁰ sus in cracl d in hammer drille				?5 in hamr	mer drilled	l holes (HI	D), compre	essed air d	drilled	
_	I: 24°C/40°C	Dry, wet			0,80						
Temperature	II: 50°C/72°C	concrete and flooded bore	Ψ ⁰ sus	[-]	0,68						
range	III:60°C/80°C	hole				0,70					
Increasing fact	tors for concrete	11.070	Ψc	[-]	(f _{ck} / 20) ^{0,1}						
	bond resistance	denending on		τ _{Rk,ucr} =				ıcr,(C20/25)			
the concrete s		depending on		τ _{Rk,cr} =				cr,(C20/25)			
Concrete con	e failure										
Relevant para							see Ta	ble C2			
Splitting failu											
Relevant para							see Ta	ble C2			
Installation fa		1DB (CD)						^			
for dry and wet concrete (HD; HDB, CD) for flooded bore hole (HD; HDB, CD) 7inst [-] 1,0 1,2											
1) Fastenings	(incl. nut and was teristic tension res	her) must comp	y with the	appropriation	te material e internal t	and prope threaded r	erty class o	f the interr	nal threade element.	d rod.	
	strength class 50										
Chemofast	Injection syste	em EP 1000 f	or conci	rete							
	es ic values of tens g life of 50 years				static acti	ion] '	Annex C	8 3	



Table C9:		eristic value			ads und	der stat	ic and	quasi-s	tatic ac	tion	
	ided anchor rod	s			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure1)			-								
Characteristic	tension resistant	e, <u>5.8</u>	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	e, Stainless		FL/N13	1.1	200	44	50	110	104	
Steel A4 and I	HCR, Strength cla	ass 70 ²⁾	N _{Rk,s}	[kN]	14	26	41	59	110	124	
Partial factor			γMs,N	[-]		1,87 2,86					
Combined pu	Ill-out and conci	ete cone failu	re								
Characteristic (CD)	bond resistance		oncrete C20	0/25 in ha	mmer dril	led holes	(HD) and	compress	ed air dril	ied holes	
	I: 24°C/40°C	Dry, wet			20	19	19	18	17	16	
Temperature range	II: 50°C/72°C	concrete and flooded bore	^τ Rk,ucr,100	[N/mm²]	15	15	14	13	13	12	
i idilgo	III:60°C/80°C	hole			6,5	6,5	6,0	6,0	5,5	5,5	
Characteristic	bond resistance	in uncracked c	oncrete C20)/25 in hai	mmer drill	led holes	with hollo	w drill bit	(HDB)		
	I: 24°C/40°C	Dry wot			16	16	16	15	14	13	
	II: 50°C/72°C	Dry, wet concrete			14	14	13	13	12	11	
· '	III:60°C/80°C		τ _{Rk,ucr,100}	[N/mm²]	6,5	6,5	6,0	6,0	5,5	5,5	
range	1: 24°C/40°C	flooded bore	nk,uci, ioo		16	16	15	15	14	13	
	II: 50°C/72°C	hole			14	14	13	13	12	11	
III:60°C/80°C Characteristic bond resistance in cracked con			 	5 in hamn	6,5	6,5	6,0	6,0	5,5 drilled bo	5,5	
	er drilled holes wit			Jiii iiaiiii	ner armed	i iloies (i i	D), compi	esseu an	annea no	ies (OD)	
	I: 24°C/40°C	Dry, wet	T		6,5	7,5	7,5	7,5	7,5	7,5	
Temperature	II: 50°C/72°C	concrete and	^τ Rk,cr,100	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5	
range	III:60°C/80°C	flooded bore hole			5,0	5,0	4,5	4,5	4,5	4,5	
Reduction fac			oracked on	norete C2							
	tor ${\psi^0}_{ extsf{Sus},100}$ in ${}^{\circ}$					anner un	illed Holes	(HD), COI	npresseu	all	
drilled floles (I: 24°C/40°C	Dry, wet	VVILITIONOV	[-]	0,80						
Temperature	II: 50°C/72°C	concrete and									
range	•	flooded bore	Ψ ⁰ sus,100		0,68						
	III:60°C/80°C	hole			0,70						
Increasing fac	tors for concrete		Ψc	[-]			(f _{ck} /	20) ^{0,1}			
Characteristic	bond resistance	depending on	^τ Rk,	ucr,100 =		Ψ	[/] c ^{• τ} Rk,ucı	r,100,(C20/2	25)		
the concrete s	trength class		τ _{RI}	k,cr,100 =		ı	^μ c • ^τ Rk,cr.	,100,(C20/2	5)		
Concrete cor	ne failure								·		
Relevant para	meter						see Ta	able C2			
Splitting failu											
Relevant para							see Ta	able C2			
Installation fa			1								
for dry and wet concrete (HD; HDB, CD) for flooded bore hole (HD; HDB, CD) 7inst [-] 1,0 1,2											
	•	· · · · · ·						,2 • the a instance	- ا ماه ا م	ما سمحا	
	(incl. nut and was									u roa.	
	strength class 50										
	Injection syst		or concre	ete							
	ces tic values of tens g life of 100 year				tatic actic	on		'	Annex (9	



Table C10: Characteristic values of tension loads un for a working life of 50 years	nder static and quasi-static action
---	-------------------------------------

	ioi a wo	iking ine o	oo year.	3						
Internal threa	ded anchor rod	s			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure1)						<u> </u>				
Characteristic	Characteristic tension resistance, 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 and 8.8	γ _{Ms,N}	[-]			1	,5		
STATE OF THE PARTY	tension resistand		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γ _{Ms,N}	[-]			1,87			2,86
Combined pu	Ill-out and conc	rete cone failu								
Characteristic	bond resistance	in uncracked c	oncrete C2	0/25 in dia	mond dri	lled holes	(DD)			
	I: 24°C/40°C	Dry, wet		[N/mm²]	14	14	13	12	12	11
Temperature range	II: 50°C/72°C	concrete and flooded bore hole	^τ Rk,ucr		12	11	10	9,5	9,5	9,0
	III:60°C/80°C				5,5	5,0	4,5	4,5	4,5	4,0
Reduction fact	or ${\psi^0}_{ extsf{SUS}}$ in uncr	acked concrete	C20/25 in	diamond c	Irilled hole	es (DD)				
	I: 24°C/40°C	Dry, wet		[-]	0,77					
Temperature range	II: 50°C/72°C	concrete and flooded bore	Ψ ⁰ sus		0,72					
	III:60°C/80°C	hole			0,72					
Increasing fact	tors for concrete		Ψc	[-]			(f _{ck} /)	20) ^{0,2}		
Characteristic the concrete st	bond resistance trength class	depending on		τ _{Rk,ucr} =				ucr,(C20/25)	
Concrete con	e failure									
Relevant para					see Ta	able C2				
Splitting failure										
Relevant para		see Tal			able C2					
Installation fa										
-	t concrete (DD)		γ _{inst}	[-]	25		1	,0	0	
for flooded bo	re hole (DD)		'inst	[]	1,2 1,4					

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-static action for a working life of 50 years (Internal threaded anchor rod)	Annex C 10

²⁾ For IG-M20 strength class 50 is valid



Table C11:	Characteristic values of tension loads under static and quasi-static action
	for a working life of 100 years

	ioi a wo	iking ine or	100 yea	13						
Internal threa	ded anchor rod	s			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure1)						*				
Characteristic tension resistance, 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 and 8.8	γ _{Ms,N}	[-]			1	,5		
	tension resistand HCR, Strength cl		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γ _{Ms,N}	[-]			1,87			2,86
Combined pu	Ill-out and conc	rete cone failu	re							
Characteristic	bond resistance	in uncracked co	oncrete C20)/25 in dia	mond dri	lled holes	(DD)			
Temperature range	I: 24°C/40°C	Dry, wet	^T Rk,ucr,100	[N/mm²]	14	14	13	12	12	11
	II: 50°C/72°C	concrete and flooded bore hole			11	10	10	9,5	9,0	8,5
1,0000	III:60°C/80°C				5,5	5,0	4,5	4,5	4,5	4,0
Reduction fact	or ψ^0 sus,100 in	uncracked cond	rete C20/2	5 in diamo	nd drilled	l holes (D	D)			
	I: 24°C/40°C	Dry, wet	Ψ ⁰ sus,100	[-]	0,73					
Temperature range	II: 50°C/72°C	concrete and flooded bore			0,70					
	III:60°C/80°C	hole			0,72					
Increasing fact	tors for concrete		Ψс	[-]			(f _{ck} /	20) 0,2		
Characteristic the concrete s	bond resistance trength class	depending on	^τ Rk,	ucr,100 =		Ψ	[/] c ^{• τ} Rk,uc		25)	
Concrete con	ne failure									
Relevant para	meter						see Ta	able C2		
Splitting failu	ire									
Relevant para							see Ta	able C2		
Installation fa										
	et concrete (DD)		γ _{inst}	[-]	1,0					
for flooded bo	re hole (DD)		rinst	1.1	1,2 1,4					

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	Annex C 11
Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (Internal threaded anchor rod)	

²⁾ For IG-M20 strength class 50 is valid



Internal threaded anchor rods				IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20		
Steel failure without lever arm1)											
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	[-]				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 2,3						
Ductility factor		k ₇	[-]				1,0				
Steel failure with lever arm1)											
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 and 8.8 $\gamma_{Ms,V}$						•	1,25	'			

Concrete edge failure										
Effective length of fastener	I _f	[mm]	min(h _{ef} ; 12 · d _{nom}) min(h _{ef} ; 300							
Outside diameter of fastener	d _{nom}	[mm]	10	12	16	20	24	30		
					<u> </u>					

 $M^0_{Rk,s}$

 $\gamma_{Ms,V}$

k₈

 γ_{inst}

γinst

[Nm]

[-]

[-]

[-]

11

26

52

1,56

92

2,0

1,0

1,0

233

456

2,38

Characteristic bending moment,

Stainless Steel A4 and HCR,

Concrete pry-out failure

Strength class 7023

Installation factor

Installation factor

Partial factor

Factor

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

²⁾ For IG-M20 strength class 50 is valid



	C13: Characteristic values of tension loads under static and quasi-static action for a working life of 50 years													
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 tension 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	γ _{Ms,N}	[-]						1,	4 2)					
Combined pull-out and conci	ete failure													
Characteristic bond resistance	in uncracked	d concret	te C20	/25 in	hamm	er (H	D) and	comp	resse	d air d	rilled h	noles ((CD)	
U: 24°C/40°C Dry, wet concrete and flooded bore hole			16	16	16	16	16	16	15	15	15	15	15	15
ਲੂੰ ਛੂੰ II: 50°C/72°C and	τ _{Rk,ucr}	[N/mm²]	12	12	12	12	12	12	12	12	11	11	11	11
III:60°C/80°C flooded bore hole			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 resistance	in uncracked	concret	te C20	/25 in	hamm	er dri	led ho	les wi	th holl	ow dril	l bit (F	HDB)	•	
I: 24°C/40°C			14	14	13	13	13	13	13	13	13	13		
II: 50°C/72°C Dry, wet			12	12	12	11	11	11	11	11	11	11]	
[호 왕 III: 60°C/80°C		 [N/mm²]	5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0] ,	3)
1: 24°C/40°C flooded	[⊤] Rk,ucr	[[14/111111-]	13	13	13	13	13	13	13	13	13	13] `	"
II: 50°C/72°C bore hole			11	11	11	11	11	11	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		
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (CD)														
and in hammer drilled holes wit	h hollow dril	bit (HDI	B)					ī	1			ī	1	
i: 24°C/40°C Dry, wet concrete and flooded bore hole			7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5		
li: 50°C/72°C and flooded	^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 bore hole			4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5		
Reduction factor ψ^0_{SUS} in cracinoles (CD) and in hammer drille						hamm	ner dril	led ho	les (H	D), co	mpres	sed ai	ir drille	d
E I: 24°C/40°C Dry, wet				,	,			0,	80					
by b	Ψ ⁰ sus	[-]						0,	68					
III:60°C/80°C bore hole								0,	70					
Increasing factors for concrete	Ψς	[-]						(f _{ck} / 2	20) ^{0,1}					
Characteristic bond resistance		Rk,ucr =						• τ _{Rk,υ}						
depending on the concrete strength class		τ _{Rk,cr} =						• TRk,						
Concrete cone failure		TIN,OI	Į.				- ' '	1 111,1	51,(020	,20)				
Relevant parameter								see Ta	ble C	2				
Splitting			I				•	JOO 16		_				
Relevant parameter								see Ta	ble C	2				
Installation factor (HD; HDB,	CD)		•											
for dry and wet concrete		r 1					1	,0					1	,2
for flooded bore hole	γinst	[-]	1,2									3	3)	
f_{uk} shall be taken from the sp	1) f _{uk} shall be taken from the specifications of reinforcing bars													
2) in absence of national regula	tion													
3) no performance assessed														
Chemofast Injection syst	em EP 100	0 for co	oncre	te										
Performances Characteristic values of tens for a working life of 50 years			tic and	d quas	si-stat	c acti	on				Ar	nex	C 13	3



I .		eristic val				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 tension 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	1256		
Partial factor		γ _{Ms,N}	[-]						1,	4 2)					
Combined pull-out and	concre	ete failure													
Characteristic bond resis	tance i	n uncracked	concret	e C20	/25 in	hamm	ner (HI	D) and	comp	resse	d air d	rilled h	noles (CD)	
⊕ I: 24°C/40°C Dry, 1	wet			16	16	16	16	16	16	15	15	15	15	15	15
Bits and		τ _{Rk,ucr,100}	[N/mm²]	12	12	12	12	12	12	12	12	11	11	11	11
III:60°C/80°C bore				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 resis		n uncracked	concret	e C20	/25 in	hamm	ı—— ıer dril	led ho	les wi	th holl	ow dril	ll bit (F	l IDB)		
I: 24°C/40°C				14	14	13	13	13	13	13	13	13	13		
Φ II. 50°C/72°C Dry, 1				12	12	12	11	11	11	11	11	11	11		
E & : 60°C/80°C conc	rete			5.5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	١ .	
호 현 III: 60°C/80°C COIIC		τRk,ucr,100	[N/mm²]	13	13	13	13	13	13	13	13	13	13	3	3)
=				11	11	11	11	11	11	11	11	11	11		
	hole			5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0		
	tance i	in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled ho									holes	CD)			
and in hammer drilled holes with hollow drill bit (HDB)															
E 24°C/40°C Dry, concident of the state of t	wet rete			6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5		
II: 50°C/72°C and		^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	3)
III:60°C/80°C flood				4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5		
Reduction factor ψ^0_{sus} , drilled holes (CD) and in	hamme							amme	r drille	d hole	s (HD), com	press	ed air	
B I: 24°C/40°C Dry, 1	wet								0,	80					
E 24°C/40°C Dry, conc.	rete	Ψ ⁰ sus,100	[-]						0,	68					
III:60°C/80°C flood	ed hole								0,	70					
Increasing factors for cor		Ψc	[-]						(f _{ck} / 2	20) ^{0,1}					
Characteristic bond resis		τ _{Rk II}	cr,100 =						Rk,ucr						
depending on the concrestrength class	ete		cr,100 =						τ _{Rk,cr,}						
Concrete cone failure		1	-,-==						, ,	, () .					
Relevant parameter									see Ta	ble C	2				
Splitting				I .											
Relevant parameter								,	see Ta	ble C	2				
Installation factor (HD;	HDB. 0	CD)		1											
for dry and wet concrete	, -							1	.0					1	,2
for flooded bore hole		γinst	[-]	1,0										; <u></u> ;)	
1) f _{uk} shall be taken from	the sp	ecifications o	of reinforce	ing ba	rs			•	, –						
2) in absence of national				J											
3) no performance asses															
Chemofast Injection	syste	em EP 100	0 for co	oncre	te										
Performances Characteristic values of tension loads under station for a working life of 100 years (reinforcing bar)				tic and	d quas	si-stat	c acti	on				Ar	nex	C 14	ļ



Table C15:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic	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]		$A_s \cdot f_{uk}^{1)}$										
Cross section area	l	A _s	[mm²]	50 79 113 154 201 314 452 491 616 804 1018 1256									1256		
Partial factor		γ _{Ms,N}	[-]						1,	4 2)					
Combined pull-ou	it and concre	ete failure		•											
Characteristic bond	d resistance i	n uncracked	d concret	e C20	/25 in	diamo	nd dri	lled ho	oles (C	D)					
<u>®</u> I: 24°C/40°C				14	13	13	13	12	12	11	11	11	11	11	10
E 24°C/40°C III: 50°C/72°C III: 60°C/80°C	and	τRk,ucr	[N/mm²]	11	11	10	10	10	9,5	9,5	9,5	9,0	9,0	8,5	8,5
च्चि III:60°C/80°C	1.100000			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 ψ	0 _{sus} in uncra	cked concr	ete C20/	25 in c	diamor	nd drill	ed ho	es (Di	D)						
발 I: 24°C/40°C	Dry, wet								0,	77					
E 24°C/40°C II: 50°C/72°C II: 60°C/80°C		$\Psi^0_{\sf sus}$	[-]	0,72											
트 III:60°C/80°C					0,72										
Increasing factors	for concrete	Ψc	[-]						(f _{ck} / 2	20) ^{0,2}	2				
Characteristic bond depending on the d strength class		τ	Rk,ucr =												
Concrete cone fai	ilure														
Relevant paramete	er							5	see Ta	ıble C	2				
Splitting															
Relevant paramete								5	see Ta	ıble C	2				
Installation factor	• •		T												
for dry and wet cor		γ _{inst}	[-]						,0						,2
for flooded bore ho	le	.0191	.,	1,2 1,4] 3	3)		

¹⁾ \mathbf{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-sta	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]	$A_s \cdot f_{uk}^{1)}$											
Cross section area		A _s	[mm²]	50	79	113	154	201	314		491	616	804	1018	1256
Partial factor		γ _{Ms,N}	[-]	[-] 1,4 ²)											
Combined pull-ou	it and concre	ete failure													
Characteristic bond	d resistance i	n uncracked	d concret	e C20	/25 in	diamo	nd dri	lled ho	oles (C	D)					
일 I: 24°C/40°C				14	13	13	13	12	12	11	11	11	11	11	10
= I: 24°C/40°C = an berature = II: 50°C/72°C III: 60°C/80°C	and flooded	τRk,ucr,100	[N/mm²]	11	10	10	10	9,5	9,0	9,0	9,0	8,5	8,5	8,0	8,0
च्चि III:60°C/80°C	0°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 ψ	⁰ sus,100 ^{in u}	ıncracked c	oncrete (220/2	5 in dia	amono	drille	d holes	s (DD)						
발 I: 24°C/40°C				0,73											
= I: 24°C/40°C = an bear = II: 50°C/72°C III: 60°C/80°C		Ψ ⁰ sus,100	[-]						0,	70					
III:60°C/80°C	flooded bore hole								0,	72					
Increasing factors	for concrete	Ψc	[-]						(f _{ck} / 2	20) ^{0,2}					
Characteristic bond depending on the castrength class		^τ Rk,u	cr,100 =	yc * ^τ Rk,ucr,100,(C20/25)											
Concrete cone fai	Concrete cone failure														
Relevant parameter						see Table C2									
Splitting															
Relevant paramete								5	see Ta	ıble C	2				
Installation factor	• •														
for dry and wet cor		 γinst	[-]					1	,0						,2
for flooded bore ho	le	7inst [-]				,2				1	,4				3)

¹⁾ \mathbf{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						unc	der s	tatio	and	quas	si-sta	tic a	ction	for
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 · f	: 1) uk				
Cross section area	A _s	[mm²]	50 79 113 154 201 314 452 491 616 804 1018 13						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	•	1												
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 C20:	Displacements under tension load1) in hammer drilled holes (HD), comp. air
	drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Threaded rod			М8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete under static and quasi-static action for a working life of 50 and 100 years										
Temperature range I: 24°C/40°C	δ_{N0} -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
Temperature range II: 50°C/72°C	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Temperature range III: 60°C/80°C	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Cracked concrete under static and quasi-static action for a working life of 50 and 100 years										
Temperature range I: 24°C/40°C	δ_{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171
Temperature range II: 50°C/72°C	δ_{N0} -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229
Temperature range III: 60°C/80°C	$\delta_{\rm N0}$ -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
	$\delta_{N\infty}$ -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

Table C18: Displacements under tension load¹⁾ in diamond drilled holes (DD)

Threaded rod				M10	M12	M16	M20	M24	M27	M30
Uncracked concrete under static and quasi-static action for a working life of 50 years										
Temperature range I: 24°C/40°C	δ_{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025
Temperature range II: 50°C/72°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
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 under static and quasi-static action for a working life of 100 years										
Temperature range I: 24°C/40°C	δ_{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027
Temperature range II: 50°C/72°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)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051
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)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051
1) Oats before of the disclosure to the control of										

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

Table C19: Displacements under shear load¹⁾ for all drilling methods

Threaded rod			М8	M10	M12	M16	M20	M24	M27	M30
Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years										
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: 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



Table C21:	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)

diffied flotes (OD) and in flammer diffied flotes with flotiow drift bit (flob)												
Internal threaded ancho	r rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20				
Uncracked concrete und	der static and q	uasi-static actio	n for a wo	rking life o	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 under	static and qua	si-static action	for a work	ing life of 8	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				

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

Internal threaded ancho	r rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Uncracked concrete und	der static and q	uasi-static actio	n for a wo	rking life o	of 50 years	}		
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)]	0,019	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		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/mm ²)]	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	$\delta_{N\infty}$ -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	anchor rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20		
Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years										
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 \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 (Internal threaded anchor rod)

Annex C 19



Table C24:		cements u holes (CD													
Reinforcing bar	,		Ø	3 Ø 1	0 Ø 1	12 9	Ø 14	Ø 16	Ø 2	0 Ø 2	4 Ø 2	5 Ø 28	3 Ø 32	Ø 36	Ø 40
Uncracked con	crete under	static and q	uasi-si	atic ac	ction f	or a	worl	king l	ife of	50 and	l 100 y	ears			
Temp range	δ_{N0} -factor	[mm/(N/mm ²	2)] 0,02	8 0,02	9 0,03	30 C),031	0,033	0,03	35 0,03	8 0,03	8 0,040	0,043	0,045	0,047
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm	2)] 0,02	8 0,02	9 0,03	30 C),031	0,033	0,03	35 0,03	8 0,03	8 0,040	0,043	0,045	0,047
Temp range	δ_{N0} -factor	[mm/(N/mm ²	2)] 0,03	8 0,03	9 0,04	40 C),042	0,044	1 0,04	7 0,05	1 0,05	1 0,054	4 0,058	0,060	0,063
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,04	7 0,04	9 0,05	51 0	0,053	0,055	0,05	9 0,06	5 0,06	5 0,068	3 0,072	0,074	0,079
Temp range	δ_{N0} -factor	[mm/(N/mm ²	2)] 0,03	8 0,03	9 0,04	40 C	0,042	0,044	1 0,04	7 0,05	1 0,05	1 0,054	4 0,058	0,060	0,063
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,04	7 0,04	9 0,05	51 0	0,053	0,055	0,05	9 0,06	5 0,06	5 0,068	3 0,072	0,074	0,079
Cracked concrete under static and quasi-static action for a working life of 50 and 100 years															
Temp range	δ _{N0} -factor	[mm/(N/mm ²	2)] 0,06	9 0,07	1 0,07	72 0	0,073	0,074	1 0,07	6 0,07	9 0,07	9 0,08	1 0,084		
I: 24°C/40°Č	δ _{N∞} -factor	[mm/(N/mm ²	2)] 0,11	5 0,12	2 0,12	28 0),135	0,142	2 0,15	5 0,17	1 0,17	1 0,18	1 0,194	1	
Temp range	δ_{N0} -factor	[mm/(N/mm	2)] 0,09	2 0,09	5 0,09	96 0	0,098	0,099	0,10	0,10	6 0,10	6 0,109	0,113	1.	• • • • • • • • • • • • • • • • • • • •
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm	2)] 0,15	4 0,16	3 0,17	72 0),181	0,189	0,20	7 0,22	9 0,22	9 0,242	2 0,260]	2)
Temp range	δ _{N0} -factor	[mm/(N/mm	2)] 0,09	2 0,09	5 0,09	96 C	0,098	0,099	0,10	2 0,10	6 0,10	6 0,109	0,113		
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm	2)] 0,15	4 0,16	3 0,17	72 0),181	0,189	0,20	7 0,22	9 0,22	9 0,242	2 0,260	1	
1) Calculation of 2) No performan Table C25:	ce assessed	ment: 0N0 =	δηφ-fact inder					tor · τ ι dia ι					tension		
Reinforcing bar	r		Ø	3 Ø 1	0 Ø 1	2 9	Ø 14	Ø 16	Ø 2	0 Ø 2	4 Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Uncracked con	crete under	static and q	uasi-st	atic ac	ction f	or a	worl	king l	ife of	50 yea	rs				
Temp range	δ _{N0} -factor	[mm/(N/mm ²	2)] 0,00	8 0,00	9 0,00	09 (0,01	0,011	0,01	2 0,01	3 0,01	3 0,014	1 0,015	0,016	0,017
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,01	8 0,01	8 0,01	19 0	,020	0,021	0,02	4 0,02	7 0,02	7 0,028	0,031	0,032	0,034
Temp range	δ_{N0} -factor	[mm/(N/mm ²	²)] 0,00	9 0,01	1 0,01	11 0),012	0,013	0,01	4 0,01	5 0,01	5 0,016	0,018	0,019	0,020
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,04	8 0,05	0,05	54 0	0,058	0,061	0,06	8 0,07	6 0,070	6 0,08	0,088	0,090	0,097
Temp range	$\delta_{ m N0}$ -factor	[mm/(N/mm ²	2)] 0,00	9 0,01	1 0,01	11 0),012	0,013	0,01	4 0,01	5 0,01	5 0,016	0,018	0,019	0,020
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	²)] 0,04	8 0,05	0,05	54 0),058	0,061	0,06	8 0,07	6 0,070	6 0,08	0,088	0,090	0,097
Uncracked con															
Temp range	δ_{N0} -factor	[mm/(N/mm ²	²)] 0,00	8 0,00	9 0,00	0 9	0,010	0,011	0,01	2 0,01	3 0,013	3 0,014	1 0,015	0,016	0,017
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	²)] 0,01	8 0,02	0,02	21 0	,022	0,024	0,02	6 0,02	9 0,029	9 0,03	0,034	0,035	0,037
Temp range	δ_{N0} -factor	[mm/(N/mm ²	2)] 0,00	9 0,01	1 0,01	11 0),012	0,013	0,01	4 0,01	5 0,01	5 0,016	0,018	0,019	0,020
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,03	5 0,03	7 0,04	40 O	,042	0,045	0,04	9 0,05	5 0,05	5 0,059	0,064	0,066	0,070
Temp range	δ_{N0} -factor	[mm/(N/mm ²	2)] 0,00	9 0,01	1 0,01	11 0	0,012	0,013	0,01	4 0,01	5 0,01	5 0,016	0,018	0,019	0,020
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²	2)] 0,03	5 0,03	7 0,04	10 0	,042	0,045	0,04	9 0,05	5 0,05	5 0,059	0,064	0,090	0,097
1) Calculation of Table C26:	·	ment: δ _{N0} = cements u						tor · τ	•				tension		
Reinforcing bar											Ø 25		Ø 32	Ø 36	Ø 40
Uncracked and		ncrete unde													× 40
	δ _{V0} -factor				0,05	0,0			0,04	0,03	0,03	0,03	0,03	0,03	0,03
All temperature ranges	$\delta_{V_{\infty}}$ -factor	 			0,05	0,0	_	-	0,04	0,03	0,03	0,03	0,03	0,03	0,03
1) Calculation of	•		0,09 δ _{V0} -facto		,			:,06 :or · V		•	shear k		U,U4	0,04	0,04
Chemofast In	· ·					= 00	/∞-Iaci	.OI · V	, v.	acuon	SHEAF IC	Jau –			
Performances Displacements for a working life	under stati				l								Anne	x C 2	0



Table		cteristic val							on			
Thread	led rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ailure				,							
Characteristic tension resistance N _{Rk,s,eq,C1} [kN] 1,0 • N _{Rk,s}												
Partial t	factor		γ _{Ms,N}	[-]				see Ta	able C1			
Combii	Combined pull-out and concrete failure											
	teristic bond resistar noles (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]	7,0	7,0	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
Tem	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
Increas	ing factors for concr	ete	Ψc	[-]				1	,0			
	teristic bond resistar concrete strength cla		τ	Rk,eq,C1 =			Ψ _C '	΄ ^τ Rk,eq	,C1,(C2	0/25)		
Installa	ntion factor											
	and wet concrete (H	γinst	[-]					,0				
for floor	ded bore hole (HD; H	HDB, CD)	/ inst	[7]	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	Table C28: Characteristic values of tension loads under seismic action (performance category C1) for a working life of 100 years											
Thread	led rod				М8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ailure											
Charac	teristic tension res	istance	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	concrete failure										
	teristic bond resist holes (CD) and in h					hamm	er drill	ed hole	s (HD)	, comp	ressed	air
Inre	I: 24°C/40°C	Dry, wet	τ _{Rk,eq,C1}	[N/mm ²]	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
Tem	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
Increas	sing factors for con	crete	Ψς	[-]				1	,0			
	teristic bond resist concrete strength		τ	Rk,eq,C1 =	Ψc * ^τ Rk,eq,C1,(C20/25)							
Installa	ation factor											
for dry	and wet concrete ((HD; HDB, CD)	γ _{inst}	r_1				1	,0			
for floo	ded bore hole (HD;	[-]				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:		stic values o ce category								rs	
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel failure											
Characteristic shear (Seismic C1)	ar resistance	V _{Rk,s,eq,C1}	[kN]				0,70) • V ⁰ Rk	,s		
Partial factor		γ _{Ms,V}			see	Table C	1				
Factor for annula	r gap	$\alpha_{\sf gap}$	[-]				0,9	5 (1,0) ¹⁾			

	Chemofast Injection system EP 1000 for concrete	
Γ	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⁾ 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.



Table C30:	Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years											
Reinforcing bar		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	

Steel failure												
Characteristic tension resistance $N_{Rk,s,eq,C1}$ [kN] $1,0 \cdot A_s \cdot f_{uk}^{(1)}$												
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor $\gamma_{Ms,N}$ [-] $1,4^{2)}$												

Combined pull-out and concrete failure

Characteristic bond resistance 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)

armea	inited notes (CD) and in naminer differ notes with hollow drift bit (HDB)													
ture	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	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
Ter	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	Increasing factors for concrete			[-]	1,0									
	Characteristic bond resistance depending on the concrete strength class		τ _H	$\tau_{\text{Rk,eq,C1}} = \qquad \qquad \Psi_{\text{C}} \cdot \tau_{\text{Rk,eq,C1,(C20/25)}}$										
Install	ation factor													
for dry CD)	for dry and wet concrete (HD; HDB, CD)		γ _{inst}	γ _{inst} [-] 1,0										
for floo	for flooded bore hole (HD; HDB, CD)]						,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 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

				-		-	-		-					
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	sistance	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	ned pull-out and	concrete failu	re											
	cteristic bond resis holes (CD) and in						in har	nmer d	drilled	holes	(HD), (compre	ssed	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	7,5	7,5
Temperature range	II: 50°C/72°C	concrete and flooded bore hole	^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		^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	Ψς	[-]	1,0									
Characteristic bond resistance depending on the concrete strength class								Ψ _C •	τ _{Rk,ec}	դ,С1,(Cź	20/25)			
Installa	ation factor													
for dry CD)	for dry and wet concrete (HD; HDB, CD)		γ _{inst} [-] 1,0											
for floo	ded bore hole (Hi	D; HDB, CD)							1	,2				
4.5														

 $^{^{1)}\,\}mathrm{f}_{\mathrm{uk}}\,\mathrm{shall}$ 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:	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	·As·	f _{uk} 1)			
Cross section area	1	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ _{Ms,V}	[-]	-] 1,5 ²⁾									
Factor for annula	r gap	$\alpha_{\sf gap}$	[-]	[-] 0,5 (1,0) ³⁾									

 $^{^{1)}\,\}mathrm{f}_{\mathrm{uk}}\,\mathrm{shall}$ 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.



Tabl		characteristic va performance ca							s	
Thread	led rod				M12	M16	M20	M24	M27	M30
Steel fa	ailure									
Steel, s Stainle	eteristic tension strength class t ss Steel A4 an th class ≥70	8.8	N _{Rk,s,eq,C2}	[kN]			1,0 •	N _{Rk,s}		
Partial	factor		γ _{Ms,N}	[-]			see Ta	able C1		
Combi	ned pull-out a	and concrete failure))							
		esistance in cracked d in hammer drilled h				hammer (drilled hol	les (HD), d	compress	ed air
ture	I: 24°C/40°C	Dry, wet	τRk,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
Ten	III:60°C/80°C	hole	τRk,eq,C2	[N/mm²]	1,9	1,6	1,6	1,7	1,5	1,6
Increas	sing factors for	concrete	Ψς	[-]			1	,0	_	
	teristic bond re concrete stren	esistance depending gth class	τ	Rk,eq,C2 =		ч	^γ c ^{• τ} Rk,ed	ղ,C2,(C20/2	5)	
	ation factor									
		ete (HD; HDB, CD)	$\frac{1}{\gamma_{inst}}$	[-]				,0		
for floo	ded bore hole	(HD; HDB, CD)	. 11191	"			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	el, strength class 8.8 nless Steel A4 and HCR, $V_{Rk,s,eq,C2}$ [kN]					V ⁰ _{Rk,s}		
Partial factor $\gamma_{Ms,V}$ [-]					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: Dis	splacements under tension	on load	(thread	ed 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 ranges	$\delta_{N,eq,C2(50\%)} = \delta_{N,eq,C2(DLS)}$	[mm]	0,21	0,24	0,27	0,36	0,92	0,70		
All temperature ranges	$\delta_{N,eq,C2(100\%)} = \delta_{N,eq,C2(ULS)}$	[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 ranges	$\delta_{V,eq,C2(50\%)} = \delta_{V,eq,C2(DLS)}$	[mm]	3,1	3,4	3,5	4,2	4,0	3,8		
	$\delta_{V,eq,C2(100\%)} = \delta_{V,eq,C2(ULS)}$	[mm]	6,0	7,6	7,3	10,9	11,1	11,2		

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

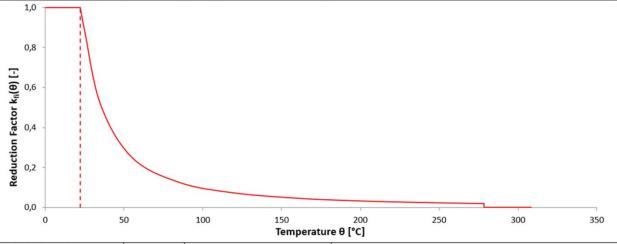


Table C37:	Characteristic values of tension and shear loads under fire exposure in
	hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer
	drilled holes with hollow drill bit (HDB)

Threaded rod						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	N _{Rk,s,fi}	[kN]	Fire - exposure time [min] -	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2
				60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1
				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
	20		θ > 278°C	0,0



				Temperatui	e θ [°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 _{Rk,s,fi}	[kN]	exposure time [min]	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1	
				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					20 0		2 0						
Characteristic bending			Fire	30	1,1	2,2	4,7	12,0	23,4	40,4	59,9	81,0	
moment; Steel, Stainless	NAO	[Nm]	exposure	60	0,9	1,8	3,5	9,0	17,5	30,3	44,9	60,7	
Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher	M ⁰ _{Rk,s,fi}	[[[]]	time [min]	90	0,7	1,3	2,5	6,3	12,3	21,3	31,6	42,7	
				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

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

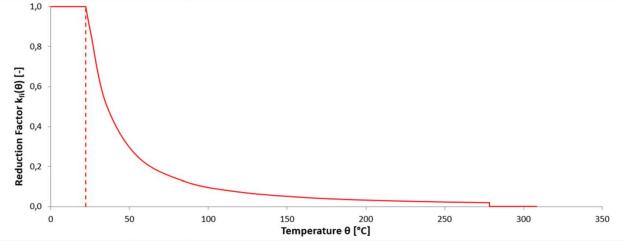


Table C38: Characteristic values of tension and shear loads under fire exposure in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Internal threaded anchor rods						IG-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}	[kN]	exposure time [min]	60	0,2	0,9	1,4	2,3	4,2	6,6	
				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	$150,28 \cdot \theta^{-1,598} \le 1,0$
	2070		θ > 278°C	0,0



	Temperature θ [°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			Fire	30	0,3	1,1	1,7	3,0	5,7	8,8			
registeres Ctast Ctainless	V	[kN]	exposure	60	0,2	0,9	1,4	2,3	4,2	6,6			
otool / r and riort, strongth	V _{Rk,s,fi}	[KIN]	time [min]	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					5								
Characteristic bending			Fire	30	0,2	1,1	2,2	4,7	12,0	23,4			
	N/O	[Nm]	ovnoguro	60	0,2	0,9	1,8	3,5	9,0	17,5			
Steel A4 and HCR, strength class 5.8 and 8.8 resp. 70	M ⁰ _{Rk,s,fi}	[INIII]	time [min]	90	0,1	0,7	1,3	2,5	6,3	12,3			
				120	0,1	0,5	1,0	1,8	4,7	9,1			

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

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



	acteristic ner drille d holes v	d ho	les (HD)	, comp	ress	ed a								mer
Reinforcing bar					Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure														
				30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	16,1
Characteristic tension	N _{Rk,s,fi}	[kN]	Fire exposure	60	0,5	1,0	1,7	2,3	3,0	4,7	6,8	7,4	9,2	12,1
resistance; BSt 500	HK,S,II	[[KIN]	time [min]	90	0,4	0,8	1,5	2,0	2,6	4,1	5,9	6,4	8,0	10,5
0		<u> </u>		120	0,3	0,6	1,1	1,5	2,0	3,1	4,5	4,9	6,2	8,0
Characteristic bond res given temperature θ	istance in o	cracke	ed and unc	racked o	oncre	ete C2	0/25 u	p to C	550/60	unde	er fire	condi	tions	or a
			θ < 2	5°C					1	,0				
Temperature reduction factor	$k_{fi,p}(\theta)$	[-]	25°C ≤ θ	≤ 278°C				176,	37 • θ	-1,598	≤ 1,0			
140101			θ > 27	/8°C	0,0									
Reduction Factor k _{ii} (θ) [-]	50	1	00	150		200		250		3	00		350	
	1		***	Temper	ature θ	re θ [°C]								
Characteristic bond resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$		[N/mm²]		$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,}$					k,cr,(C2	(C20/25) ¹⁾			
Steel failure without lev	er arm					Ī								
			Fire	30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	
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
redistance, bet eee			time [min]	90	0,4	0,8	1,5 1,1	2,0 1,5	2,6	4,1 3,1	5,9 4,5	6,4 4,9	8,0 6,2	10,5 8,0
Steel failure with lever a	ırm			120	0,0	0,0	1,1	1,0	2,0	0,1	4,5	7,5	0,2	0,0
				30	0,6	1,8	4,1	6,5	9,7	18,8	32,6	36,8	51,7	77,2
Characteristic bending	NAO	[Nlma]	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	ן נוזווו <u>ן</u>	exposure time [min]	90	0,4	1,2	2,6	4,2	6,3	12,3	21,2	23,9	33,6	50,2
				120	0,3	0,9	2,0	3,2	4,8	9,4	16,3			38,6
1) $\tau_{\text{Rk,cr,(C20/25)}}$ characte temperature range	ristic bond re	esistan	ce for crack	ed concr	ete for	concre	ete stre	ength c	lass C	20/25	for the	releva	ınt	
Chemofast Injection Performances Characteristic values o	-				expos	sure (r	reinfor	cing b	oar)		Aı	nnex	C 3	l