



Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products



# European Technical Assessment

ETA-19/0201 of 28 April 2025

English translation prepared by DIBt - Original version in German language

#### **General Part**

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Chemofast Injection System EP 1000 for concrete
Product family to which the construction product belongs	Bonded fasteners and bonded expansion fasteners for use in concrete
Manufacturer	CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich DEUTSCHLAND
Manufacturing plant	CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich DEUTSCHLAND
This European Technical Assessment contains	49 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-02-0601, Edition 12/2023
This version replaces	ETA-19/0201 issued on 12 June 2024



Page 2 of 49 | 28 April 2025

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.



Page 3 of 49 | 28 April 2025

#### **Specific Part**

#### 1 Technical description of the product

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

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

The product description is given in Annex A.

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

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 and/or 100 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

#### 3.1 Mechanical resistance and stability (BWR 1)

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

#### 3.2 Safety in case of fire (BWR 2)

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

#### 3.3 Hygiene, health and the environment (BWR 3)

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



Page 4 of 49 | 28 April 2025

# 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

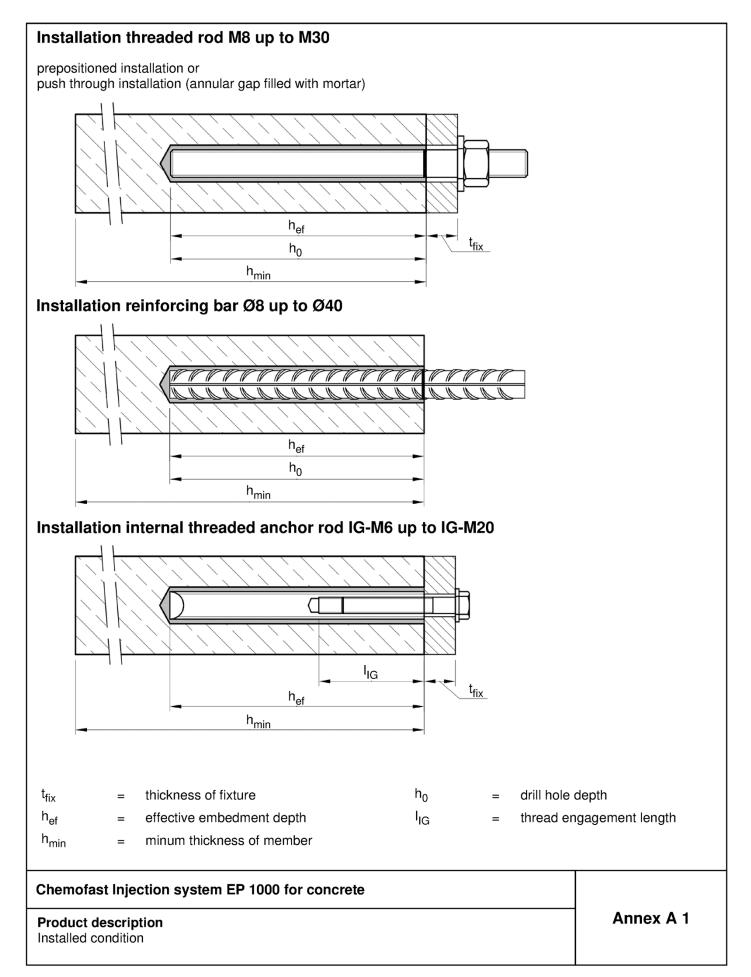
# 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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 28 April 2025 by Deutsches Institut für Bautechnik

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

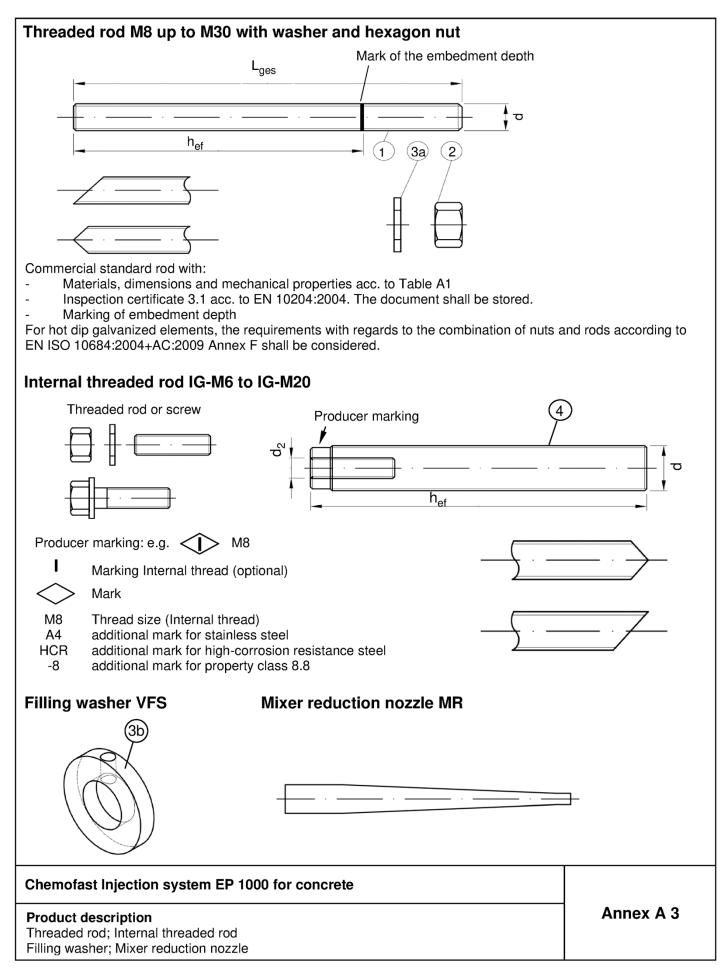






Cartridge system	
Side-by-Side Cartridge: 440 ml, 500 ml up to 540 ml, 585 ml and 1400 ml Processing and safety instructions, sl number, manufacturer's information, of	
Static mixer PM-19E	
Piston plug VS and mixer extension VL	
Chemofast Injection system EP 1000 for concrete	
Product description Injection system	Annex A 2







Part	Designation	Material				
		acc. to EN ISO 683-4:				
		5 μm acc. to EN ISO		2:2022 or 1:2022 and EN ISO 10684	·2004+AC·2009 or	
		15 µm acc. to EN ISO			.2004+7.0.2003 01	
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
1 Threaded rod		4.6	f <sub>uk</sub> = 400 N/mm <sup>2</sup>	f <sub>vk</sub> = 240 N/mm <sup>2</sup>	A <sub>5</sub> > 8%	
		4.8	f <sub>uk</sub> = 400 N/mm <sup>2</sup>	f <sub>yk</sub> = 320 N/mm <sup>2</sup>	A <sub>5</sub> > 8%	
	Threaded rod	acc. to		f <sub>uk</sub> = 500 N/mm <sup>2</sup>	f <sub>vk</sub> = 300 N/mm <sup>2</sup>	A <sub>5</sub> > 8%
		EN ISO 898-1:2013		f <sub>uk</sub> = 500 N/mm <sup>2</sup>	f <sub>yk</sub> = 400 N/mm <sup>2</sup>	A <sub>5</sub> > 8%
				f <sub>uk</sub> = 800 N/mm <sup>2</sup>	f <sub>vk</sub> = 640 N/mm <sup>2</sup>	$A_5 \ge 12\%^{(3)}$
			4	for anchor rod class 4.6 o	or 4.8	
2	Hexagon nut	acc. to EN ISO 898-2:2022	5	for anchor rod class 5.6 o		
			<u> </u>	for anchor rod class 8.8		
3a	Washer			galvanised or sherardized		7004.2000
3b	Filling washer			EN ISO 7089:2000, EN ISC galvanised or sherardized		1034.2000)
	Internal threaded	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
4	anchor rod	acc. to	5.8	f <sub>uk</sub> = 500 N/mm <sup>2</sup>	$f_{VK} = 400 \text{ N/mm}^2$	A <sub>5</sub> > 8%
		EN ISO 898-1:2013	8.8	f <sub>uk</sub> = 800 N/mm <sup>2</sup>	f <sub>yk</sub> = 640 N/mm <sup>2</sup>	A <sub>5</sub> > 8%
Stai	nless steel A4 (Mate	rial 1.4401 / 1.4404 / 1	.457	1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t	to EN 10088-1:2023)	·
Stai	nless steel A4 (Mate	rial 1.4401 / 1.4404 / 1	.457	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel	to EN 10088-1:2023) 3-1:2023) Characteristic steel	Elongation at
Stai Hig	nless steel A4 (Mate h corrosion resistan	rial 1.4401 / 1.4404 / 1 <b>ce steel</b> (Material 1.45	.457	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength	Elongation at fracture
Stai Higl	nless steel A4 (Mate	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to	.457 529 o 50 70	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel	to EN 10088-1:2023) 3-1:2023) Characteristic steel	fracture
Stai Higl	nless steel A4 (Mate h corrosion resistan	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class	.457 529 o 50 70	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f <sub>uk</sub> = 500 N/mm <sup>2</sup>	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture A <sub>5</sub> ≥ 8%
Stai Higi	Threaded rod <sup>1)4)</sup>	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020	.457 529 o 50 70 80 50	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$
Stai Hig	nless steel A4 (Mate h corrosion resistan	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020	.457 529 o 50 70 80 50 70	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$
Stai Higi 1	Threaded rod <sup>1)4)</sup>	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020	.457 529 o 50 70 80 50 70 80	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$
Stai Higi	Threaded rod <sup>1)4)</sup>	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452	.457 529 o 50 70 80 50 70 80 71.43 9 or	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 50 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 4578, acc. to EN 10088- 1:2023	fracture $A_5 ≥ 8\%$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$
Stai Higl 1 2 3a	nless steel A4 (Mate h corrosion resistand Threaded rod <sup>1)4)</sup> Hexagon nut <sup>1)4)</sup> Washer	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	.457 529 o 50 70 80 50 70 80 70 80 71.43 9 or 50 006, E	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 50 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 4578, acc. to EN 10088- 1:2023	fracture $A_5 ≥ 8\%$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$
Stai Hig 1 2 3a <u>3b</u>	nless steel A4 (Mate h corrosion resistand Threaded rod <sup>1)4)</sup> Hexagon nut <sup>1)4)</sup> Washer Filling washer	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	.457 529 o 50 70 80 50 70 80 70 80 71.43 9 or 50 006, E	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 50 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 4578, acc. to EN 10088- 1:2023	fracture $A_5 ≥ 8\%$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$ $A_5 ≥ 12\%^{3}$
Stai Hig 1 2 3a <u>3b</u>	nless steel A4 (Mate h corrosion resistand Threaded rod <sup>1)4)</sup> Hexagon nut <sup>1)4)</sup> Washer	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to	.457 529 o 50 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 50 70 50 70 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 70 50 50 50 50 50 50 50 50 50 5	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 1:2023 D 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^3)$ $A_5 \ge 12\%^3)$ $A_5 \ge 12\%^3)$ -1:2023 -1:2023 7094:2000) Elongation at fracture $A_5 > 8\%$
Stai Higl 1 3a 3b	nless steel A4 (Materia corrosion resistant         n corrosion resistant         Threaded rod <sup>1)4)</sup> Hexagon nut <sup>1)4)</sup> Washer         Filling washer         Internal threaded anchor rod <sup>1)2</sup> )	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to EN ISO 3506-1:2020	.457 <u>529 o</u> <u>50</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>71</u> <u>44</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>71</u> <u>445</u> <u>71</u> <u>445</u> <u>70</u> <u>80</u> <u>71</u> <u>445</u> <u>70</u> <u>80</u> <u>71</u> <u>445</u> <u>70</u> <u>80</u> <u>71</u> <u>445</u> <u>70</u> <u>70</u> <u>80</u> <u>71</u> <u>745</u> <u>70</u> <u>70</u> <u>80</u> <u>71</u> <u>745</u> <u>70</u> <u>70</u> <u>80</u> <u>71</u> <u>745</u> <u>70</u> <u>70</u> <u>80</u> <u>71</u> <u>70</u> <u>70</u> <u>80</u> <u>71</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>71</u> <u>70</u> <u>71</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>7</u>	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 1:2023 D 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 ≥ 8\%$ $A_5 ≥ 12\%^3$ $A_5 ≥ 12\%^3$ $A_5 ≥ 12\%^3$ -1:2023         -1:2023         7094:2000)         Elongation at fracture $A_5 > 8\%$ $A_5 > 8\%$
Stai Hig 1 1 2 3a 3b 4 1) 2) 3)	nless steel A4 (Maten corrosion resistant         n corrosion resistant         Threaded rod <sup>1)4)</sup> Hexagon nut <sup>1)4)</sup> Washer         Filling washer         Internal threaded anchor rod <sup>1)2)</sup> Property class 70 or 80 fm for IG-M20 only property A <sub>5</sub> > 8% fracture elongate	rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to EN ISO 3506-1:2020 or anchor rods and hexago	.457 <u>529 o</u> <u>50</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>80</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u> <u>70</u>	1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ s up to M24 and Internal threader	to EN 10088-1:2023) 3-1:2023) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 4541, acc. to EN 10088- 1:2023 D 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 ≥ 8\%$ $A_5 ≥ 12\%^3$ $A_5 ≥ 12\%^3$ $A_5 ≥ 12\%^3$ -1:2023         -1:2023         7094:2000)         Elongation at fracture $A_5 > 8\%$ $A_5 > 8\%$



Reinforcing bar: ø8 up to ø40		
	NYNYYYYYYYYYYYYYYYY AAAAAAAAAAAAAAAAAA	annan i
Minimum value of related rip area f <sub>R,min</sub> acco		
Rib height of the bar shall be in the range 0,( (d: Nominal diameter of the bar; h <sub>rib</sub> : Rib heig		
Table A2: Materials Reinforcing	bar	
Part Designation	Material	
Rebar		
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 $f_{uk} = f_{tk} = k \cdot f_{yk}$	to EN 1992-1-1/NA
Chemofast Injection system EP 1000 fo Product description Materials reinforcing bar	r concrete	Annex A 5
7002321.25		8 06 01 44/25



Fas	teners subject to (Static a	and quasi-static lo	oads):				
		 Working li	fe 50 years		ng life 100 years		
		uncracked	0/25 to C90/105 cracked	uncracked	e C20/25 to C90/105		
	Base material	concrete	concrete	concrete			
HD: HDB: CD:	Hammer drilling Hammer drilling with hollow drill bit Compressed air drilling	Ø8 to	o M30, o Ø32, o IG-M20	M8 to M30, Ø8 to Ø32, IG-M6 to IG-M20			
HD: CD:	Hammer drilling Compressed air drilling	Ø36 to Ø40	No performance assessed	Ø36 to Ø4	0 No performance assessed		
DD:	Diamond drilling	M8 to M30, Ø8 to Ø40, IG-M6 to IG-M20	M16 to M30 <sup>4)</sup> IG-M10 to IG-M20 <sup>4)</sup>	M8 to M30 Ø8 to Ø40 IG-M6 to IG-I	), No performance		
Temp	perature Range:	I: - 40°C II: - 40°C III: - 40°C	to $+40^{\circ}C^{1)}$ to $+72^{\circ}C^{2)}$ to $+80^{\circ}C^{3)}$	ll: - 4	$0^{\circ}$ C to +40°C <sup>1)</sup> 0°C to +72°C <sup>2)</sup> 0°C to +80°C <sup>3)</sup>		
Fas	teners subject to (seismi						
		Performance	Category C1	Perform	ance Category C2		
	Base material	Crac	ked and uncracked co	oncrete C20/25	to C50/60		
HD: HDB CD:	Hammer drilling : Hammer drilling with hollow drill bit Compressed air drilling		o M30, o Ø32	M12 to M30			
DD:	Diamond drilling	No performa	nce assessed	No perfo	formance assessed		
Tem	perature Range:	l: - 40°C ll: - 40°C lll: - 40°C	II: - 4	0°C to +40°C <sup>1)</sup> 0°C to +72°C <sup>2)</sup> 0°C to +80°C <sup>3)</sup>			
Fas	teners subject to (fire exp	osure):					
	Base material	Crac	ked and uncracked co	oncrete C20/25	to C50/60		
HD: HDB: CD:	Hammer drilling Hammer drilling with hollow drill bit Compressed air drilling		M8 to Ø8 to IG-M6 to	Ø32,			
DD:	Diamond drilling						
Temp	perature Range:						
2) (n 3) (n	nax. long-term temperature +24°C nax. long-term temperature +50°C nax. long-term temperature +60°C 20/25 to C50/60 only	and max. short-term	temperature +72°C)				
Che	mofast Injection system El	P 1000 for concret	e				
	nded use cifications				Annex B 1		



#### **Base materials:**

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A2:2021.
- Strength classes C20/25 to C90/105 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 + A1:2015 corresponding to corrosion resistance class:
     Stainless steel Stahl A2 according to Annex A 4, Table A1: CRC II
    - Stainless steel Stahl A4 according to Annex A 4. Table A1: CRC III
    - High corrosion resistance steel HCR according to Annex A 4, Table A1: CRC V

#### Design:

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



Threaded rod						M8	M10	M12	M16	6   M20	D   M:	24   1	M27	M30
Diameter of element			d = d	nom	[mm]	8	10	12	16	20	2	4	27	30
Nominal drill hole diameter			d <sub>0</sub>	[mm]	10	12	14	18	22	2	8	30	35	
Effective embedment depth			h <sub>ef,min</sub>		[mm]	60	60	70	80	90	9	6	108	120
Effective embedment depth					[mm]	160	200	240	320	400	) 48	30 !	540	600
Diameter of clearance hole in -	Preposition	ned inst	allation	d <sub>f</sub> ≤	[mm]	9	12	14	18	22	2	6	30	33
the fixture	Push thre	ough in	stallatio	n d <sub>f</sub>	[mm]	12	14	16	20	24	3	0	33	40
Maximum installation	torque		max <sup>-</sup>	T <sub>inst</sub>	[Nm]	10	20	40 <sup>1)</sup>	60	100	) 17	70 2	250	300
Minimum thickness c	f member		ł	າ <sub>min</sub>	[mm]		<sub>əf</sub> + 30 r				h <sub>ef</sub> +	2do	•	
							≥ 100 m	-						
Minimum spacing				s <sub>min</sub>	[mm]	40	50	60	75	95	_		125	140
Minimum edge distar				C <sub>min</sub>	[mm]	35	40	45	50	60	6	5	75	80
1) Maximum installati														
Table B2:	nstallatio	on pa	ramet	ers fo	or rein	forci	ng bar	•						
Reinforcing bar			Ø 81)	Ø 10 <sup>1)</sup>	Ø 121)	Ø 14	Ø 16	Ø 20	Ø 24 <sup>1)</sup>	Ø 25 <sup>1)</sup>	Ø 28	Ø 32	Ø 36	Ø 40
Diameter of element	d = d <sub>nom</sub>	[mm]	8	10	12	14	16	20	24	25	28	32	36	40
Nominal drill hole diameter	d <sub>0</sub>	[mm]	10 12	12 14	14 16	18	20	25	30 32	30 32	35	40	45	52/5
Effective embedmen depth	t h <sub>ef,min</sub> h <sub>ef,max</sub>		60 160	60 200	70 240	75 280	80 320	90 400	96 480	100 500	112 560	128 640	144 720	160 800
Minimum thickness of member	h <sub>min</sub>	[mm]	h <sub>ef</sub> +	30 mm 0 mm	_	200	h <sub>ef</sub> + 2				010	720		
Minimum spacing	s <sub>min</sub>	[mm]	40	50	60	70	75	95	120	120	130	150	180	200
Minimum edge distance	C <sub>min</sub>	[mm]	35	40	45	50	50	60	70	70	75	85	180	200
1) both nominal drill h	nole diamete	er can b	e used											
Table B3: I	nstallatio	n na	ramat	ore fr	or Into	rnal t	broad	od an	ohor	rod				
Internal threaded ar		n pa	lamet			M6	IG-M8		M10	IG-M1	2 10	G-M16		-M20
Internal diameter of a			d	2 [mm		6	8			12	2 1	16		20
Outer diameter of an			d = d <sub>nor</sub>			0	12	_	16	20		24	_	30
Nominal drill hole dia			d						18	22		28	_	35
			h <sub>ef,mi</sub>	<u> </u>		50	14 70	_	30	90		96	_	120
Effective embedment	t depth		h <sub>ef,ma</sub>	_		00	240	320		400		480		500
Diameter of clearanc hole in the fixture	е		d <sub>f</sub> :	≤ [mm	-	7	9		12	14		18		22
Maximum installation	torque	1	max T <sub>ins</sub>	st [Nm	ı] 1	0	10		20	40		60	100	
Thread engagement length min/max		I		-	20	8/20			12/30	)	16/32	2	0/40	
Minimum thickness of member			h <sub>mi</sub>	n [mm	ן]	h <sub>ef</sub> + 30 ≥ 100			h <sub>ef</sub>		<sub>ef</sub> + 2c	+ 2d <sub>0</sub>		
Minimum spacing			s <sub>mi</sub>	n [mr		60	60		75	95		115		140
Minimum edge distar			c <sub>mi</sub>	n [mm	ן]  4	0	45	Į	50	60		65		80
1) With metric thread	S													
Chemofast Inject	ion syste	m EP	1000 fo	or con	crete									



	FULLER			and the second se	poppone	HARARA R.						
Threaded	Re-	Internal	d <sub>0</sub> Drill bit - Ø	d <sub>t</sub>		<b>d</b> <sub>b,min</sub>	Installa Piston		on direction piston plu			
Rod	inforcing bar	threaded anchor rod	DD HDB, CD	Brush	-	min. Brush - Ø	plug	L				
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]			1	-		
M8	8		10	RB10	11,5	10,5		•				
M10	8 / 10	IG-M6	12	RB12	13,5	12,5		Nonlur	roquired			
M12	10 / 12	IG-M8	14	RB14	15,5	14,5		No plug required				
-	12	-	16	RB16	17,5	16,5						
M16	14	IG-M10	18	RB18	20,0	18,5	VS18					
-	16	-	20	RB20	22,0	20,5	VS20	]				
M20	-	IG-M12	22	RB22	24,0	22,5	VS22	h <sub>ef</sub> >	h <sub>ef</sub> > 250 mm al			
-	20	-	25	RB25	27,0	25,5	VS25					
M24	-	IG-M16	28	RB28	30,0	28,5	VS28	1		all		
M27	24 / 25	-	30	RB30	31,8	30,5	VS30	250 mm				
-	24 / 25	-	32	RB32	34,0	32,5	VS32					
M30	28	IG-M20	35	RB35	37,0	35,5	VS35					
-	32	-	40	RB40	43,5	40,5	VS40					
-	36	-	45	RB45	47,0	45,5	VS45	all				
-	40	-	52 -	RB52	54,0	52,5	VS52		all	all		
-	10	-	- 55	RB55	58,5	55,5	VS55					
HDB – Ho	y and insta llow drill bit	allation to	ols ————	5		The hollow drill hollow drill bit a negative press 150 m <sup>3</sup> /h (42 l/s	and a class ure of 253	s M hoover v	vith a minimu	ım		
Brush RB						Piston Plug	vs					

**Brush extension RBL** 

\_\_\_\_\_

# Chemofast Injection system EP 1000 for concrete

Intended use Cleaning and installation tools Annex B 4



Table B5:	Worki	ng and curing	ı time	
Tempera	ture in bas	se material	Maximum working time	Minimum curing time <sup>1)</sup>
	Т		t <sub>work</sub>	t <sub>cure</sub>
+ 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	ridge 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.

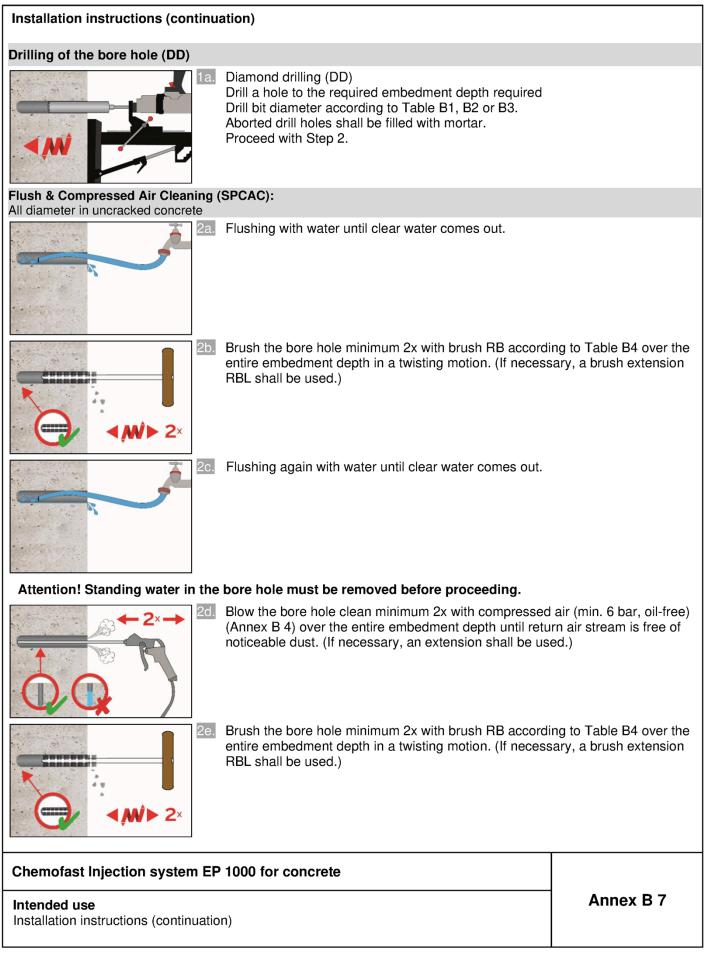
# Chemofast Injection system EP 1000 for concrete

Intended use Working time and curing time Annex B 5

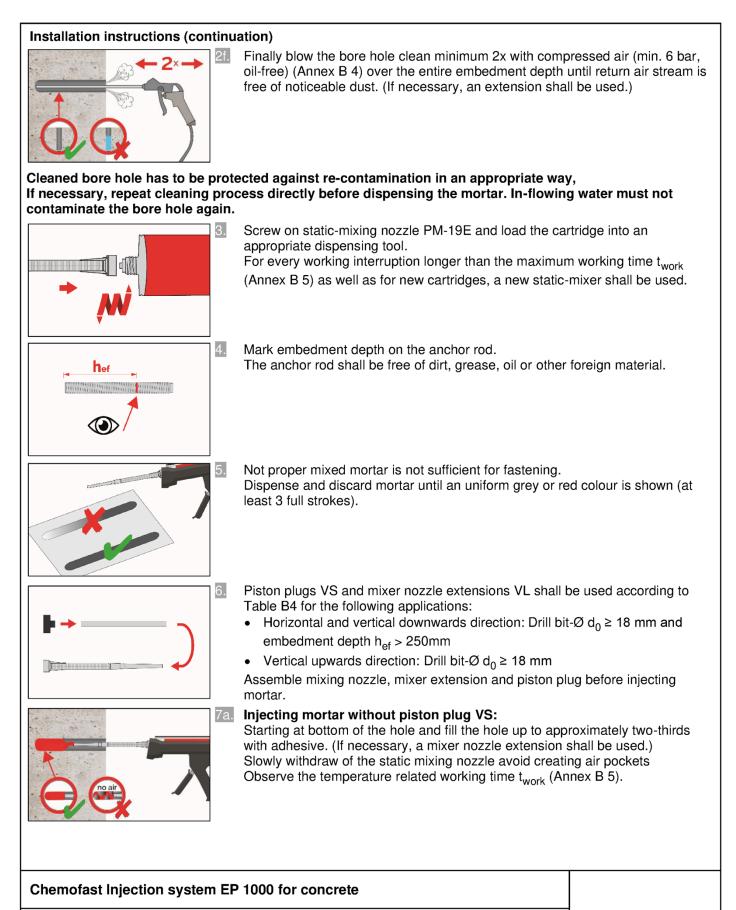


Installation instructions							
Drilling of the bore hole (HD, I	HDB	8, CD)					
	1a.	Hammer drilling (HD) / Compressed air drilling (CD) Drill a hole to the required embedment depth. Drill bit diameter according to Table B1, B2 or B3. Aborted drill holes shall be filled with mortar. Proceed with Step 2.					
	1b. At	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 Proceed with Step 3. tention! Standing water in the bore hole must be rem	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.				
Compressed Air Cleaning (CA			-				
All diameter in cracked and unc			air (min Chan ail fua)				
	2a.	Blow the bore hole clean minimum 2x with compressed (Annex B 4) over the entire embedment depth until retu noticeable dust. (If necessary, an extension shall be use	rn air stream is free of				
	2b.	Brush the bore hole minimum 2x with brush RB accordi entire embedment depth in a twisting motion. (If necess RBL shall be used.)					
	2c.	Finally blow the bore hole clean minimum 2x with comp oil-free) (Annex B 4) over the entire embedment depth free of noticeable dust. (If necessary, an extension shall	until return air stream is				
	prod	ected against re-contamination in an appropriate way cess directly before dispensing the mortar. In-flowing					
Chemofast Injection system	I EP	1000 for concrete					
Intended use			Annex B 6				



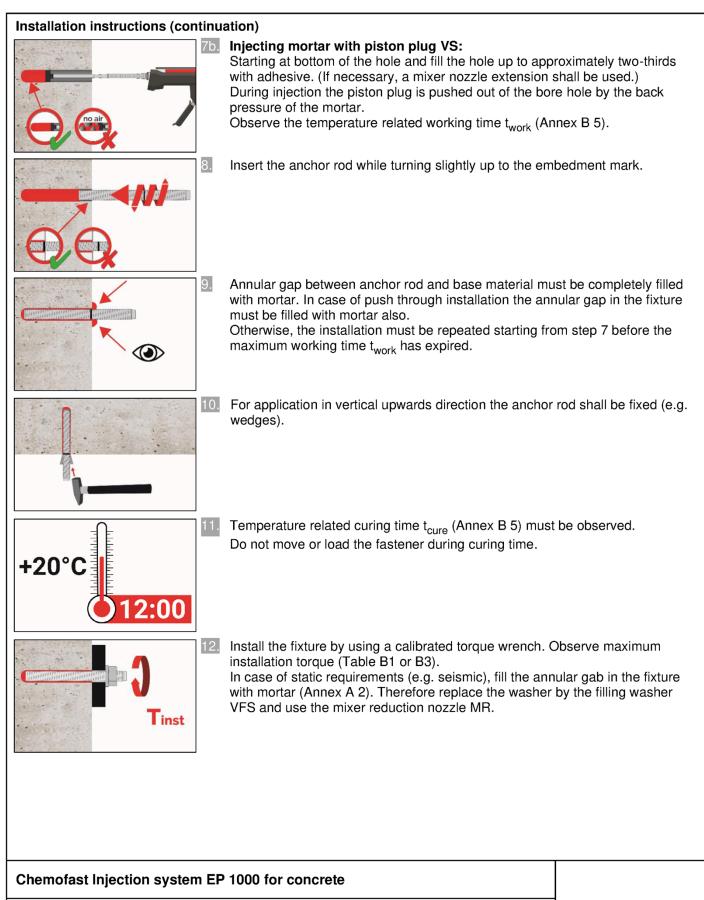






Intended use Installation instructions (continuation) Annex B 8





Intended use Installation instructions (continuation) Annex B 9



Т	able C1: Characteristic values resistance of threade			ension	resista	ancea	and s	teel s	hear		
Th	nreaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Cr	oss section area	A <sub>s</sub>	[mm <sup>2</sup> ]	36,6	58	84,3	157	245	353	459	561
Cł	naracteristic tension resistance, Steel failu	re <sup>1)</sup>									
St	eel, Property class 4.6 and 4.8	N <sub>Rk,s</sub>	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
St	eel, Property class 5.6 and 5.8	N <sub>Rk,s</sub>	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
St	eel, Property class 8.8	N <sub>Rk,s</sub>	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
St	ainless steel A2, A4 and HCR, class 50	N <sub>Rk,s</sub>	[kN]	18	29	42	79	123	177	230	281
St	ainless steel A2, A4 and HCR, class 70	N <sub>Rk,s</sub>	[kN]	26	41	59	110	171	247	_3)	_3)
St	ainless steel A4 and HCR, class 80	N <sub>Rk,s</sub>	[kN]	29	46	67	126	196	282	_3)	_3)
Cł	naracteristic tension resistance, Partial fac	tor <sup>2)</sup>									
St	eel, Property class 4.6 and 5.6	γ <sub>Ms,N</sub>	[-]				2,0	D			
St	eel, Property class 4.8, 5.8 and 8.8	γ <sub>Ms,N</sub>	[-]				1,	5			
St	ainless steel A2, A4 and HCR, class 50	γ <sub>Ms,N</sub>	[-]				2,8	6			
St	ainless steel A2, A4 and HCR, class 70	γ <sub>Ms,N</sub>	[-]				1,8	57			
Stainless steel A4 and HCR, class 80 Y <sub>Ms,N</sub> [-] 1,6											
Cł	naracteristic shear resistance, Steel failure										
۲	Steel, Property class 4.6 and 4.8	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
arm	Steel, Property class 5.6 and 5.8	V <sup>0</sup> Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
lever	Steel, Property class 8.8	V <sup>0</sup> Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
out	Stainless steel A2, A4 and HCR, class 50	V <sup>0</sup> Rk,s	[kN]	9	15	21	39	61	88	115	140
Without	Stainless steel A2, A4 and HCR, class 70	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	13	20	30	55	86	124	_3)	_3)
5	Stainless steel A4 and HCR, class 80	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	_3)	_3)
	Steel, Property class 4.6 and 4.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M <sup>0</sup> Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
		M <sup>0</sup> Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
h lever	Stainless steel A2, A4 and HCR, class 50	M <sup>0</sup> Rk,s	[Nm]	19	37	66	167	325	561	832	1125
Wit		M <sup>0</sup> Rk,s	[Nm]	26	52	92	232	454	784	_3)	_3)
	Stainless steel A4 and HCR, class 80	M <sup>0</sup> Rk,s	[Nm]	30	59	105	266	519	896	_3)	_3)
Cł	naracteristic shear resistance, Partial facto										
St	eel, Property class 4.6 and 5.6	γ <sub>Ms,V</sub>	[-]				1,6	7			
St	eel, Property class 4.8, 5.8 and 8.8	γ <sub>Ms,V</sub>	[-]				1,2	:5			
St	ainless steel A2, A4 and HCR, class 50	γ <sub>Ms,V</sub>	[-]				2,3	8			
St	ainless steel A2, A4 and HCR, class 70	γ <sub>Ms,V</sub>	[-]				1,5	6			
St	ainless steel A4 and HCR, class 80	γ <sub>Ms,V</sub>	[-]				1,3	3			
1	Values are only valid for the given stress area	A <sub>s</sub> . Value	s in bra	ackets are	e valid for	unders	ized thr	eaded ro	ods with	smaller	

 Values are only valid for the given stress area A<sub>s</sub>. Values in brackets are valid for undersized threaded rods with smaller stress area A<sub>s</sub> for hot-dip galvanised threaded rods according to EN ISO 10684:2004+AC:2009.

2) in absence of national regulation

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



#### 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 failure Uncracked concrete k<sub>ucr,N</sub> [-] 11,0 7,7 Cracked concrete k<sub>cr,N</sub> [-] 1,5 h<sub>ef</sub> Edge distance C<sub>cr,N</sub> [mm] Axial distance [mm] 2 c<sub>cr.N</sub> s<sub>cr,N</sub> Splitting $h/h_{ef} \ge 2,0$ 1,0 h<sub>ef</sub> h $2,0 > h/h_{ef} > 1,3$ 2 · h<sub>ef</sub> 2,5 – Edge distance C<sub>cr,sp</sub> [mm] h<sub>ef</sub> $h/h_{ef} \le 1,3$ 2,4 h<sub>ef</sub> 2 c<sub>cr,sp</sub> Axial distance [mm] s<sub>cr,sp</sub>

## 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



Tabl	Table C3:Characteristic values of tension loads under static and quasi-static action for a working life of 50 yearsThreaded rodM8M10M12M16M20M24M27M30													
					M8	M10	M12	M16	M20	M24	M27	M30		
Steel fa			N		1		A . 4	(	<b>T</b> -h					
	teristic tension res	istance	N <sub>Rk,s</sub>	[kN]			A <sub>s</sub> • f	<sub>uk</sub> (or s 						
Partial			<sup>γ</sup> Ms,N	[-]				see Ta	able C1					
L	ned pull-out and eteristic bond resist		d concrete C20	/25 in hamr	ner dril	led (HC	)) and	compre	esed a	ir drille	d holes			
L	I: 24°C/40°C				20	20	19	19	18	17	16	16		
Temperature range	II: 50°C/72°C	Dry, wet concrete or	<sup>τ</sup> Rk,ucr	[N/mm²]	15	15	15	14	13	13	12	12		
Temp	III:60°C/80°C	flooded bore hole			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
Charac	teristic bond resist	ance in uncracke	d concrete C20	/25 in hamr	ner dril	led hole	es with	hollow	drill bi	t (HDB)	)			
e	I: 24°C/40°C				17	16	16	16	15	14	14	13		
ang	II: 50°C/72°C	Dry or wet			14	14	14	13	13	12	12	11		
Le L	III:60°C/80°C	concrete			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
ratu	I: 24°C/40°C		<sup>- τ</sup> Rk,ucr	[N/mm <sup>2</sup> ]	16	16	16	15	15	14	14	13		
Temperature range	II: 50°C/72°C	flooded bore			14	14	14	13	13	12	12	11		
Ter	III:60°C/80°C	hole			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
	teristic bond resist			5 in hamme		,			,	, i	·	,		
	hammer drilled hol		l bit (HDB)		7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5		
ratu ge	I: 24°C/40°C     Dry, wet concrete or flooded here		7-1			-			-	,				
Temperature range	II: 50°C/72°C III:60°C/80°C	flooded bore hole	<sup>τ</sup> Rk,cr	[N/mm <sup>2</sup> ]	6,0 5,0	6,0 5,0	7,0 5,0	7,0 4,5	7,0 4,5	7,0 4,5	7,0 4,5	7,0 4,5		
<u> </u>		<u> </u>	<u> </u>											
holes (	ion factor ψ <sup>0</sup> <sub>sus</sub> in CD) and in hamme				hamme	er drille	d holes	s (HD),	compre	essed a	air drille	d		
lperatur range	I: 24°C/40°C	Dry, wet						0,	80					
npera range	II: 50°C/72°C	concrete or flooded bore	$\Psi^0$ sus	[-]				0,	68					
Tem	III:60°C/80°C	hole						0,	70					
	ing factors for	≤ C50/60						(f <sub>ck</sub> / 2	20) <sup>0,1</sup>					
concret		> C50/60	Ψc	[-]				1	,1					
Charac	teristic bond resist	ance depending	τ <sub>Rk,ucr</sub> =	1			Ψα	<sup>• τ</sup> Rk,ι	Icr.(C20/	(25)				
	concrete strength o		$\tau_{\rm Rk,cr} =$					c • <sup>7</sup> Rk,						
Concre	ete cone failure o	r Splitting						• • • • • •	,(					
	nt parameter							see Ta	able C2					
	ation factor and wet concrete (			1	I				0					
	ded bore hole (HD)	,	γinst	[-]	<u> </u>				,0 ,2					
		,,	1											
Perfo Chara	Chemofast Injection system EP 1000 for concrete       Annex C 3         Performances       Annex C 3         Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (threaded rod)       Annex C 3													



Tabl	Table C4:Characteristic values of tension loads under static and quasi-static action for a working life of 100 yearsThreaded rodM8M10M12M16M24M27M30													
					M8	M10	M12	M16	M20	M24	M27	M30		
Steel fa					1		• •							
	teristic tension res	istance	N <sub>Rk,s</sub>	[kN]			A <sub>s</sub> • f	<sub>uk</sub> (or s		le C1)				
Partial			<sup>γ</sup> Ms,N	[-]				see Ta	able C1					
	ned pull-out and teristic bond resist		d concrete C20	/25 in ham	mor dril		)) and	compre	e hasa	ir drillo	d holes			
	I: 24°C/40°C				20	20	19	19	18	17				
Temperature range	II: 50°C/72°C	Dry, wet concrete or	<sup>7</sup> Rk,ucr,100	[N/mm²]	15	15	19	19	13	17	16 12	16 12		
Temp	III:60°C/80°C	flooded bore hole		[]	6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
Charac	teristic bond resist	ance in uncracke	d concrete C20	/25 in hamr	ner dril	led hol	es with	hollow	drill bit	t (HDB	)			
	I: 24°C/40°C				17	16	16	16	15	14	14	13		
nge	II: 50°C/72°C	Dry or wet			14	14	14	13	13	12	12	11		
rera	III:60°C/80°C	concrete			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
Temperaturerange	I: 24°C/40°C		<sup>τ</sup> Rk,ucr,100	[N/mm <sup>2</sup> ]	16	16	16	15	15	14	14	13		
upe	II: 50°C/72°C	flooded bore			14	14	14	13	13	12	12	11		
Ten	III:60°C/80°C	hole			6,5	6,5	6,5	6,0	6,0	5,5	5,5	5,5		
Charac		ance in cracked c	oncrete C20/25	 5 in hamme										
	Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)													
Temperature range	I: 24°C/40°C	Dry, wet			6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5		
npera range	II: 50°C/72°C	concrete or flooded bore	<sup>τ</sup> Rk,cr,100	[N/mm <sup>2</sup> ]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5		
Ten	III:60°C/80°C	hole			5,0	5,0	5,0	4,5	4,5	4,5	4,5	4,5		
	ion factor $\psi^0_{sus,10}$ CD) and in hamme				5 in har	nmer d	rilled h	oles (H	D), cor	npress	ed air c	Irilled		
L Ì	I: 24°C/40°C	Dry, wet						0,	80					
nperatur range	II: 50°C/72°C	concrete or	$\Psi^0$ sus,100	[-]				0	68					
Temp	III:60°C/80°C	flooded bore	♥ sus,100					,						
Ѓ Ѓ	III:60°C/80°C							,	70					
	ing factors for	≤ C50/60	$-\psi_{c}$	[-]					20) <sup>0,1</sup>					
concret	le	> C50/60						1	,1					
	teristic bond resist		τ <sub>Rk,ucr,100</sub> =				$\psi_{\mathbf{C}}$ .	$\tau$ Rk,ucr	,100,(C2	20/25)				
on the o	concrete strength	class	<sup>τ</sup> Rk,cr,100 =				$\psi_{c}$ .	<sup>τ</sup> Rk,cr,	100,(C2	0/25)				
L	ete cone failure o	r Splitting												
	nt parameter ation factor							see Ta	able C2					
	and wet concrete (	(HD; HDB, CD)						1	,0					
	ded bore hole (HD		<sup>-</sup> <sup>γ</sup> inst	[-]					,2					
									1					
Perfo Chara	Chemofast Injection system EP 1000 for concrete       Annex C 4         Performances       Annex C 4         Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (threaded rod)       Annex C 4													



	for a working life of 50 years												
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30		
Steel failure						• •	,						
Characteristic tension res	istance	N <sub>Rk,s</sub>	[kN]			A <sub>s</sub> ∙ f	<sub>uk</sub> (or se						
Partial factor		γ <sub>Ms,N</sub>	[-]				see Ta	ble C1					
Combined pull-out and o		d concrete OCC		o.o.cl -1.'	lloc! ! '								
Characteristic bond resist	ance in uncracked	a concrete C20/	25 in diam				Γ́Ι						
L: 24°C/40°C H: 24°C/40°C H: 50°C/72°C HI: 60°C/80°C	Dry, wet concrete or			15	14	14	13	12	12	11	11		
II: 50°C/72°C	flooded bore hole	<sup>τ</sup> Rk,ucr	[N/mm <sup>2</sup> ]	12	12	11	10	9,5	9,5	9,0	9,0		
				5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0		
Characteristic bond resist	ance in cracked c	oncrete C20/25	in diamon	d drille	d holes	(DD)							
L: 24°C/40°C I: 24°C/20°C II: 50°C/72°C III: 60°C/80°C	Dry, wet concrete or						5,5	5,5	5,5	5,5	5,4		
and the set of the set	flooded bore	<sup>τ</sup> Rk,cr	[N/mm²]		1)		4,6	4,6	4,6	4,6	4,5		
	hole				/= = :		2,4	2,3	2,4	2,4	2,3		
Reduction factor $\psi^0_{sus}$ in	uncracked concre	ete C20/25 in di	amond drill	ed hole	es (DD)								
e I: 24°C/40°C	Dry, wet						0,	77					
້ຳອີດເຊັ່ມ II: 50°C/72°C							0,	72					
ل <mark>َّهَ</mark> III:60°C/80°C							0,72						
	≤ C50/60	- Ψc,ucr	[-]				(f <sub>ck</sub> / 2	20) 0,2					
Increasing factors for concrete	> C50/60	,		1,2									
	≤ C50/60	Ψc,cr	[-]	(f <sub>ck</sub> / 20) <sup>0,4</sup>									
Characteristic bond resist		τ <sub>Rk,ucr</sub> =				Ψc,u	ıcr <sup>•τ</sup> Rk	ucr,(C2,	0/25)				
on the concrete strength o		τ <sub>Rk,cr</sub> =				Ψ <b>c</b> ,	,cr <sup>∙ τ</sup> Rk	,cr,(C20	/25)				
Concrete cone failure or	Splitting												
Relevant parameter							see Ta	ble C2					
for dry and wet concrete (	DD)						1	,0					
for flooded bore hole (DD)		γinst	[-]		1,2				1,4				
1) no performance assessed													
Chemofast Injection	system EP 100	0 for concret	e										
	<b>Performances</b> Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (threaded rod)									ex C 5			



	for a working life of 100 years												
Threaded rod	_	-		M8	M10	M12	M16	M20	M24	M27	M30		
Steel failure													
Characteristic tension resi	istance	N <sub>Rk,s</sub>	[kN]			$A_{s} \cdot f$	<sub>uk</sub> (or s						
Partial factor		γ <sub>Ms,N</sub>	[-]				see Ta	able C1					
Combined pull-out and of Characteristic bond resista		d apparata C20	25 in diam	and dri	llad hal								
							Ĺ	10	10				
L: 24°C/40°C H: 24°C/20°C H: 24°C/20°C HI: 24°C/40°C HI: 24°C/40°C	Dry, wet concrete or flooded bore	<sup>7</sup> Rk,ucr,100	[N/mm²]	15 11	14 11	14 10	13 10	12 9,5	12 9,0	11 8,5	11 8,5		
□ = III:60°C/80°C	hole			5,5	5,5	5,0	4,5	4,5	4,5	4,0	4,0		
Reduction factor $\psi^0_{sus,100}$	) in uncracked co	ncrete C20/25 i	n diamond	drilled	holes (	DD)							
l: 24°C/40°C	Dry, wet						0,	73					
L: 24°C/40°C H: 24°C/20°C H: 24°C/20°C HI: 24°C/40°C HI: 24°C/40°C	concrete or flooded bore hole	$\Psi^0$ sus,100	[-]					70					
<sup>⊕</sup> III:60°C/80°C	noie							),72					
Increasing factors for concrete	≤ C50/60	Ψc	[-]					20) <sup>0,2</sup>					
Characteristic bond resista	> C50/60						1	1,2					
on the concrete strength o		$\tau_{Rk,ucr,100} =$				Ψ <b>c</b> •	<sup>τ</sup> Rk,ucr	,100,(C2	20/25)				
Concrete cone failure or	Splitting							able C2					
Relevant parameter							see la	able C2					
	DD)	24	<b>F</b> 1	1.0									
for flooded bore hole (DD)	·	<sup>y</sup> inst	[-]		1,2				1,4				
for dry and wet concrete (DD)													
Chemofast Injection	Chemofast Injection system EP 1000 for concrete												
Performances Characteristic values of for a working life of 100		quasi-stat	ic actio	on				Anne	x C 6	•			



for a working l				1									
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30			
Steel failure without lever arm													
Characteristic shear resistance Steel, strength class 4.6, 4.8 and 5.6, 5.8	V <sup>0</sup> Rk,s	[kN]			0,6•	A <sub>s</sub> ∙f <sub>uk</sub>	(or see	Table C	1)				
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all strength classes	V <sup>0</sup> Rk,s	[kN]			0,5 •	A <sub>s</sub> ∙f <sub>uk</sub>	(or see	Table C	1)				
Partial factor	γ <sub>Ms,V</sub>	[-]				see	Table C	1					
Ductility factor	k <sub>7</sub>	[-]	1,0										
Steel failure with lever arm													
Characteristic bending moment	[Nm]	1,2 • $W_{el}$ • $f_{uk}$ (or see Table C1)											
Elastic section modulus	[mm³]	31	62	109	277	541	935	1387	1874				
Partial factor	γ <sub>Ms,V</sub>	[-]				see	Table C	;1					
Concrete pry-out failure													
Factor	k <sub>8</sub>	[-]					2,0						
Installation factor	γ <sub>inst</sub>	[-]					1,0						
Concrete edge failure													
Effective length of fastener	۱ <sub>f</sub>	[mm]		n	nin(h <sub>ef</sub> ; <sup>·</sup>	12 • d <sub>nor</sub>	n)		min(h <sub>ef</sub> ;	300mm)			
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	16	20	24	27	30			
Installation factor	γinst	[-]	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



Internal threaded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure <sup>1)</sup>			I		1	1			1
Characteristic tension resistand	e, 5.8	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.8	3 and 8.8	γMs,N	[-]			1	,5		
Characteristic tension resistand	e, Stainless			14	26	44	59	110	104
Steel A4 and HCR, Strength cla	ass 70 <sup>2)</sup>	N <sub>Rk,s</sub>	[kN]	14	20	41	59	110	124
Partial factor		γMs,N	[-]			1,87			2,86
Combined pull-out and conci									
Characteristic bond resistance	1	oncrete C	20/25 in h		r , , ,	· · ·			<u>``</u>
Tomporatura I: 24°C/40°C	Dry, wet concrete or			20	19	19	18	17	16
Temperature range II: 50°C/72°C	flooded bore	<sup>τ</sup> Rk,ucr	[N/mm <sup>2</sup> ]	15	15	14	13	13	12
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 C	20/25 in h					, ,	
I: 24°C/40°C	Dry or wet			16	16	16	15	14	13
II: 50°C/72°C	concrete			14	14	13	13	12	11
TemperatureIII:60°C/80°CrangeI: 24°C/40°C		<sup>τ</sup> Rk,ucr	[N/mm <sup>2</sup> ]	6,5 16	6,5 16	6,0 15	6,0 15	5,5 14	5,5 13
II: 50°C/72°C	flooded bore			14	14	13	13	14	11
III:60°C/80°C	hole			6,5	6,5	6,0	6,0	5,5	5,5
Characteristic bond resistance and in hammer drilled holes wit			/25 in ham	nmer drille	d holes (I	HD), comp	ressed air	drilled ho	les (CD)
l: 24°C/40°C	Dry, wet			7,0	8,5	8,5	8,5	8,5	8,5
Temperature II: 50°C/72°C	concrete or flooded bore	<sup>τ</sup> Rk,cr	[N/mm <sup>2</sup> ]	6,0	7,0	7,0	7,0	7,0	7,0
range III:60°C/80°C	hole			5,0	5,0	4,5	4,5	4,5	4,5
Reduction factor $\psi^0_{SUS}$ in crac		ked conc	rete C20/2	5 in hamr	ner drilled	holes (HI	D), compre	essed air o	drilled
holes (CD) and in hammer drill				lo in naim			, compre		annou
I: 24°C/40°C	Dry, wet					0.	80		
Temperature II: 50°C/72°C	concrete or	$\psi^0$ sus	[-]			,	68		
range III:60°C/80°C	flooded bore hole	+ sus					70		
	≤ C50/60						20) <sup>0,1</sup>		
Increasing factors for concrete		$\Psi_{c}$	[-]						
	> C50/60						,1		
Characteristic bond resistance	depending on		<sup>τ</sup> Rk,ucr =			Ψc • <sup>τ</sup> Rk,ι	ıcr,(C20/25)		
the concrete strength class			τ <sub>Rk,cr</sub> =			Ψc • <sup>τ</sup> Rk,	cr,(C20/25)		
Concrete cone failure or Spli	tting								
Relevant parameter						see Ta	ble C2		
Installation factor for dry and wet concrete (HD; H							,0		
for flooded bore hole (HD; HDE	,	γinst	[-]				,0 ,2		
<sup>1)</sup> Fastenings (incl. nut and was	. ,	lv with the	appropriat	te material	and prop		,	al threade	ed rod.
The characteristic tension res	sistance for stee	l failure is	valid for th	e internal i	threaded r	od and the	fastening	element.	
<sup>2)</sup> For IG-M20 strength class 50	is valid								
Chemofast Injection system	em EP 1000 f	or conc	rete						
							- I .	\	<b>`</b> 0
Performances								Annex (	8 כ
Characteristic values of tens		an at at	a al constructions	atat's "	·				



Internal threaded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure <sup>1)</sup>									
Characteristic tension resistan	ce, 5.8	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.	8 and 8.8	γMs,N	[-]			1	,5		
Characteristic tension resistan									101
Steel A4 and HCR, Strength cl		N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124
Partial factor		γMs,N	[-]			1,87			2,86
Combined pull-out and conc	rete cone failu	re							
Characteristic bond resistance	in uncracked c	oncrete C20	)/25 in har	nmer drill	ed (HD) a	and comp	ressed air	drilled ho	les (CD)
I: 24°C/40°C	Dry, wet			20	19	19	18	17	16
Temperature range II: 50°C/72°C	concrete or flooded bore	<sup>τ</sup> Rk,ucr,100	[N/mm²]	15	15	14	13	13	12
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 har	nmer drill	ed holes	with hollo	w drill bit (	HDB)	
I: 24°C/40°C	Dry or wet			16	16	16	15	14	13
II: 50°C/72°C	concrete			14	14	13	13	12	11
Temperature III:60°C/80°C		τ <sub>Rk,ucr,100</sub>	[N/mm <sup>2</sup> ]	6,5	6,5	6,0	6,0	5,5	5,5
range <u>I: 24°C/40°C</u> II: 50°C/72°C	flooded bore			16 14	16 14	15 13	15 13	14 12	<u>13</u> 11
III:60°C/80°C	hole			6,5	6,5	6,0	6,0	5,5	5,5
Characteristic bond resistance	in cracked con	rete C20/2	5 in hamm	,	,	,	,	,	,
and in hammer drilled holes wi					`				
I: 24°C/40°C	Dry, wet			6,5	7,5	7,5	7,5	7,5	7,5
emperature II: 50°C/72°C f		<sup>τ</sup> Rk,cr,100	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5
III:60°C/80°C	hole			5,0	5,0	4,5	4,5	4,5	4,5
Reduction factor $\psi^0_{sus,100}$ in	cracked and ur	hcracked co	ncrete C2	0/25 in ha	ammer dr	lled holes	(HD), cor	npressed	air
drilled holes (CD) and in hamn									
I: 24°C/40°C	Dry, wet			,		0,	80		
Temperature II: 50°C/72°C	concrete or	$\Psi^0$ sus,100	[-]			0.	68		
range III:60°C/80°C	flooded bore hole	- 303,100					70		
	≤ C50/60						20) <sup>0,1</sup>		
Increasing factors for concrete		Ψc	[-]						
	> C50/60						,1		
Characteristic bond resistance	depending on	<sup>τ</sup> Rk,	ucr,100 =		Ч	c <sup>•τ</sup> Rk,ucr	,100,(C20/2	25)	
the concrete strength class		<sup>τ</sup> Rł	k,cr,100 =		۱	<sup>ν</sup> c <sup>•τ</sup> Rk,cr,	100,(C20/2	5)	
	tting					<b>.</b>			
Concrete cone failure or Spl						see la	able C2		
Relevant parameter							,0		
Relevant parameter						1			
Relevant parameter Installation factor for dry and wet concrete (HD;	. ,	γ <sub>inst</sub>	[-]				, <u>e</u> ,2		
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was	3, CD) sher) must comp	ly with the a	ppropriate			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re	3, CD) sher) must comp sistance for stee	ly with the a	ppropriate			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was	3, CD) sher) must comp sistance for stee	ly with the a	ppropriate			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re	3, CD) sher) must comp sistance for stee	ly with the a	ppropriate			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re	3, CD) sher) must comp sistance for stee	ly with the a	ppropriate			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HD) <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re	3, CD) sher) must comp sistance for stee ) is valid	ly with the a I failure is va	ppropriate alid for the			1 rty class of	,2 the intern		d rod.
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDI <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re <sup>2)</sup> For IG-M20 strength class 50 Chemofast Injection syst	3, CD) sher) must comp sistance for stee ) is valid	ly with the a I failure is va	ppropriate alid for the			1 rty class of	,2 f the intern fastening e	element.	
Relevant parameter Installation factor for dry and wet concrete (HD; for flooded bore hole (HD; HDf <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension re <sup>2)</sup> For IG-M20 strength class 50	3, CD) sher) must comp sistance for stee ) is valid <b>rem EP 1000</b> f	I with the a l failure is va	ppropriate Id for the	internal th	readed ro	1 rty class of	,2 f the intern fastening e		



Internal threaded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure <sup>1)</sup>	5.0	N	EL-N II	10	17	00	40	70	100
Characteristic tension resistance		N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.8		γMs,N	[-]			1	,5		
Characteristic tension resistand Steel A4 and HCR, Strength cla		N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124
Partial factor		γMs,N	[-]			1,87			2,86
Combined pull-out and conci			0/05 · I			(DD)			
Characteristic bond resistance	In uncracked co	oncrete C2	0/25 in dia	mond dril	led holes	l í			
Temperature II: 24°C/40°C	Dry, wet concrete or			14	14	13	12	12	11
range	flooded bore	<sup>τ</sup> Rk,ucr	[N/mm²]	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
Characteristic bond resistance i	in cracked cond	rete C20/2	25 in diamo	ond drilled	l holes (D	D)			
I: 24°C/40°C	Dry, wet concrete or					5,5	5,5	5,5	5,4
Temperature range II: 50°C/72°C	flooded bore	<sup>τ</sup> Rk,cr	[N/mm <sup>2</sup> ]	3)		4,6	4,6	4,6	4,5
III:60°C/80°C	hole					2,4	2,3	2,4	2,3
Reduction factor $\psi^0{}_{sus}$ in uncra	acked concrete	C20/25 in	diamond d	rilled hole	es (DD)				
I: 24°C/40°C	Dry, wet					0,	77		
Temperature range II: 50°C/72°C	concrete or flooded bore	$\Psi^0$ sus	[-]				0,77 0,72 0,72		
III:60°C/80°C	hole					0,	72		
	≤ C50/60		[-]			(f <sub>ck</sub> / 2	20) <sup>0,2</sup>		
ncreasing factors for concrete	> C50/60	Ψc,ucr	[_]			1	,2		
	≤ C50/60	Ψc,cr	[-]			(f <sub>ck</sub> / 2	20) <sup>0,4</sup>		
Characteristic bond resistance	depending on		τ <sub>Rk,ucr</sub> =		ψ	′c,ucr <sup>• τ</sup> R	k,ucr,(C20/2	25)	
he concrete strength class			τ <sub>Rk,cr</sub> =			Ψc,cr <sup>• τ</sup> RI	k,cr,(C20/2	5)	
Concrete cone failure or Spli	tting								
Relevant parameter						see Ta	able C2		
Installation factor		1							
for dry and wet concrete (DD)		γ <sub>inst</sub>	[-]		0	1	,0	4	
for flooded bore hole (DD) <sup>1)</sup> Fastenings (incl. nut and was The characteristic tension res <sup>2)</sup> For IG-M20 strength class 50 <sup>3)</sup> no performance assessed	sistance for stee				and prope		the intern		ed rod.
Chemofast Injection system Performances Characteristic values of tens							A	nnex C	10



Table C11		eristic value rking life of			ids und	ler stat	ic and c	quasi-s	tatic ac	tion	
	ded anchor rod	S			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure <sup>1)</sup>	1										
	tension resistanc	e, <u>5.8</u>	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123	
Steel, strength	n class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196	
	strength class 5.8		γMs,N	[-]			1	,5			
	tension resistand HCR, Strength cla		N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124	
Partial factor			γ <sub>Ms,N</sub>	[-]			1,87			2,86	
	Ill-out and conci						(22)				
Characteristic	bond resistance	in uncracked co	oncrete C20	)/25 in dia	mond dril	led holes	(DD)				
Temperature	I: 24°C/40°C	Dry, wet concrete or			14	14	13	12	12	11	
range	II: 50°C/72°C	flooded bore	<sup>τ</sup> Rk,ucr,100	[N/mm²]	11	10	10	9,5	9,0	8,5	
	III:60°C/80°C				5,5	5,0	4,5	4,5	4,5	4,0	
Reduction fact	or ψ <sup>0</sup> sus,100 in ι	uncracked cond	rete C20/2	5 in diamo	nd drilled	holes (D	D)				
	I: 24°C/40°C	Dry, wet					0,	73			
Temperature range	II: 50°C/72°C	concrete or flooded bore	$\Psi^0$ sus,100	[-]			0,	70			
	III:60°C/80°C	hole					0,	72			
Increasing fact	tors for concrete	≤ C50/60	Ψc	[-]	(f <sub>ck</sub> / 20) <sup>0,2</sup>						
		> C50/60	ΨC	LJ		,2					
Characteristic the concrete st	bond resistance of trength class	depending on	<sup>τ</sup> Rk,	ucr,100 =		ψ	c <sup>•τ</sup> Rk,ucr	,100,(C20/2	25)		
Concrete con	ne failure or Spli	tting									
Relevant para							see Ta	able C2			
Installation fa			1					0			
			γinst	[-]	1	2	I		4		
for dry and wet concrete (DD)       Yinst       [-]       1,0         for flooded bore hole (DD)       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.         2) For IG-M20 strength class 50 is valid											
Chemofast Injection system EP 1000 for concrete       Anne         Performances       Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (Internal threaded anchor rod)       Anne											



Internal threaded anchor rods				IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure without lever arm <sup>1)</sup>									
Characteristic shear resistance,	5.8	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γ <sub>Ms,V</sub>	[-]				1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		V <sup>0</sup> Rk,s	[kN]	7	13	20	30	55	40
Partial factor		γ <sub>Ms,V</sub>	[-]			1,56			2,38
Ductility factor		k <sub>7</sub>	[-]				1,0		
Steel failure with lever arm <sup>1)</sup>									
Characteristic bending moment,	5.8	M <sup>0</sup> Rk,s	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γ <sub>Ms,V</sub>	[-]				1,25		
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	11	26	52	92	233	456
Partial factor		γ <sub>Ms,V</sub>	[-]			1,56			2,38
Concrete pry-out failure									
Factor		k <sub>8</sub>	[-]				2,0		
Installation factor		γ <sub>inst</sub>	[-]				1,0		
Concrete edge failure		-		1					
Effective length of fastener		۱ <sub>f</sub>	[mm]		min	(h <sub>ef</sub> ; 12 • d	d <sub>nom</sub> )		min(h <sub>ef</sub> ; 300mm
Outside diameter of fastener		d <sub>nom</sub>	[mm]	10	12	16	20	24	30
Installation factor		γ <sub>inst</sub>	[-]			1	1,0	1	
<ol> <li>Fastenings (incl. nut and washe The characteristic tension resist</li> <li>For IG-M20 strength class 50 is</li> </ol>	ance for								
Chemofast Injection system	ו EP 10	00 for co	ncrete					An	inex C 12



Table C13:	Characte for a wor					load	s un	der s	static	and	qua	si-st	atic a	actio	n
Reinforcing bar				Ø 8	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	on	N <sub>Rk,s</sub>	[kN]					-	A <sub>s</sub> ·	f <sub>uk</sub> 1)					
Cross section area		A <sub>s</sub>	[mm <sup>2</sup> ]	50	79	113	154	201	314		491	616	804	1018	1256
Partial factor		γ <sub>Ms,N</sub>	[-]						1,4	4 <sup>2)</sup>					
Combined pull-out															
Characteristic bond		n uncracked	d concret	e C20	/25 in	hamm	er (HI	D) and	comp	presse	d air d	rilled I	noles (	CD)	
				16	16	16	16	16	16	15	15	15	15	15	15
	concrete or flooded	<sup>7</sup> Rk,ucr	[N/mm <sup>2</sup> ]	12	12	12	12	12	12	12	12	11	11	11	11
HI:60°C/80°C				5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	4,5	4,5
Characteristic bond	resistance in	n uncracked	d concret	e C20	/25 in	hamm	er dril	led ho	les wi	th holl	ow dri	ll bit (H	HDB)		
α <u>I: 24°C/40°C</u>	Dry, wet			14	14	13	13	13	13	13	13	13	13		
				12	12	12	11	11	11	11	11	11	11		
D <sub>0</sub> 08/D <sub>0</sub> 09 III: 24 <sub>0</sub> C/40 <sub>0</sub> C		<sup>7</sup> Rk,ucr	[N/mm <sup>2</sup> ]	5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	3	3)
<u>E 1: 24°C/40°C</u> <u>II: 50°C/72°C</u>	nooded	,		13 11	13	13 11	13 11	13 11	13 11	13 11	13	13 11	13 11		
H: 60°C/80°C	bore hole			5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0		
Characteristic bond	resistance ir	n cracked c	oncrete (	,				, <u>'</u>		· ·		· ·	· ·	holes (	(CD)
and in hammer drill									· · ·	· ·					, , 
¦⊹ ຫຼ]: 24°C/40°C				7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5		
d a b a b a b a b a b a b a b a b a b a	concrete or flooded	<sup>τ</sup> Rk,cr	[N/mm <sup>2</sup> ]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	] 3	3)
<sup>₩</sup> <sup>™</sup> III:60°C/80°C	nooueu	,		4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	1	
Reduction factor $\psi^{C}$ holes (CD) and in h					hamm	ier dril	led ho	les (H	D), co	mpres	sed ai	r drille	d		
l: 24°C/40°C	Dry, wet			0,80											
	and	ψ <sup>0</sup> sus	[-]						0.	68					
<u>та</u> ш:60°С/80°С	flooded	r sus													
										70					
	≤ C50/60	Ψc	[-]						(f <sub>ck</sub> / 2	20) <sup>0,1</sup>					
	> C50/60								1	,1					
Characteristic bond depending on the c		τ	Rk,ucr =					$\psi_{\textbf{C}}$	• <sup>τ</sup> Rk,u	icr,(C20	)/25)				
strength class	Uncrete		<sup>τ</sup> Rk,cr =					$\Psi_{c}$	• <sup>τ</sup> Rk,	cr,(C20	/25)				
Concrete cone fail	ure or Splitt	ting							-						
Relevant parameter	r							5	see Ta	able C	2				
Installation factor	• •	D)													
for dry and wet con		γinst	[-]						,0						,2
for flooded bore hol	-			Jaa ba				1	,2					3	3)
2) in absence of na	<ol> <li>f<sub>uk</sub> shall be taken from the specifications of reinforcing bars</li> <li>in absence of national regulation</li> <li>no performance assessed</li> </ol>														
Chemofast Inje	ction syste	em EP 100	0 for co	oncre	te										
Performances Characteristic va for a working life	d quas	si-stati	c acti	on				Ar	nex	C 13	}				



Table C14:	Characte for a wor					load	s un	der s	tatio	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			I														
Characteristic tension resistance	on	N <sub>Rk,s</sub>	[kN]						A <sub>s</sub> •	f <sub>uk</sub> 1)							
Cross section area		As	[mm <sup>2</sup> ]	50	79	113	154	201	314	452	491	616	804	1018	1256		
Partial factor		γ <sub>Ms,N</sub>	[-]						1,	42)							
Combined pull-out	t and concre	ete failure															
Characteristic bond	resistance ir	n uncracked	d concret	e C20	/25 in	hamm	er (Hl	D) and	comp	presse	d air d	rilled I	noles (	CD)			
¦ I: 24°C/40°C	Dry, wet			16	16	16	16	16	16	15	15	15	15	15	15		
	concrete or	<sup>7</sup> Rk,ucr,100	[N/mm <sup>2</sup> ]	12	12	12	12	12	12	12	12	11	11	11	11		
<sup>₩</sup> <sup>™</sup> III:60°C/80°C				5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	4,5	4,5		
Characteristic bond		n uncracked	d concret										,	,	,		
1. 2400/4000				14	14	13	13	13	13	13	13	13	13				
	Dry or wet concrete			12	12	12	11	11	11	11	11	11	11				
D <sub>0</sub> 08/D <sub>0</sub> 09 III: 60	CONCIELE	<sup>τ</sup> Rk,ucr,100	[N/mm <sup>2</sup> ]	5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0	3)			
<u>อ</u> ัฐ <u>I: 24°C/40°C</u>	flooded	*RK,UCF, 100	[1.4/11111]	13	13	13	13	13	13	13	13	13	13		<i>,</i>		
<u>∎</u> <u>II: 50°C/72°C</u>	bore hole			11	11	11	11	11	11	11	11	11	11				
111.00*0/80*0				5,5	5,5	5,5	5,5	5,5	5,5	5,0	5,0	5,0	5,0				
Characteristic bond and in hammer drill	ed holes with						arilied		s (HD)	, comp	resse		irilied r	noles (	CD)		
	Dry, wet			6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5				
i: 24°C/40°C E E E II: 50°C/72°C III:60°C/80°C	concrete or flooded	<sup>τ</sup> Rk,cr,100	[N/mm <sup>2</sup> ]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	3)			
H:60°C/80°C				4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5				
Reduction factor $\psi^{C}$ drilled holes (CD) a								amme	r drille	ed hole	s (HD	), com	presse	ed air			
¦. പി: 24°C/40°C			[-]	0,80													
	concrete or	$\Psi^0$ sus,100		0,68													
<sup>™</sup> <sup>™</sup> III:60°C/80°C	flooded bore hole			0,70													
Interedening rubiere	≤ C50/60	Ψc	[-]						(f <sub>ck</sub> / )	20) <sup>0,1</sup>							
for concrete	> C50/60	ΨC		1,1													
Characteristic bond		τ <sub>Bk</sub>		Ψc <sup>•</sup> <sup>τ</sup> Rk,ucr,100,(C20/25)													
depending on the co	oncrete																
strength class Concrete cone fail	uro or Splitt		,cr,100 =	Ψ <b>c</b> • <sup>τ</sup> Rk,cr,100,(C20/25)													
Relevant parameter		ing		see Table C2													
Installation factor		<b>CD</b> )									-						
for dry and wet cond								1	,0					1	2		
for flooded bore hol		γinst	[-]						,2					3			
<sup>1)</sup> f <sub>uk</sub> shall be taker	n from the spe	ecifications of	of reinforc	ing ba	rs												
2) in absence of na	tional regulati	on															
<sup>3)</sup> no performance	assessed																
Chemofast Inje	ction syste	em EP 100	0 for co	oncre	te												
<b>Performances</b> Characteristic values of tension loads under static and guasi-static action										Annex C 14							
for a working life	of 100 years	s (reinforcir	ng bar)														



Table C15:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic a	actio	n	
Reinforcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40	
Steel failure																
Characteristic tensi resistance	ion	N <sub>Rk,s</sub>	[kN]						A <sub>s</sub> .	f <sub>uk</sub> 1)						
Cross section area		A <sub>s</sub>	[mm²]	50	79	113	154	201	314		491	616	804	1018	1256	
Partial factor		γ <sub>Ms,N</sub>	[-]						1,	42)						
Combined pull-ou																
Characteristic bond resistance in uncracked concret																
en 1: 24°C/40°C	C concrete or flooded	<sup>τ</sup> Rk,ucr		14	13	13	13	12	12	11	11	11	11	11	10	
L: 24°C/40°C and a de transformed to the second se			[N/mm²]		11	10	10	10	9,5	9,5	9,5	9,0	9,0	8,5	8,5	
				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 $\psi^0$	<sup>0</sup> sus in uncra	cked concr	ete C20/2	25 in o	diamor	nd drill	ed ho	es (DI	D)							
entre de l: 24°C/40°C	jory, wei			0,77												
L: 24°C/40°C and a constraints L: 24°C/40°C L: 50°C/72°C II: 50°C/72°C III: 60°C/80°C	Jilooded	$\Psi^0$ sus	[-]	0,72												
- III:60°C/80°C	bore hole			0,72												
Increasing factors	≤ C50/60	Ψc,ucr	[-]					(f <sub>ck</sub> / 20) <sup>0,2</sup>								
for concrete	> C50/60	, 001		1,2												
Characteristic bond resistance depending on the concrete τ <sub>Rk,ucr</sub> = strength class			Rk,ucr =	Ψc,ucr <sup>•</sup> <sup>τ</sup> Rk,ucr,(C20/25)												
Concrete cone fai	-	ting														
Relevant paramete								5	see la	able C	2					
Installation factor for dry and wet con		1		1,0 1,2												
for flooded bore ho		γ <sub>inst</sub>	[-]	1,2 1,4										3		
<sup>1)</sup> $f_{uk}$ shall be take		ecifications o	of reinforc	i na ba		, <b>_</b>					,.				/	
<ul> <li><sup>2)</sup> in absence of na</li> <li><sup>3)</sup> no performance</li> </ul>	ational regulat															
Chemofast Inje	ection syste	em EP 100	0 for co	oncre	te							٨	nnex	C 15		
Performances Characteristic va for a working life				tic and	d quas	si-stati	c acti	on								



Table C16:	Characte for a wor					load	s un	der s	tatic	and	qua	si-st	atic a	actio	n		
Reinforcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40		
Steel failure																	
Characteristic tensi resistance	ion	N <sub>Rk,s</sub>	[kN]		$A_{s} \cdot f_{uk}^{(1)}$												
Cross section area		A <sub>s</sub>	[mm <sup>2</sup> ]	50	79	113	154	201	314		491	616	804	1018	1256		
Partial factor		γ <sub>Ms,N</sub>	[-]						1,	4 <sup>2)</sup>							
Combined pull-ou																	
Characteristic bond resistance in uncracked concret																	
l: 24°C/40°C	Dry, wet	Dry, wet			14	13	13	13	12	12	11	11	11	11	11	10	
entra	flooded	<sup>τ</sup> Rk,ucr,100	[N/mm²]		10	10	10	9,5	9,0	9,0	9,0	8,5	8,5	8,0	8,0		
⊢ <sup>©</sup> III:60°C/80°C				5,0	5,0	5,0	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0	4,0		
	0 sus,100 in u	ncracked c	oncrete (	C20/25 in diamond drilled holes (DD)													
L: 24°C/40°C and a constraints L: 24°C/40°C L: 50°C/72°C III: 60°C/80°C	Dry, wet concrete or			0,73													
II: 50°C/72°C	flooded	$\Psi^0$ sus,100	[-]	0,70													
<sup>⊕</sup> III:60°C/80°C										72	,						
Increasing factors	≤ C50/60	Ψc,ucr	[-]	(f <sub>ck</sub> / 20) <sup>0,2</sup>													
for concrete	> C50/60	+ C,UCI		1,2													
			icr,100 =	Ψc,ucr <sup>•</sup> <sup>τ</sup> Rk,ucr,100,(C20/25)													
Concrete cone fai	•	ting															
Relevant paramete								5	see Ta	able C	2						
Installation factor	. ,		1	1,0 1,2													
for dry and wet con for flooded bore ho		γ <sub>inst</sub>	[-]	1,0										<u> </u>	,2 3)		
<sup>1)</sup> f <sub>uk</sub> shall be take			l of reinford	l Sing ba		,2					, <b>-</b>				·)		
<ul> <li>2) in absence of na</li> <li>3) no performance</li> </ul>	ational regulat				15												
Chemofast Inje	ection syste	em EP 100	0 for co	oncre	te							۸.	nnex	C 16			
<b>Performances</b> Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (reinforcing bar)										AI	mex						



Table C17: Character a working						unc	ler s	tatio	and	qua	si-sta	tic ad	ction	for
Reinforcing bar			Ø 8	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 <sup>0</sup> Rk,s	$R_{k,s}$ [kN] $0.5 \cdot A_s \cdot f_{uk}^{(1)}$								uk 1)				
Cross section area	A <sub>s</sub>	[mm²]	50	50 79 113 154 201 314 452 491 616 804 1018 125								1256		
Partial factor	γMs,V	[-]		1,5 <sup>2)</sup>										
Ductility factor	k <sub>7</sub>	[-]							1,0					
Steel failure with lever arm	•													
Characteristic bending moment	M <sup>0</sup> Rk,s	[Nm]						1,2 •	W <sub>el</sub> ·	f <sub>uk</sub> 1)				
Elastic section modulus	W <sub>el</sub>	[mm <sup>3</sup> ]	50	98	170	269	402	785	1357	1534	2155	3217	4580	6283
Partial factor	γ <sub>Ms,V</sub>	[-]							1,5 <sup>2)</sup>					
Concrete pry-out failure														
Factor	ctor k <sub>8</sub> [-] 2,0													
Installation factor $\gamma_{inst}$ [-] 1,0														
Concrete edge failure	1													
Effective length of fastener	۱ <sub>f</sub>	[mm]		I	nin(h	<sub>əf</sub> ; 12	• d <sub>noi</sub>	n)			min(ł	n <sub>ef</sub> ; 300	)mm)	
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	24	25	28	32	36	40
Installation factor	γinst	[-]							1,0					
<ol> <li>f<sub>uk</sub> shall be taken from the spec</li> <li>in absence of national regulation</li> </ol>		f reinford	ing ba	ars										
Chemofast Injection systen	n EP 100	0 for co	oncre	ete										
<b>Performances</b> Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (reinforcing bar)									А	nnex	C 17	7		



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

ar	illea noies (	JD) and in na	mmer	ariilea	noles	with r	WOIIO			5)
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete	under static and	d quasi-static act	tion for a	a workin	g life of	50 and	100 yeai	rs		
Temperature range I	· δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
Temperature range I	l: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
່50°C/72°Cັ	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Temperature range II	I: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Cracked concrete un	der static and q	uasi-static actio	n for a w	orking l	ife of 50	and 10	0 years			
Temperature range I	: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171
Temperature range I	l: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229
Temperature range II	I: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
0°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229
1) Calculation of the di	splacement: δ <sub>N0</sub>	$\sigma = \delta_{N0} - factor \cdot \tau;$	$\delta_{N\infty} = \delta_{N}$	N∞-factor	·τ; τ:	action be	ond stres	s for tens	sion	
	_		_		_					
	splacements	s under tensio	1	<sup>1</sup> ) in d	iamon	d drill	ed hole	<u>es (DD</u>	)	
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Cracked and uncracl	ked concrete un	der static and qu	lasi-stat	ic actior	n for a w	orking I	ife of 50	years		
Temperature range I:	: $\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025
Temperature range I	l: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070
Temperature range II	I: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070
Uncracked concrete		1	1	1	<u> </u>		1			
Temperature range I		[mm/(N/mm <sup>2</sup> )]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027
Temperature range I		[mm/(N/mm <sup>2</sup> )]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051
Temperature range II	I: δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup> )]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051
<ol> <li>Calculation of the di</li> </ol>	splacement: δ <sub>N</sub>	$\delta = \delta_{N0}$ -factor $\cdot \tau$ ;	$\delta_{N^{\infty}} = \delta_{1}$	<sub>N∞</sub> -factor	• τ; τ:	action be	ond stres	s for tens	sion	
Table C20: Di	splacements	s under shear	· load <sup>1)</sup>	for all	drillin	ig met	hods			
Threaded rod	-		M8	M10	M12	M16	M20	M24	M27	M30
Uncracked and crack	ked concrete un	der static and qu	iasi-stat	ic action	n for a w	orking l	ife of 50	and 100	) years	
All temperature	δ <sub>V0</sub> -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
<sup>1)</sup> Calculation of the di	••••	$\delta = \delta v_0$ -factor · V;	,	v∞-factor	,		hear load	,		<u> </u>

# Chemofast Injection system EP 1000 for concrete

#### Performances

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



Table C22: Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quastTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$	0,029 0,029 0,039 0,049 0,039 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fa <b>IG-M6</b> si-static a 0,012 0,014 0,053 0,014 0,053	0,030           0,030           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,072           0,122           0,096           0,163           0,096           0,163           actor + τ;           in diam           IG-M8           o,012           0,014           0,055           0,014           0,055	0,033           0,033           0,044           0,055           0,044           0,055           50 and 10           0,074           0,074           0,074           0,074           0,074           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,035 0,035 0,047 0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,016 0,016 0,062	<b>6 (DD)</b> IG-M16	0,041 0,055 0,070 0,055 0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229
Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0}$ -factor $\tau$ ; $\delta_{No}$ -factor $\tau$ ; $\delta_{No}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range	0,029 0,029 0,039 0,049 0,039 0,049 <b>for a work</b> 0,071 0,115 0,095 0,154 0,095 0,154 0,095 0,154 <b>i load</b> <sup>1)</sup> <b>i G-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 <b>on for a work</b> 0,012 0,012 0,012 0,012 0,012 0,021	0,030           0,030           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,040           0,051           0,072           0,122           0,096           0,163           0,096           0,163           actor + τ;           in diam           IG-M8           o,012           0,012           0,014           0,055           0,014           0,055           o,012	0,033           0,033           0,044           0,055           0,044           0,055           50 and 10           0,074           0,074           0,074           0,074           0,074           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,035 0,035 0,047 0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,016 0,016 0,062	0,038 0,051 0,064 0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 ior tension <b>i (DD)</b> <b>i G-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016	0,041 0,055 0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229
24°C/40°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{No^-}$ factor[mm/(N/mm²)]Cracked concrete under static and quasi-static action for Temperature range II: 24°C/40°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{No^-}$ factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{No^-}$ factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 24°C/40°C $\delta_{No^-}$ factor[mm/(N/mm²)]24°C/40°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{No^-}$ factor[mm/(N/mm²)]Temperature range III: 60°C/80°C <th>0,039 0,049 0,049 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 <math>\delta_{N∞} = \delta_{N∞}</math>-fi <b>I load</b><sup>1</sup>) <b>IG-M6</b> si-static a 0,012 0,014 0,053 on for a work 0,012 0,012 0,012 0,012 0,012 0,012 0,012 0,021</th> <th>0,040           0,051           0,040           0,051           0,051           cing life of           0,072           0,122           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           ctor - τ;           in diam           iG-M8           oction for a           0,012           0,014           0,055           0,014           0,055           orking life           0,012</th> <th>0,044           0,055           0,044           0,055           50 and 10           0,074           0,074           0,099           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           0,0172           0,013           0,020           0,015           0,058           0,015           0,058           0,015           0,058           0,010 yea</th> <th>0,047 0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,007 0,181 0,102 0,181 0,102 0,181 0,007 0,181 0,007 0,181 0,007 0,181 0,007 0,181 0,002 0,001 0,007 0,002 0,007 0,002 0,000 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000000</th> <th>0,051 0,064 0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 0,106 0,189 tor tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016</th> <th>0,055 0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229</th>	0,039 0,049 0,049 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 $\delta_{N∞} = \delta_{N∞}$ -fi <b>I load</b> <sup>1</sup> ) <b>IG-M6</b> si-static a 0,012 0,014 0,053 on for a work 0,012 0,012 0,012 0,012 0,012 0,012 0,012 0,021	0,040           0,051           0,040           0,051           0,051           cing life of           0,072           0,122           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           ctor - τ;           in diam           iG-M8           oction for a           0,012           0,014           0,055           0,014           0,055           orking life           0,012	0,044           0,055           0,044           0,055           50 and 10           0,074           0,074           0,099           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           0,0172           0,013           0,020           0,015           0,058           0,015           0,058           0,015           0,058           0,010 yea	0,047 0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,007 0,181 0,102 0,181 0,102 0,181 0,007 0,181 0,007 0,181 0,007 0,181 0,007 0,181 0,002 0,001 0,007 0,002 0,007 0,002 0,000 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,002 0,001 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000000	0,051 0,064 0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 0,106 0,189 tor tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016	0,055 0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229 0,110 0,229
Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Cracked concrete under static and quasi-static action for Temperature range II: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: 8/N0-factor $\delta_{N0}$ -factor $mm/(N/mm²)$ ]Temperature range II: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)] </td <td>0,049 0,039 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 0,095 0,154 0,0154 0,0154 0,012 0,012 0,014 0,053 on for a work 0,012 0,012 0,012 0,012 0,012 0,012 0,021</td> <td>0,051           0,040           0,051           cing life of           0,072           0,122           0,096           0,163           0,096           0,163           actor + τ;           in diam           IG-M8           o,012           0,012           0,014           0,055           orking life           0,012</td> <td>0,055           0,044           0,055           50 and 10           0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           τ: action b           ond drill           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea</td> <td>0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,012 0,018 <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,062</td> <td>0,064 0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016</td> <td>0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,025 0,018 0,070 0,018</td>	0,049 0,039 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 0,095 0,154 0,0154 0,0154 0,012 0,012 0,014 0,053 on for a work 0,012 0,012 0,012 0,012 0,012 0,012 0,021	0,051           0,040           0,051           cing life of           0,072           0,122           0,096           0,163           0,096           0,163           actor + τ;           in diam           IG-M8           o,012           0,012           0,014           0,055           orking life           0,012	0,055           0,044           0,055           50 and 10           0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           τ: action b           ond drill           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,059 0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,012 0,018 <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,062	0,064 0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016	0,070 0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,025 0,018 0,070 0,018
$50^{\circ}$ C/72°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}$ C/80°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Cracked concrete under static and quasi-static action for Temperature range I: $24^{\circ}$ C/40°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}$ C/72°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}$ C/80°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}$ C/80°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $24^{\circ}$ C/40°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $24^{\circ}$ C/40°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $24^{\circ}$ C/40°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $24^{\circ}$ C/40°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}$ C/72°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}$ C/72°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}$ C/80°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}$ C/72°C $\delta_{N\sigma}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}$ C/72°C<	0,039 0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fand <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 on for a work 0,012 0,012 0,012 0,012 0,012 0,012 0,012 0,021	0,040           0,051           cing life of           0,072           0,122           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           0,096           0,163           0,0163           actor - τ;           in diam           iction for a           0,012           0,014           0,055           0,014           0,055           orking life           0,012	0,044           0,055           50 and 10           0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           τ: action br           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,047 0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,012 <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,062	0,051 0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 tor tension tension tension tension 0,014 0,023 0,016 0,065 0,016	0,055 0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,025 0,018 0,070 0,018
Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Cracked concrete under static and quasi-static action for Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Uncracked concrete under static and quasi-static actionTemperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $50^{\circ}C/72^{\circ}C$ <td< td=""><td>0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 δ<sub>N∞</sub> = δ<sub>N∞</sub>-fa <b>10ad<sup>1</sup></b>) <b>IG-M6</b> si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a wo 0,012 0,021</td><td>0,051 cing life of 0,072 0,122 0,096 0,163 0,096 0,163 actor · τ; in diam IG-M8 ction for 0,012 0,012 0,014 0,055 0,014 0,055 0,014 0,055 0,012</td><td>0,055           50 and 10           0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           τ: action br           Drd drill           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea</td><td>0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,012 <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,016 0,062</td><td>0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 for tension <b>c (DD)</b> IG-M16 ears 0,014 0,023 0,016 0,065 0,016</td><td>0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,025 0,015 0,025 0,018 0,070</td></td<>	0,049 for a work 0,071 0,115 0,095 0,154 0,095 0,154 δ <sub>N∞</sub> = δ <sub>N∞</sub> -fa <b>10ad<sup>1</sup></b> ) <b>IG-M6</b> si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a wo 0,012 0,021	0,051 cing life of 0,072 0,122 0,096 0,163 0,096 0,163 actor · τ; in diam IG-M8 ction for 0,012 0,012 0,014 0,055 0,014 0,055 0,014 0,055 0,012	0,055           50 and 10           0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,099           0,172           0,0172           τ: action br           Drd drill           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,059 0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,012 <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,016 0,062	0,064 0,079 0,142 0,106 0,189 0,106 0,189 0,106 0,189 for tension <b>c (DD)</b> IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,070 0,082 0,171 0,110 0,229 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,025 0,015 0,025 0,018 0,070
$60^{\circ}$ C/80°C $\overline{\delta_{N\infty}}$ -factor[mm/(N/mm <sup>2</sup> )]Cracked concrete under static and quasi-static action for Temperature range I: $24^{\circ}$ C/40°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range II: $50^{\circ}$ C/72°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]1) Calculation of the displacement: $\delta_{N0}$ -factor $\overline{\delta_{N0}}$ -factor + $\tau$ ; $\delta_{N0}$ -factor $\overline{\delta_{N0}}$ -factor + $\tau$ ; $\delta_{N0}$ -factor1) Calculation of the displacement: $\delta_{N0}$ -factor $\overline{\delta_{N0}}$ -factor + $\tau$ ; $\delta_{N0}$ -factor $\overline{\delta_{N0}}$ -factorInternal threaded anchor rodsImm/(N/mm <sup>2</sup> )]Cracked and uncracked concrete under static and quasi $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range II: $24^{\circ}$ C/40°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Uncracked concrete under static and quasi-static actionTemperature range III: $24^{\circ}$ C/40°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $20^{\circ}$ C/72°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: $60^{\circ}$ C/80°C $\overline{\delta_{N0}}$ -factor[mm/(N/mm <sup>2</sup> )] </td <td>for a work 0,071 0,115 0,095 0,154 0,095 0,154 <math>\delta_{N\infty} = \delta_{N\infty}</math>-fand <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 <b>on for a wo</b> 0,012 0,012 0,012 0,012 0,012 0,012 0,021</td> <td>cing life of           0,072           0,122           0,096           0,163           0,096           0,163           actor • τ;           in diam           IG-M8           o,012           0,012           0,012           0,014           0,055           orking life           0,012</td> <td>50 and 10 0,074 0,128 0,099 0,172 0,099 0,172 τ: action b 0 0,017 1G-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,015 0,058 0,015</td> <td>0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,118 <b>Ed holes</b> <b>IG-M12</b> <b>ife of 50 y</b> 0,014 0,022 0,016 0,062</td> <td>0,079 0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> IG-M16 ears 0,014 0,023 0,016 0,065 0,016</td> <td>0,082 0,171 0,110 0,229 0,110 0,229 IG-M20 0,015 0,015 0,025 0,018 0,070</td>	for a work 0,071 0,115 0,095 0,154 0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fand <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 <b>on for a wo</b> 0,012 0,012 0,012 0,012 0,012 0,012 0,021	cing life of           0,072           0,122           0,096           0,163           0,096           0,163           actor • τ;           in diam           IG-M8           o,012           0,012           0,012           0,014           0,055           orking life           0,012	50 and 10 0,074 0,128 0,099 0,172 0,099 0,172 τ: action b 0 0,017 1G-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,015 0,058 0,015	0 years 0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,118 <b>Ed holes</b> <b>IG-M12</b> <b>ife of 50 y</b> 0,014 0,022 0,016 0,062	0,079 0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,082 0,171 0,110 0,229 0,110 0,229 IG-M20 0,015 0,015 0,025 0,018 0,070
Temperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: <td>0,071 0,115 0,095 0,154 0,095 0,154 <math>\delta_{N∞} = \delta_{N∞}</math>-fi <b>I load</b><sup>1)</sup> <b>IG-M6</b> si-static a 0,012 0,014 0,053 0,014 0,053 on for a wo 0,021</td> <td>0,072         0,122         0,096         0,163         0,096         0,163         0,096         0,163         actor • τ;         in diam         IG-M8         oction for a         0,012         0,014         0,055         0,014         0,055         orking life         0,012</td> <td>0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           τ: action br           ond drille           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea</td> <td>0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,102 0,181 0,018 <b>ed holes</b> <b>iG-M12</b> <b>ife of 50 y</b> 0,014 0,022 0,016 0,062 0,016 0,062</br></br></br></br></td> <td>0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016</td> <td>0,171 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,015 0,025 0,018 0,070 0,018</td>	0,071 0,115 0,095 0,154 0,095 0,154 $\delta_{N∞} = \delta_{N∞}$ -fi <b>I load</b> <sup>1)</sup> <b>IG-M6</b> si-static a 0,012 0,014 0,053 0,014 0,053 on for a wo 0,021	0,072         0,122         0,096         0,163         0,096         0,163         0,096         0,163         actor • τ;         in diam         IG-M8         oction for a         0,012         0,014         0,055         0,014         0,055         orking life         0,012	0,074           0,128           0,099           0,172           0,099           0,172           0,099           0,172           τ: action br           ond drille           IG-M10           a working I           0,013           0,020           0,015           0,058           0,015           0,058           of 100 yea	0,076 0,135 0,102 0,181 0,102 0,181 0,102 0,181 	0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016	0,171 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,015 0,025 0,018 0,070 0,018
$24^{\circ}C/40^{\circ}C$ $\delta_{N\infty}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0}$ -factor + $\tau$ ; $\delta$ Table C22: Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quaseTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Te	0,115 0,095 0,154 0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fands <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 0,014 0,053 <b>on for a wo</b> 0,012 0,012 0,012	0,122 0,096 0,163 0,096 0,163 actor τ; in diam IG-M8 ction for 0,012 0,012 0,014 0,055 0,014 0,055 0,014 0,055 0,014	0,128 0,099 0,172 0,099 0,172 τ: action b ond drill IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,015 0,058 of 100 yea	0,135 0,102 0,181 0,102 0,181 0,102 0,181 0,018 0,018 0,014 0,014 0,014 0,016 0,062 0,016 0,062	0,142 0,106 0,189 0,106 0,189 for tension <b>5 (DD)</b> <b>IG-M16</b> <b>ears</b> 0,014 0,023 0,016 0,065 0,016	0,171 0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,025 0,018 0,070 0,018
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0,095 0,154 0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fand <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 0,014 0,053 <b>on for a wo</b> 0,012 0,012 0,012 0,021	0,096 0,163 0,096 0,163 actor - τ; in diam IG-M8 ction for a 0,012 0,019 0,014 0,055 0,014 0,055 0,014 0,055 0,014 0,055 0,014	0,099 0,172 0,099 0,172 τ: action b ond drill G-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,015 0,058 0,015	0,102 0,181 0,102 0,181 0,181 0,181 0,018 0,018 0,014 0,022 0,016 0,016 0,062	0,106 0,189 0,106 0,189 or tension <b>5 (DD)</b> IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,110 0,229 0,110 0,229 <b>IG-M20</b> 0,015 0,015 0,025 0,018 0,070 0,018
Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0}$ -factor · $\tau$ ; $\delta$ Table C22: Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quastTemperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0}$ = $\delta_{N0}$ -factor · $\tau$ ; $\delta_{N0}$	0,154 0,095 0,154 $\delta_{N∞} = \delta_{N∞}$ -fa <b>I load</b> <sup>1)</sup> <b>IG-M6</b> si-static a 0,012 0,012 0,014 0,053 on for a wo 0,012 0,012 0,012	0,163 0,096 0,163 actor - τ; in diam IG-M8 ction for 0,012 0,019 0,014 0,055 0,014 0,055 0,014 0,055 0,014	0,172 0,099 0,172 τ: action b ond drill IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 of 100 yea	0,181 0,102 0,181 0,181 0,181 0,018 0,018 0,018 0,018 0,014 0,014 0,022 0,016 0,016 0,062	0,189 0,106 0,189 for tension 6 (DD) IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,229 0,110 0,229 IG-M20 0,015 0,025 0,018 0,070 0,018
$50^{\circ}C/72^{\circ}C$ $\delta_{N\infty}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N\infty}$ -factor $\delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N0}$ -factor $\cdot \tau$ ; $\delta$ Table C22:Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quaseTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range III: $60^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$	0,095 0,154 $\delta_{N\infty} = \delta_{N\infty}$ -fand <b>IG-M6</b> <b>si-static a</b> 0,012 0,012 0,014 0,053 0,014 0,053 <b>on for a wo</b> 0,012 0,012 0,012 0,012	0,096 0,163 actor · τ; in diam IG-M8 ction for 0,012 0,019 0,014 0,055 0,014 0,055 0,014 0,055 0,014	0,099 0,172 τ: action b 0nd drill IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,015 0,058 0,015	0,102 0,181 000 stress f ed holes ife of 50 y 0,014 0,022 0,016 0,062 0,016 0,062	0,106 0,189 for tension (DD) IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,110 0,229 IG-M20 0,015 0,025 0,018 0,070 0,018
Internal threaded anchorInternal threaded anchorImm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$ Table C22: Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quasTemperature range I: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range II: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range III: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Uncracked concrete under static and quasi-static actionTemperature range II: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range II: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range III: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range III: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm²)]$ Temperature range III: $\delta_{N0}$ -factor $[mm/(N/mm²)]$ $1$ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N0}$	0,154 $\delta_{N\infty} = \delta_{N\infty}$ -find the formula is the	0,163 actor · τ; in diam IG-M8 ction for a 0,012 0,014 0,014 0,055 0,014 0,055 orking life 0,012	0,172 τ: action b ond drill IG-M10 a working l 0,013 0,020 0,015 0,058 0,015 0,058 o,015 0,058 o,015	0,181 0,181 0nd stress f ed holes ife of 50 y 0,014 0,022 0,016 0,062 0,016 0,062	0,189 or tension (DD) IG-M16 ears 0,014 0,023 0,016 0,065 0,016	0,229 IG-M20 0,015 0,025 0,018 0,070 0,018
$60^{\circ}C/80^{\circ}C$ $\delta_{N\infty}$ -factor[mm/(N/mm^2)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$ <b>Table C22:Displacements under tension</b> Internal threaded anchor rods <b>Cracked and uncracked concrete under static and quas</b> Temperature range I: $\delta_{N0}$ -factor[mm/(N/mm^2)] $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)]Temperature range II: $\delta_{N0}$ -factor[mm/(N/mm^2)] $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)]Temperature range III: $\delta_{N0}$ -factor[mm/(N/mm^2)] $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)]Uncracked concrete under static and quasi-static actionTemperature range II: $\delta_{N0}$ -factor[mm/(N/mm^2)] $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)]Temperature range II: $\delta_{N0}$ -factor[mm/(N/mm^2)] $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)] $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)]Temperature range III: $\delta_{N0}$ -factor[mm/(N/mm^2)] $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor[mm/(N/mm^2)] $1)$ Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$	$\delta_{N\infty} = \delta_{N\infty}$ -fa <b>IG-M6</b> <b>si-static a</b> 0,012 0,019 0,014 0,053 0,014 0,053 <b>on for a we</b> 0,012 0,012 0,021	actor τ; in diam IG-M8 action for 0,012 0,019 0,014 0,055 0,014 0,055 orking life 0,012	τ: action b ond drill IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 of 100 yea	IG-M12           ife of 50 y           0,014           0,022           0,016           0,062           0,062	IG-M16           ears           0,014           0,023           0,016           0,016	IG-M20 0,015 0,025 0,018 0,070 0,018
Table C22:Displacements under tensionInternal threaded anchor rodsCracked and uncracked concrete under static and quastTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factorTemperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factorTemperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factorTemperature range II: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factorTemperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factorTemperature range III: $60^{\circ}C/80^{\circ}C$ <td>IG-M6 si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a we 0,012 0,021</td> <td>in diam IG-M8 ction for a 0,012 0,019 0,014 0,055 0,014 0,055 orking life 0,012</td> <td>IG-M10         IG-M10         a working I         0,013         0,020         0,015         0,058         0,015         0,058         0,058         0,058         0,058         0,058         0,058         0,058</td> <td>ed holes IG-M12 ife of 50 y 0,014 0,022 0,016 0,062 0,062 0,062</br></br></td> <td><ul> <li>(DD)</li> <li>IG-M16</li> <li>ears</li> <li>0,014</li> <li>0,023</li> <li>0,016</li> <li>0,065</li> <li>0,016</li> </ul></td> <td>0,015 0,025 0,018 0,070 0,018</td>	IG-M6 si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a we 0,012 0,021	in diam IG-M8 ction for a 0,012 0,019 0,014 0,055 0,014 0,055 orking life 0,012	IG-M10         IG-M10         a working I         0,013         0,020         0,015         0,058         0,015         0,058         0,058         0,058         0,058         0,058         0,058         0,058	ed holes IG-M12 ife of 50 y 0,014 0,022 	<ul> <li>(DD)</li> <li>IG-M16</li> <li>ears</li> <li>0,014</li> <li>0,023</li> <li>0,016</li> <li>0,065</li> <li>0,016</li> </ul>	0,015 0,025 0,018 0,070 0,018
Internal threaded anchor rodsCracked and uncracked concrete under static and quastTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\tau$ ; $\delta_{N0}$ -factor $\delta_{N0}$ -factor $\tau$ ;	IG-M6 si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a we 0,012 0,021	IG-M8           o,012           0,019           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014	IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,058 of 100 yea	IG-M12 ife of 50 y 0,014 0,022 0,016 0,062 0,016 0,062	IG-M16           ears           0,014           0,023           0,016           0,065           0,016	0,015 0,025 0,018 0,070 0,018
Internal threaded anchor rodsCracked and uncracked concrete under static and quastTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\tau$ ; $\delta_{N0}$ -factor $\delta_{N0}$ -factor $\tau$ ;	IG-M6 si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a we 0,012 0,021	IG-M8           o,012           0,019           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014           0,055           0,014	IG-M10 a working I 0,013 0,020 0,015 0,058 0,015 0,058 0,058 of 100 yea	IG-M12 ife of 50 y 0,014 0,022 0,016 0,062 0,016 0,062	IG-M16           ears           0,014           0,023           0,016           0,065           0,016	0,015 0,025 0,018 0,070 0,018
Cracked and uncracked concrete under static and quasticationTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N0}$	si-static a 0,012 0,019 0,014 0,053 0,014 0,053 on for a wo 0,012 0,021	Instant         Instant           0,012         0,012           0,019         0,014           0,055         0,014           0,055         0,014           0,055         0,014           0,055         0,014           0,055         0,014           0,055         0,014           0,055         0,012	a working l 0,013 0,020 0,015 0,058 0,015 0,058 of 100 yea	ife of 50 y 0,014 0,022 0,016 0,062 0,016 0,062	ears 0,014 0,023 0,016 0,065 0,016	0,015 0,025 0,018 0,070 0,018
$\begin{array}{c c} \mbox{Temperature range I:} & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ 24^{\circ}C/40^{\circ}C & \delta_{N\infty}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & 00^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Uncracked concrete under static and quasi-static action \\ \hline & Temperature range I: \\ 24^{\circ}C/40^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range II: \\ 24^{\circ}C/40^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range II: \\ 50^{\circ}C/72^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: \\ \hline & Temperature range III: \\ 60^{\circ}C/80^{\circ}C & \delta_{N0}\mbox{-}factor & [mm/(N/mm^2)] \\ \hline & Temperature range III: $	0,012 0,019 0,014 0,053 0,014 0,053 <b>on for a we</b> 0,012 0,021	0,012 0,019 0,014 0,055 0,014 0,055 0,015 0,012	0,013 0,020 0,015 0,058 0,015 0,058 of 100 yea	0,014 0,022 0,016 0,062 0,016 0,062	0,014 0,023 0,016 0,065 0,016	0,025 0,018 0,070 0,018
24°C/40°C $\delta_{N\infty}$ -factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Ducracked concrete under static and quasi-static actionTemperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Ducracked concrete under static and quasi-static actionTemperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Ducracked concrete under static and quasi-static actionTemperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\tau$ ; $\delta$	0,019 0,014 0,053 0,014 0,053 on for a wo 0,012 0,021	0,019 0,014 0,055 0,014 0,055 orking life 0,012	0,020 0,015 0,058 0,015 0,058 0,058 of 100 yea	0,022 0,016 0,062 0,016 0,062	0,023 0,016 0,065 0,016	0,025 0,018 0,070 0,018
Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static action $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static action $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor · $\tau$ ; $\delta_{N0}$	0,014 0,053 0,014 0,053 on for a we 0,012 0,021	0,014 0,055 0,014 0,055 orking life 0,012	0,015 0,058 0,015 0,058 of 100 yea	0,016 0,062 0,016 0,062	0,016 0,065 0,016	0,018 0,070 0,018
$50^{\circ}C/72^{\circ}C$ $\overline{\delta_{N\infty}}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N0}}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N0} = \delta_{N0}$ -factor $\tau$ ;	0,053 0,014 0,053 on for a wo 0,012 0,021	0,055 0,014 0,055 orking life 0,012	0,058 0,015 0,058 of 100 yea	0,062 0,016 0,062	0,065 0,016	0,070 0,018
Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range I: $24^{\circ}C/40^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range II: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $50^{\circ}C/72^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$	0,014 0,053 <b>n for a w</b> 0,012 0,021	0,014 0,055 orking life 0,012	0,015 0,058 of 100 yea	0,016 0,062	0,016	0,018
$60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N\infty}}$ -factor[mm/(N/mm^2)]Uncracked concrete under static and quasi-static actionTemperature range I: $24^{\circ}C/40^{\circ}C$ $\overline{\delta_{N0}}$ -factor[mm/(N/mm^2)]Temperature range II: $50^{\circ}C/72^{\circ}C$ $\overline{\delta_{N0}}$ -factor[mm/(N/mm^2)]Temperature range III: $50^{\circ}C/72^{\circ}C$ $\overline{\delta_{N0}}$ -factor[mm/(N/mm^2)]Temperature range III: $60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N0}}$ -factor[mm/(N/mm^2)]Temperature range III: $60^{\circ}C/80^{\circ}C$ $\overline{\delta_{N0}}$ -factor[mm/(N/mm^2)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$	0,053 n for a wo 0,012 0,021	0,055 orking life 0,012	0,058 of 100 yea	0,062		
InvoInvoInvoUncracked concrete under static and quasi-static actionTemperature range I: 24°C/40°C $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor · $\tau$ ; $\delta$	n for a wo 0,012 0,021	orking life 0,012	of 100 yea		0,065	0,070
$\begin{array}{c c} \mbox{Temperature range I:} & $$$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $$ $	0,012 0,021	0,012		rs		
$\begin{array}{c c} 24^{\circ}\text{C}/40^{\circ}\text{C} & \overline{\delta_{N\infty}}\text{-factor} & [mm/(N/mm^2)] \\ \hline \text{Temperature range II:} & \overline{\delta_{N0}}\text{-factor} & [mm/(N/mm^2)] \\ 50^{\circ}\text{C}/72^{\circ}\text{C} & \overline{\delta_{N\infty}}\text{-factor} & [mm/(N/mm^2)] \\ \hline \text{Temperature range III:} & \overline{\delta_{N0}}\text{-factor} & [mm/(N/mm^2)] \\ 60^{\circ}\text{C}/80^{\circ}\text{C} & \overline{\delta_{N\infty}}\text{-factor} & [mm/(N/mm^2)] \\ \hline 1) \text{ Calculation of the displacement:} & \overline{\delta_{N0}} = \overline{\delta_{N0}}\text{-factor} \cdot \tau; & \overline{\delta_{N0}} \\ \hline \end{array}$	0,021	-			0.044	
Temperature range II: 50°C/72°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)]Temperature range III: $\delta_{N0}$ -factor $\delta_{N0}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor · $\tau$ ; $\delta_{N0}$			0,013	0,014	0,014	0,015
50°C/72°C $\delta_{N\infty}$ -factor[mm/(N/mm²)]Temperature range III: 60°C/80°C $\delta_{N0}$ -factor[mm/(N/mm²)] $\delta_{N\infty}$ -factor[mm/(N/mm²)]1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ;	0,014		0,023	0,024	0,025	0,027
Temperature range III: $60^{\circ}C/80^{\circ}C$ $\delta_{N0}$ -factor $[mm/(N/mm^2)]$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$		0,014	0,015	0,016	0,016	0,018
$\frac{1}{60^{\circ}\text{C}/80^{\circ}\text{C}} \frac{1}{\delta_{N\infty}\text{-factor}} \frac{1}{[\text{mm}/(\text{N/mm}^2)]}$ 1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau;  \delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau;$	0,039	0,040	0,043	0,045	0,047	0,051
1) Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta$	0,014	0,014	0,015	0,016	0,016	0,018
	0,039	0,040	0,043	0,045	0,047	0,051
Table C23: Displacements under shear lo	$\delta_{N\infty} = \delta_{N\infty} - \mathbf{f}_{\alpha}$	actor $\cdot \tau$ ;	τ: action b	ond stress f	or tension	
	oad <sup>1)</sup> fo	r all dril	lina met	hods		
Internal threaded anchor rods IG-M				IG-M12	IG-M16	IG-M20
Uncracked and cracked concrete under static and quas						
S factor [		0,06	0,06	0,05	0,04	0,04
		·		-		
		),09	0,08	0,08	0,06	0,06
1) Calculation of the displacement $\delta_{V0} = \delta_{V0}$ -factor · V; $\delta$	$\delta_{V\infty} = \delta_{V\infty}$ -fa	actor · V;	V: action s	near load		
Chemofast Injection system EP 1000 for concrete	)					
Performances					Annex	C 19



Table C24:		cements u holes (CD									•			
Reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32	Ø 36	Ø 40
Uncracked con	crete under	static and q	uasi-sta	tic acti	on for	a wor	king li	fe of 5	0 and <sup>-</sup>	100 ye	ars			
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043	0,045	0,04
l: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043	0,045	0,04
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,038	0,039	0,040	0,042	0,044	0,047	0,051	0,051	0,054	0,058	0,060	0,06
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	²)] 0,047	0,049	0,051	0,053	0,055	0,059	0,065	0,065	0,068	0,072	0,074	0,079
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	²)] 0,038	0,039	0,040	0,042	0,044	0,047	0,051	0,051	0,054	0,058	0,060	0,06
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,047	0,049	0,051	0,053	0,055	0,059	0,065	0,065	0,068	0,072	0,074	0,079
Cracked concre	ete under st	atic and qua	si-static	action	for a	workir	ig life	of 50 a	nd 100	) years	5	-		
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,069	0,071	0,072	0,073	0,074	0,076	0,079	0,079	0,081	0,084		
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,115	0,122	0,128	0,135	0,142	0,155	0,171	0,171	0,181	0,194		
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,092	0,095	0,096	0,098	0,099	0,102	0,106	0,106	0,109	0,113		2)
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,154	0,163	0,172	0,181	0,189	0,207	0,229	0,229	0,242	0,260		)
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,092	0,095	0,096	0,098	0,099	0,102	0,106	0,106	0,109	0,113		
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	2)] 0,154	0,163	0,172	0,181	0,189	0,207	0,229	0,229	0,242	0,260		
<sup>1)</sup> Calculation of the displacement: $\delta_{N0} = \delta_{N0}$ -factor $\cdot \tau$ ; $\delta_{N\infty} = \delta_{N\infty}$ -factor $\cdot \tau$ ; $\tau$ : action bond stress for tension 2) No performance assessed <b>Table C25: Displacements under tension load</b> <sup>1)</sup> <b>in diamond drilled holes (DD)</b>														
		cinents u									<u>``</u>	· · ·	Ø 36	<i>α</i> 10
Reinforcing barØ 8Ø 10Ø 12Ø 14Ø 16Ø 20Ø 24Ø 25Ø 28Ø 32Ø 36Ø 40Uncracked concrete under static and quasi-static action for a working life of 50 years														
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>									0.014	0.015	0.016	0.01
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	/ <b>·</b>			· ·	· ·			· ·	· ·			
Temp range	δ <sub>N0</sub> -factor	[mm/(N/mm <sup>2</sup>						-		<u> </u>				
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>			-						-		-	
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	/			<u> </u>				<u> </u>	<u> </u>			
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	/ <b>·</b>			<u> </u>				<u> </u>	<u> </u>			
Uncracked con			/- /						,		0,001	0,000	0,000	0,00
Temp range		[mm/(N/mm <sup>2</sup>									0.014	0.015	0.016	0.01
I: 24°C/40°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	_					+						
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	/• · ·			<u> </u>	· ·			· ·	· ·			,
II: 50°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>				l	l			l				
Temp range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup>	/- ·	-		-	-	-	-	-	-	-		
III: 60°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup>	/ <b>-</b>			· ·								
<sup>1)</sup> Calculation of <b>Table C26:</b>	the displacer	• •	δ <sub>N0</sub> -factor	· τ;	δ <sub>N∞</sub> = 0	δ <sub>N∞</sub> -fac	tor · τ;	τ: a	ction bo	ond stre				
Reinforcing bar											a 20	a 22	Ø 26	Ø 40
Uncracked and														w 40
	δ <sub>V0</sub> -factor												0,03	0,03
All temperature	δ <sub>V∞-</sub> factor						·	·	-				0,03	0,03
<sup>1)</sup> Calculation of			$\delta_{v0}$ -factor			,06   0 δv∞-fac	·	·	ction sl	,	,	0,04	0,04	0,04
Chemofast Injection system EP 1000 for concrete Performances							ļ	Annex	k C 20	D				

Displacements under static and quasi-static action for a working life of 50 and 100 years (reinforcing bar)



#### Table C27: Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years M27 Threaded rod M8 M10 M12 M16 M20 M24 M30 Steel failure 1,0 • N<sub>Rk,s</sub> Characteristic tension resistance N<sub>Rk,s,eq,C1</sub> [kN] Partial factor [-] see Table C1 γMs,N 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) I: 24°C/40°C [N/mm<sup>2</sup>] 7,0 7,0 8,5 8,5 8,5 8,5 8,5 8,5 <sup>τ</sup>Rk,eq,C1 Dry, wet Temperatui range concrete and II: 50°C/72°C 7,0 7,0 7,0 [N/mm<sup>2</sup>] 6,0 6,0 7,0 7,0 7,0 <sup>τ</sup>Rk,eq,C1 flooded bore hole 4,5 III:60°C/80°C [N/mm<sup>2</sup>] 5,0 5,0 5,0 4,5 4,5 4,5 4,5 <sup>τ</sup>Rk,eq,C1 Increasing factors for concrete 1,0 Ψc [-] Characteristic bond resistance depending $\tau_{Rk,eq,C1} =$ Ψc <sup>•</sup> <sup>τ</sup>Rk,eq,C1,(C20/25) on the concrete strength class Installation factor for dry and wet concrete (HD; HDB, CD) 1,0 γinst [-] for flooded bore hole (HD; HDB, CD) 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)



#### Characteristic values of tension loads under seismic action Table C28: (performance category C1) for a working life of 100 years M10 M12 M16 M20 M24 Threaded rod M8 M30 M27 Steel failure 1,0 • N<sub>Rk,s</sub> Characteristic tension resistance N<sub>Rk,s,eq,C1</sub> [kN] Partial factor see Table C1 [-] γMs,N 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) I: 24°C/40°C [N/mm<sup>2</sup>] 6,5 6,5 7,5 7,5 7,5 7,5 7,5 7,5 <sup>τ</sup>Rk,eq,C1 Dry, wet **Femperatu** range concrete and II: 50°C/72°C [N/mm<sup>2</sup>] 5,5 5,5 6,5 6,5 6,5 6,5 6,5 6,5 <sup>τ</sup>Rk,eq,C1 flooded bore hole III:60°C/80°C [N/mm<sup>2</sup>] 5.0 5.0 5.0 4.5 4.5 4,5 4.5 4.5 <sup>τ</sup>Rk,eq,C1 1,0 Increasing factors for concrete $\Psi_{c}$ [-] Characteristic bond resistance depending $\tau_{Rk,eq,C1} =$ Ψc • <sup>τ</sup>Rk,eq,C1,(C20/25) on the concrete strength class Installation factor for dry and wet concrete (HD; HDB, CD) 1,0 γinst [-] for flooded bore hole (HD; HDB, CD) 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)



	tic values o ce category								rs	
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure		I		II				II		
Characteristic shear resistance (Seismic C1)	V <sub>Rk,s,eq,C1</sub>	[kN]				0,70	℃・V <sup>0</sup> Rk	,s		
Partial factor	γ <sub>Ms</sub> ,V	[-]				see	Table C	51		
Factor for annular gap	$\alpha_{gap}$	[-]				0,5	5 (1,0) <sup>1)</sup>			

# 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 (threaded rod)



Tabl		aracteristic rformance o									n			
	rcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel f		• .	N	<b>FI N I</b>							)			
	cteristic tension re	sistance	N <sub>Rk,s,eq,C1</sub>		50	70	110			s • f <sub>uk</sub>		401	010	004
	section area		A <sub>s</sub>	[mm²]	50	79	113	154	201	314 4 <sup>2)</sup>	452	491	616	804
Partial	ined pull-out and	Looporata failu	<sup>γ</sup> Ms,N	[-]					1,	44				
Charao	teristic bond resis holes (CD) and in	stance in cracke	ed and uncra				in har	nmer o	drilled	holes	(HD), (	compre	essed	air
ure	I: 24°C/40°C	Dry, wet	<sup>τ</sup> 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	<sup>τ</sup> 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
Ten	III:60°C/80°C		<sup>τ</sup> 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	Ψc	[-]					1	,0				
	Characteristic bond resistance depending on the concrete strength			k,eq,C1 =				$\psi_{c}$ .	<sup>τ</sup> Rk,ec	I,C1,(C2	20/25)			
	ation factor		1	1										
for dry	and wet concrete	(HD; HDB,	γ <sub>inst</sub>	[-]					1	,0				
<u> </u>	ded bore hole (HI	D; HDB, CD)	. Anst						1	,2				
1) f <sub>uk</sub>	shall be taken from	the specificatio	ns of reinford	ing bars										
Cher	nofast Injectior	n system EP 1	1000 for co	oncrete										
	ormances acteristic values	of tension load	s under seis	smic actio	n (per	forma	nce ca	ategor	y C1)		Α	nnex	C 24	ł

for a working life of 50 years (reinforcing bar)



	cing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel fa		aiatanaa	N	FLAND					10.0	. f 1	)			
	eristic tension re	esistance	N <sub>Rk,s,eq,C1</sub>		50	70	110			$\frac{\cdot f_{uk}}{214}$		401	010	004
	ection area		A <sub>s</sub>	[mm <sup>2</sup> ]	50	79	113	154	201	314	452	491	616	804
Partial fa	ned pull-out and	l concrete failu	<sup>γ</sup> Ms,N	[-]					٦,٠	4 <sup>2)</sup>				
Charact	eristic bond resi oles (CD) and ir	stance in cracke	ed and uncra				in har	nmer o	drilled	holes (	HD), c	compre	essed	air
nre	I: 24°C/40°C	Dry, wet	<sup>τ</sup> 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	<sup>τ</sup> Rk,eq,C1	[N/mm <sup>2</sup> ]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
Ter	III:60°C/80°C	hole	<sup>τ</sup> 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
Increasi	Increasing factors for concrete		Ψc	[-]					1	,0				
Characteristic bond resistance depending on the concrete strength class				k,eq,C1 =				ψ <b>c</b> •		,C1,(C2	20/25)			
	tion factor													
for dry a CD)	and wet concrete	e (HD; HDB,	24						1	,0				
,	led bore hole (H	D: HDB, CD)	γinst	[-]					1	,2				
	hall be taken fron		ns of reinford	ing bars						,				



Table C32:	Characteristic (performance										ears		
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 shear resistance $V_{Rk,s,eq,C1}$ [kN] $0,35 \cdot A_s \cdot f_{uk}^{(1)}$													
Cross section area	l	A <sub>s</sub>	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ <sub>Ms,V</sub>	[-]						1,5 <sup>2)</sup>				
Factor for annula	r gap	$\alpha_{gap}$	[-]					0	,5 (1,0	) <sup>3)</sup>			
<sup>1)</sup> f <sub>uk</sub> shall be take	n from the specificat	ions of reinfor	cing bars	;									
<ul> <li>2) in absence of na</li> <li>3) Value in bracket Annex A 3 is red</li> </ul>	s valid for filled annu	ılar gab betwe	en faster	ner an	d clear	ance ł	nole in	the fix	ture. I	Jse of	special f	illing wa	sher

## 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)



(performance ca	alues of ten ategory C2)						s	
Threaded rod			M12	M16	M20	M24	M27	M30
Steel failure								
Characteristic tension resistance, Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	N <sub>Rk,s,eq,C2</sub>	[kN]			1,0 •	N <sub>Rk,s</sub>		
Partial factor	γ <sub>Ms,N</sub>	[-]			see Ta	ble C1		
Combined pull-out and concrete failure	e							
Characteristic bond resistance in cracked drilled holes (CD) and in hammer drilled h				hammer o	drilled hol	es (HD), c	compress	ed air
₽ I: 24°C/40°C Dry, wet	<sup>τ</sup> Rk,eq,C2	[N/mm <sup>2</sup> ]	5,8	4,8	5,0	5,1	4,8	5,0
e e e e e e e e e e e e e e e e e e e	<sup>τ</sup> Rk,eq,C2	[N/mm²]	5,0	4,1	4,3	4,4	4,1	4,3
الا:60°C/80°C hole	<sup>τ</sup> Rk,eq,C2	[N/mm <sup>2</sup> ]	1,9	1,6	1,6	1,7	1,5	1,6
Increasing factors for concrete	Ψc	[-]			1	,0		
Characteristic bond resistance depending on the concrete strength class	1	Rk,eq,C2 =		ų	′c <sup>• τ</sup> Rk,eq	,C2,(C20/2	5)	
Installation factor		,						
for dry and wet concrete (HD; HDB, CD) for flooded bore hole (HD; HDB, CD)	γ <sub>inst</sub>	[-]				,0 ,2		
(performance ca	ategory C2)	for a wo	rking li M12	fe of 50 M16	) and 1 M20	00 year <sup>M24</sup>	' <b>S</b> M27	M30
Steel failure	_							
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	V <sub>Rk,s,eq,C2</sub>	[kN]	0,70 • V <sup>0</sup> <sub>Rk,s</sub>					
Partial factor	γ <sub>Ms,V</sub>	[-]			see Ta	ıble C1		
Partial factor Factor for annular gap	α <sub>gap</sub>	[-]			0,5 (	1,0) <sup>1)</sup>		
Partial factor	α <sub>gap</sub>	[-]	earance h	ole in the	0,5 (	1,0) <sup>1)</sup>	ial filling w	asher
Partial factor Factor for annular gap <sup>1)</sup> Value in brackets valid for filled annular	α <sub>gap</sub> gab between fas	[-]	earance h	ole in the	0,5 (	1,0) <sup>1)</sup> se of spec	ial filling w	



Threaded rod			M12	M16	M20	M24	M27	M30
Uncracked and cracked con for a working life of 50 and 1		on (perforr	nance ca	tegory C	2)			
or a working me of oo and 1	δ <sub>N,eq,C2(50%)</sub> =	[]	0.01	0.04	0.07	0.00	0.00	0.70
	δ <sub>N,eq,C2(DLS)</sub>	[mm]	0,21	0,24	0,27	0,36	0,92	0,70
All temperature ranges	$\delta_{N,eq,C2(100\%)} =$	[mm]	0,54	0,51	0,54	0,63	1,70	0,92
	δ <sub>N,eq,C2(ULS)</sub>	[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[[	0,54	0,51	0,54	0,03	1,70	0,92
-	ements under shea	r Ioad (th		-			I	I
Threaded rod		, <u>.</u>	M12	M16	M20	M24	M27	M30
Uncracked and cracked con for a working life of 50 and 1		on (perforr	nance ca	tegory C	2)			
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
an temperature ranges	$\delta_{V,eq,C2(100\%)} = \\ \delta_{V,eq,C2(ULS)}$	[mm]	6,0	7,6	7,3	10,9	11,1	11,2



hamn	acteristic v ner drilled d holes wit	hole	s (HD), d	compre	ssed							mer
Threaded rod					M8	M10	M12	M16	M20	M24	M27	M30
Steel failure					1	1						I
Characteristic tension			Fire	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2
resistance; Steel, Stainles Steel A2, A4 and HCR,	s    N <sub>Rk,s,fi</sub>	   [kN]	exposure	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1
strength class 5.8 resp. 50	)	[]	time [min]	90	0,7	1,0	1,6	3,0	4,7	6,7	8,7	10,7
and higher				120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9
Characteristic bond resi given temperature θ	stance in cra	скеа	and uncra	скеа соп	crete C	20/25 l		50/60 U	nder 11	re cond	litions	for a
			θ < 2	23°C				1	,0			
Temperature reduction factor	k <sub>fi,p</sub> (θ)	[-]	$23^{\circ}C \le \theta$	≤ 278°C			150	, <b>28</b> • θ	-1,598 <u>≤</u>	1,0		
1,0			θ > 2	78°C 0,0								
Reduction Factor k <sub>fi</sub> ( <b>θ</b> ) [-]												
0,0	50	100		150 Temperatur	200 e θ [°C]		250		300		350	
Characteristic bond resistance for a given temperature ( $\theta$ )	τ <sub>Rk,fi</sub> (θ)		[N/mm²	2]			k <sub>fi,p</sub> (	θ)•τ <sub>Rk</sub>	.,cr,(C20/	(25) <sup>1)</sup>		
Steel failure without leve	er arm	1			1							
Characteristic shear resistance; Steel, Stainles			Fire	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2
Steel A2, A4 and HCR,	V <sub>Rk,s,fi</sub>	[kN]	exposure time	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1
strength class 5.8 resp. 50 and higher	)		[min]	90	0,7	1,0	1,6	3,0	4,7	6,7	8,7	10,7
Steel failure with lever a	rm			120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9
Characteristic bending				30	1,1	2,2	4,7	12,0	23,4	40,4	59,9	81,0
moment; Steel, Stainless			Fire 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	M <sup>0</sup> <sub>Rk,s,fi</sub>	[Nm]	time	90	0,7	1,3	2,5	6,3	12,3	21,3	31,6	42,7
and higher			[min]	120	0,5	1,0	1,8	4,7	9,1	15,7	23,3	31,5
<ol> <li><sup>1)</sup> τ<sub>Rk,cr,(C20/25)</sub> character temperature range</li> </ol>	ristic bond resis	stance	for cracked	l concrete	for cond	crete str	ength cl	ass C2(	)/25 for	the relev	/ant	
Performances	Chemofast Injection system EP 1000 for concrete       Annex C 29         Performances       Annex C 29         Characteristic values of tension and shear loads under fire exposure (threaded rod)       Annex C 29											



#### Table C38: Characteristic values of tension and shear loads under fire exposure in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB) Internal threaded anchor rods IG-M6 IG-M8 **IG-M10** IG-M12 **IG-M16 IG-M20** Steel failure 30 0,3 1,1 1,7 3,0 5,7 8,8 Characteristic tension Fire 0,2 60 0,9 1,4 2,3 4,2 6,6 resistance; Steel, Stainless exposure N<sub>Rk,s,fi</sub> [kN] Steel A4 and HCR, strength time 90 0.2 0.7 1,0 1,6 4.7 3,0 class 5.8 and 8.8 resp. 70 [min] 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 $\theta$ $\theta < 23^{\circ}C$ 1,0 Temperature reduction $150,28 \cdot \theta^{-1,598} \le 1,0$ k<sub>fi,p</sub>(θ) [-] $23^{\circ}C \le \theta \le 278^{\circ}C$ factor θ > 278°C 0,0 1,0 0,8 Reduction Factor k<sub>ii</sub>(0) [-] 0,6 0,4 0,2 0,0 0 100 150 200 300 50 250 350 Temperature θ [°C] Characteristic bond $k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1}$ resistance for a given $\tau_{\mathsf{Rk,fi}}(\theta)$ [N/mm<sup>2</sup>] temperature ( $\theta$ ) Steel failure without lever arm 30 0,3 1,1 1,7 3,0 5,7 8,8 Characteristic shear Fire 60 0,2 0,9 1,4 2.3 4,2 6,6 resistance: Steel, Stainless exposure V<sub>Rk,s,fi</sub> [kN] Steel A4 and HCR, strength time 0,2 90 0,7 1,0 1,6 3,0 4,7 class 5.8 and 8.8 resp. 70 [min] 120 0,1 0,5 0,8 1,2 2,2 3,4 Steel failure with lever arm 30 0,2 1,1 2,2 4,7 12,0 23,4 Characteristic bending Fire 0.2 0.9 1,8 60 3,5 9,0 17,5 moment: Steel, Stainless exposure M<sup>0</sup><sub>Rk,s,fi</sub> [Nm] Steel A4 and HCR, strength time 90 0,1 0,7 1,3 2,5 6,3 12,3 class 5.8 and 8.8 resp. 70 [min] 120 0,1 0,5 1,0 1,8 4,7 9,1 1) TRk,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 Annex C 30 Performances Characteristic values of tension and shear loads under fire exposure (internal threaded anchor rod)



#### Table C39: 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) **Reinforcing bar** Ø 8 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 Fire 60 0,5 1,0 1,7 4,7 7,4 9,2 12,1 2,3 3,0 6,8 Characteristic tension N<sub>Rk,s,fi</sub> [kN] exposure resistance; BSt 500 90 0.4 0,8 1,5 2,0 2,6 10,5 4,1 5,9 6.4 8,0 time [min] 120 0,3 0,6 1,1 1,5 2,0 4,5 4,9 8,0 3,1 6,2 Characteristic bond resistance in cracked and uncracked concrete C20/25 up to C50/60 under fire conditions for a given temperature $\theta$ θ < 25°C 1.0 Temperature reduction $176,37 \cdot \theta^{-1,598} \le 1,0$ $k_{fi,p}(\theta)$ [-] $25^{\circ}C \le \theta \le 278^{\circ}C$ factor θ > 278°C 0.0 1,0 0,8 Reduction Factor k<sub>ii</sub>(0) [-] 0,6 0,4 0,2 0,0 0 50 100 150 200 250 300 350 Temperature θ [°C] Characteristic bond $k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1}$ resistance for a given [N/mm<sup>2</sup>] $\tau_{\mathsf{Rk},\mathsf{fi}}(\theta)$ temperature ( $\theta$ ) Steel failure without lever arm 30 0,5 1,2 2,3 4,0 6,3 9,0 9,8 12,3 16,1 3,1 Fire 60 0.5 1.0 1.7 2,3 3.0 4.7 6.8 7.4 9,2 12,1 Characteristic shear V<sub>Rk,s,fi</sub> [kN] exposure resistance; BSt 500 0,4 1,5 90 0,8 2,0 2,6 4,1 5,9 6,4 8,0 10,5 time [min] 120 0,3 0,6 1,1 1,5 2,0 3,1 4,5 4,9 6,2 8,0 Steel failure with lever arm 0,6 9,7 18,8 32,6 36,8 51,7 77,2 30 1,8 4,1 6,5 Fire 60 0.5 1,5 3,1 4,8 7,2 14,1 24,4 27,6 38.8 57,9 Characteristic bending M<sup>0</sup>Rk,s,fi [Nm] exposure moment: BSt 500 90 0.4 1,2 2.6 4,2 6,3 12,3 21,2 23.9 33.6 50.2 time [min] 120 0,3 0,9 2,0 3,2 4,8 9,4 16,3 18,4 25,9 38.6 1) TRk,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 Annex C 31 Performances Characteristic values of tension and shear loads under fire exposure (reinforcing bar)