



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-16/0018 of 6 October 2020

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

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

This version replaces

Deutsches Institut für Bautechnik

Chemofast Injection system UM-H for concrete

Bonded anchor for use in concrete

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

CHEMOFAST Anchoring GmbH

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

EAD 330499-01-0601 Edition 04/2020

ETA-16/0018 issued on 18 July 2019

Deutsches Institut für Bautechnik Kolonnenstraße 30 B | 10829 Berlin | GERMANY | Phone: +49 30 78730-0 | Fax: +49 30 78730-320 | Email: dibt@dibt.de | www.dibt.de



European Technical Assessment ETA-16/0018 English translation prepared by DIBt

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Specific Part

1 Technical description of the product

The "Chemofast Injection system UM-H+ for concrete" is a bonded anchor consisting of a cartridge with Chemofast injection mortar UM-H and a steel element according to Annex A3.

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 4, C 6 to C 7, C 9 to C 10, B3
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 5, C 8, C 11
Displacements under short-term and long-term loading	See Annex C 12 to C 14
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 15 to C 18

3.2 Hygiene, health and the environment (BWR 3)

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



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

In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

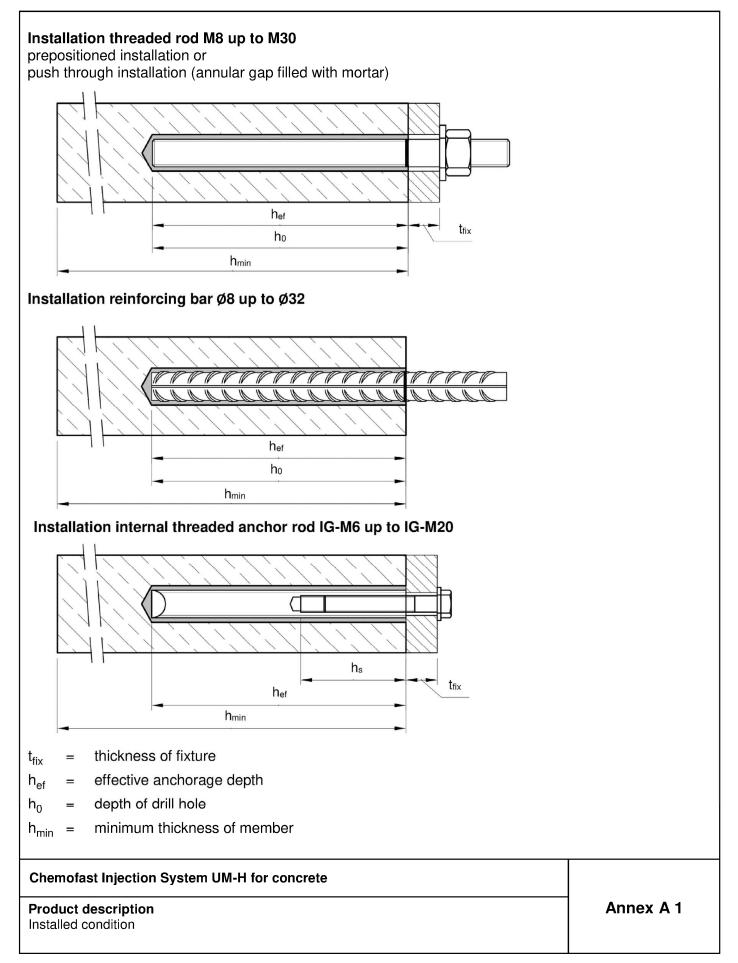
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

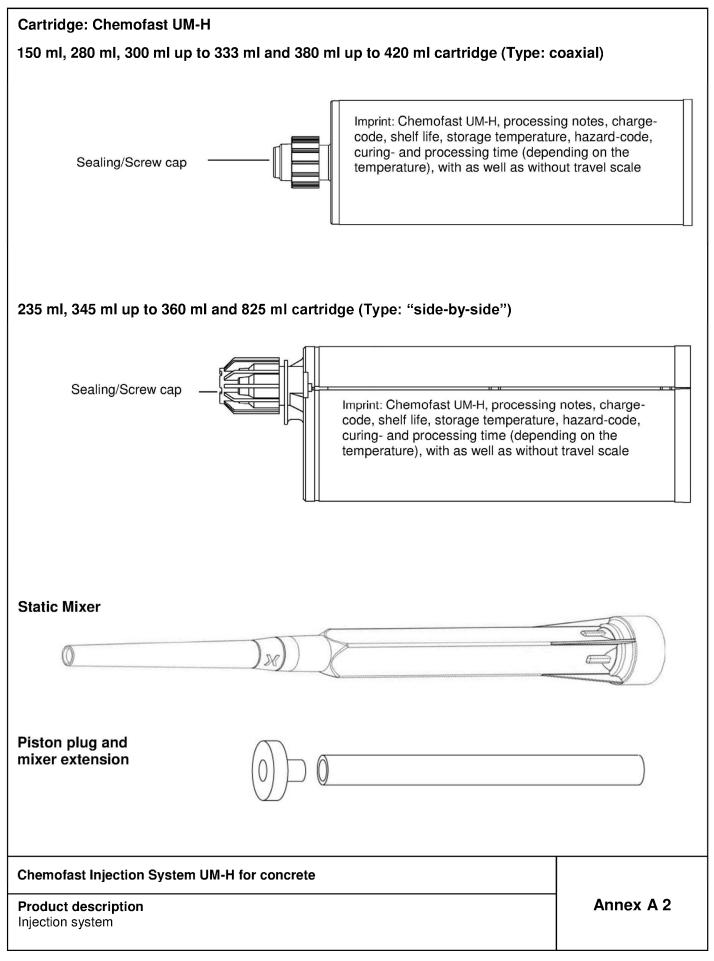
Issued in Berlin on 6 October 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow Head of Department *beglaubigt:* Lange









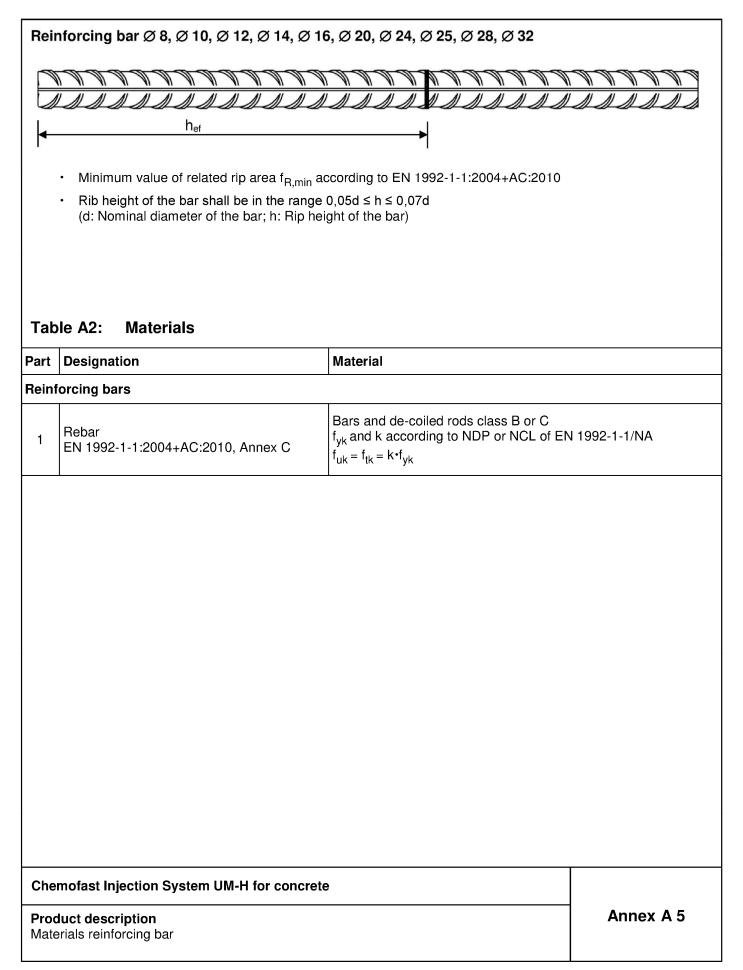


Threaded rod M8, M10, M12, M16, M20, M24, M27, M30 with washer a	nd hexagon nut
	 Commercial standard threaded rod with: Materials, dimensions and mechanical properties acc. Table A1 Inspection certificate 3.1 acc. to EN 10204:2004 Marking of embedment depth
Internal threaded anchor rod IG-M6, IG-M8, IG-M10, IG-M12, IG-M16, I	G-M20
Threaded rod or screw Mark of the producer	4
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Marking Internal three	
M8 Thread size (Interna	(thread)
A4 additional mark for s	tainless steel
HCR additional mark for h	igh-corrosion resistance steel
Filling washer and mixer reduction nozzle for filling the annular gap fixture	between anchor rod and
(3b)	
	· ·
Chemofast Injection System UM-H for concrete	
Product description Threaded rod, internal threaded rod and filling washer	Annex A 3



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3aWasherA4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)3bFilling washerStainless steel A4, High corrosion resistance steelCharacteristic steel ultimate tensile strengthElongation at fracture4Internal threaded anchor rod ¹⁾² acc. to EN ISO 3506-1:2009 50 $f_{uk} = 500$ N/mm² $f_{yk} = 210$ N/mm² $A_5 > 8%$ 1)Property class 70 or 80 for threaded rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16 2 for IG-M20 only property class 50 3 3 $A_5 > 8\%$ fracture elongation if no use for seismic performance category C2 4 Property class 80 only for stainless steel A4 and high corrosion resistance steel HCR	ligh	Threaded rod ¹⁾⁴⁾	nce steel (Material 1.45) Property class acc. to EN ISO 3506-1:2009 acc. to	29 or 50 70 80 50 70	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$
Internal threaded anchor rod $^{1/2}$ Property classCharacteristic steel ultimate tensile strengthCharacteristic steel yield strengthElongation at fracture4Internal threaded anchor rod $^{1/2}$ acc. to EN ISO 3506-1:200950 $f_{uk} = 500 \text{ N/mm}^2$ $f_{yk} = 210 \text{ N/mm}^2$ $A_5 > 8\%$ 1)Property class 70 or 80 for threaded rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16 $a_5 > 8\%$ fracture elongation if no use for seismic performance category C2 $a_5 > 8\%$ $a_5 > 8\%$ fracture elongation if no use for seismic performance steel HCR	High 1	Threaded rod ¹⁾⁴⁾	nce steel (Material 1.45) Property class acc. to EN ISO 3506-1:2009 acc. to EN ISO 3506-1:2009	29 or 50 70 80 50 70 80	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 80	EN 10088-1:2014) : 2014) 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 $A_5 \ge 8\%$ $A_5 \ge 12\%^{-3}$ $A_5 \ge 12\%^{-3}$
Property class ultimate tensile strength yield strength fracture 4 Internal threaded anchor rod ^{1/2}) acc. to EN ISO 3506-1:2009 50 $f_{uk} = 500 \text{ N/mm}^2$ $f_{yk} = 210 \text{ N/mm}^2$ $A_5 > 8\%$ 1) Property class 70 or 80 for threaded rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16 $A_5 > 8\%$ 2) for IG-M20 only property class 50 33 $A_5 > 8\%$ fracture elongation if no use for seismic performance category C2 4 4 4 and high corrosion resistance steel HCR 4	1 1 2	Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer	Accesseel (Material 1.45) Property class acc. to EN ISO 3506-1:2009 acc. to EN ISO 3506-1:2009 A2: Material 1.4301 / 1 A4: Material 1.4301 / 1 HCR: Material 1.4529 (e.g.: EN ISO 887:200)	29 or 1 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 50 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1: 2 ISO 7089:2000, EN ISO 7	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 .8, acc. to EN 10088-1 2014	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$:2014 :2014
4 International function of 1/2) EN ISO 3506-1:2009 70 $f_{uk} = 700 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $A_5 > 8\%$ 1) Property class 70 or 80 for threaded rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16 2) for IG-M20 only property class 50 3) $A_5 > 8\%$ fracture elongation if <u>no</u> use for seismic performance category C2 4) Property class 80 only for stainless steel A4 and high corrosion resistance steel HCR	1 1 2 3a	Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer	Accesseel (Material 1.45) Property class acc. to EN ISO 3506-1:2009 acc. to EN ISO 3506-1:2009 A2: Material 1.4301 / 1 A4: Material 1.4301 / 1 HCR: Material 1.4529 (e.g.: EN ISO 887:200)	29 or 1 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 50 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.454 565, acc. to EN 10088-1:2 ISO 7089:2000, EN ISO 7 rosion resistance steel	EN 10088-1:2014) : 2014) 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 $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$:2014 :2014 :2014
anchor rod ^{1/2/} EN ISO 3506-1:2009 70 $f_{uk} = 700 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $A_5 > 8\%$ ¹⁾ Property class 70 or 80 for threaded rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16 ²⁾ for IG-M20 only property class 50 ³⁾ A ₅ > 8% fracture elongation if <u>no</u> use for seismic performance category C2 ⁴⁾ Property class 80 only for stainless steel A4 and high corrosion resistance steel HCR	1 2 3a	Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer	nce steel (Material 1.45) Property class acc. to EN ISO 3506-1:2009 acc. to EN ISO 3506-1:2009 A2: Material 1.4301 / 1 A4: Material 1.4301 / 1 HCR: Material 1.4401 / 1 HCR: Material 1.4529 (e.g.: EN ISO 887:200 Stainless steel A4, Hig	29 or 1 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1:2 ISO 7089:2000, EN ISO 7 rosion resistance steel Characteristic steel ultimate tensile strength	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 .2014 .093:2000 or EN ISO 70 Characteristic steel yield strength	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$:2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014
 ²⁾ for IG-M20 only property class 50 ³⁾ A₅ > 8% fracture elongation if <u>no</u> use for seismic performance category C2 ⁴⁾ Property class 80 only for stainless steel A4 and high corrosion resistance steel HCR 	High 1 2 3a 3b	corrosion resistant Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer Filling washer Internal threaded	nce steel (Material 1.45)Property classacc. toEN ISO 3506-1:2009acc. toEN ISO 3506-1:2009A2: Material 1.4301 / 1A4: Material 1.4301 / 1HCR: Material 1.4401 / 1HCR: Material 1.4529(e.g.: EN ISO 887:200)Stainless steel A4, HigProperty classacc. to	29 or 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN 9h corr	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1:2 ISO 7089:2000, EN ISO 7 rosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 8, acc. to EN 10088-1 2014 093:2000 or EN ISO 70 Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$:2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2015 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2014 :2015 :2014 :2014 :2015 :2014 :2014 :2015 :2014 :2014 :2015 :2014 :2014 :2015 :2014 :2014 :2015 :2016 :2017 :2018 :2019 :20100 :20100
	1 1 2 3a 3b 4	corrosion resistant Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer Filling washer Internal threaded anchor rod ¹⁾²⁾	nce steel (Material 1.45)Property classacc. toEN ISO 3506-1:2009acc. toEN ISO 3506-1:2009A2: Material 1.4301 / 1A4: Material 1.4401 / 1HCR: Material 1.4529(e.g.: EN ISO 887:200)Stainless steel A4, HigProperty classacc. toEN ISO 3506-1:2009	29 or 7 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN gh corr 50 70	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1: 2 ISO 7089:2000, EN ISO 7 rosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 .3, acc. to EN 10088-1 .014 .093:2000 or EN ISO 70 Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$
Chemofast Injection System UM-H for concrete	High 1 2 3a 3b 4 (1) 2) 3)	corrosion resistant Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer Filling washer Internal threaded anchor rod ¹⁾²⁾ Property class 70 or for IG-M20 only property class 70 or for IG-M20	nce steel (Material 1.45)Property classacc. toEN ISO 3506-1:2009acc. toEN ISO 3506-1:2009A2: Material 1.4301 / 1A4: Material 1.4401 / 1HCR: Material 1.4529(e.g.: EN ISO 887:200)Stainless steel A4, HigProperty classacc. toEN ISO 3506-1:200980 for threaded rods anderty class 50gation if no use for seism	29 or 1 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN gh corn 50 70 hexag ic perf	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1: 2 ISO 7089:2000, EN ISO 7 rosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ fon nuts up to M24 and Interr formance category C2	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 .2,	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$
	High 1 2 3a 3b 4 (1) 2) 3)	corrosion resistant Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer Filling washer Internal threaded anchor rod ¹⁾²⁾ Property class 70 or for IG-M20 only property class 70 or for IG-M20	nce steel (Material 1.45)Property classacc. toEN ISO 3506-1:2009acc. toEN ISO 3506-1:2009A2: Material 1.4301 / 1A4: Material 1.4401 / 1HCR: Material 1.4529(e.g.: EN ISO 887:200)Stainless steel A4, HigProperty classacc. toEN ISO 3506-1:200980 for threaded rods anderty class 50gation if no use for seism	29 or 1 50 70 80 50 70 80 1.4307 1.4404 or 1.4 6, EN gh corn 50 70 hexag ic perf	/ 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088-1 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 threaded rod class 50 for threaded rod class 70 for threaded rod class 70 for threaded rod class 80 7 / 1.4311 / 1.4567 or 1.454 4 / 1.4571 / 1.4362 or 1.457 565, acc. to EN 10088-1: 2 ISO 7089:2000, EN ISO 7 rosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ fon nuts up to M24 and Interr formance category C2	EN 10088-1:2014) : 2014) Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$.1, acc. to EN 10088-1 .2,	fracture $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$







Anchorages subject to static a	•	s of intended use s:		
	for a working li	e of 50 years	for a work	ing life of 100 years
Base material	Non-cracked concrete	cracked concrete	Non-cracked concrete	d cracked concrete
Hammer drilling (HD), Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	M8 to Ø8 to IG-M6 to	¢.	M8 to M30, Ø8 to Ø32, M6 to IG-M20	
Temperature Range:	II: - 40 °C III: - 40 °C	to $+40 \ ^{\circ}C^{1)}$ to $+80 \ ^{\circ}C^{2)}$ to $+120 \ ^{\circ}C^{3)}$ to $+160 \ ^{\circ}C^{4)}$		0 °C to +40 °C ¹⁾ 0 °C to +80 °C ²⁾
Anchorages subject to seismic	action:		·	
	for Performance	e Category C1	for Perfor	mance Category C2
Base material		Cracked and no	n-cracked concre	te
Hammer drilling (HD), Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	M8 to Ø8 to		N	/12 to M24
Temperature Range:	Ⅱ: - 40 °C Ⅲ: - 40 °C	to $+40 \ ^{\circ}C^{1)}$ to $+80 \ ^{\circ}C^{2)}$ to $+120 \ ^{\circ}C^{3)}$ to $+160 \ ^{\circ}C^{4)}$: - 40 : - 40	0 °C to +40 °C ¹⁾ 0 °C to +80 °C ²⁾ 0 °C to +120 °C ³⁾ 0 °C to +160 °C ⁴⁾
 (max long-term temperatur ²⁾ (max long-term temperatur ³⁾ (max long-term temperatur ⁴⁾ (max long-term temperatur Base materials: Compacted, reinforced or unre EN 206:2013 + A1:2016. Strength classes C20/25 to C4 Use conditions (Environmental Structures subject to dry intern For all other conditions accord class: Stainless steel Stahl A2 Stainless steel Stahl A4 High corrosion resistant 	e +50 °C and max sh e +72 °C and max sh e +100 °C and max s einforced normal weig 50/60 according to EN I conditions): nal conditions (all mai ding to EN 1993-1-4:2 2 according to Annex I according to Annex	ort-term temperatu ort-term temperatu hort-term temperatu ght concrete withou N 206:2013 + A1:20 terials). 2006+A1:2015 corro A 4, Table A1: CR0 A 4, Table A1: CR0	re +80 °C) re +120 °C) ure +160 °C) It fibres according 016. esponding to corr C II C III	
Chemofast Injection System UM	-H for concrete			
Intended Use Specifications				Annex B 1



Design:

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

Installation:

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

Chemofast Injection System UM-H for concrete

Intended Use Specifications

Deutsches Institut für Bautechnik

Table B1: Ir	stallation par	ameters fo	or threa	ded r	bd						
Anchor size				M8	M10	M12	M16	M20	M24	M27	M30
Diameter of elemen	t	d = d _{nom}	[mm]	8	10	12	16	20	24	27	30
Nominal drill hole di	ameter	d ₀	[mm]	10	12	14	18	22	28	30	35
Effective embedmer	at dopth	h _{ef,min}	[mm]	60	60	70	80	90	96	108	120
	it depth	h _{ef,max}	[mm]	160	200	240	320	400	480	540	600
Diameter of clearance hole in	Prepositioned ins	tallation d _f ≤	[mm]	9	12	14	18	22	26	30	33
the fixture ¹⁾	Push through i	nstallation d _f	[mm]	12	14	16	20	24	30	33	40
Maximum torque mo	oment	max T _{inst} ≤	[Nm]	10	20	40 ²⁾	60	100	170	250	300
Minimum thickness	of member	h _{min}	[mm]		_f + 30 m : 100 mr			I	n _{ef} + 2d ₀		
Minimum spacing		s _{min}	[mm]	40	50	60	75	95	115	125	140
Minimum edge dista	ince	c _{min}	[mm]	35	40	45	50	60	65	75	80

¹⁾ For application under seismic loading the diameter of clearance hole in the fixture shall be at maximum $d_1 + 1$ mm or alternatively the annular gap between fixture and threaded rod shall be filled force-fit with mortar.

²⁾ Maximum Torque moment for M12 with steel Grade 4.6 is 35 Nm

Table B2: Installation parameters for rebar

Rebar size			Ø 81)	Ø 10 ¹⁾	Ø 12 ¹⁾	Ø 14	Ø 16	Ø 20	Ø 24 ¹⁾	Ø 25 ¹⁾	Ø 28	Ø 32
Diameter of element	d = d _{nom}	[mm]	8	10	12	14	16	20	24	25	28	32
Nominal drill hole diameter	d ₀	[mm]	10 12	12 14	14 16	18	20	25	30 32	30 32	35	40
Effective embedment depth	h _{ef,min}	[mm]	60	60	70	75	80	90	96	100	112	128
Effective embedment depth	h _{ef,max}	[mm]	160	200	240	280	320	400	480	500	560	640
Minimum thickness of member	h _{min}	[mm]	-	30 mm)0 mm	2			ł	n _{ef} + 2d ₀			
Minimum spacing	s _{min}	[mm]	40	50	60	70	75	95	120	120	130	150
Minimum edge distance	с _{тіп}	[mm]	35	40	45	50	50	60	70	70	75	85
1) la alta va sustina e l'alutti la alta alta va												

¹⁾ both nominal drill hole diameter can be used

Table B3: Installation parameters for Internal threaded rod

Anchor size			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Internal diameter of sleeve	d ₂	[mm]	6	8	10	12	16	20
Outer diameter of sleeve1)	d = d _{nom}	[mm]	10	12	16	20	24	30
Nominal drill hole diameter	d ₀	[mm]	12	14	18	22	28	35
Effective embedment death	h _{ef,min}	[mm]	60	70	80	90	96	120
Effective embedment depth	h _{ef,max}	[mm]	200	240	320	400	480	600
Diameter of clearance hole in the fixture	d _f ≤	[mm]	7	9	12	14	18	22
Maximum torque moment	max T _{inst} ≤	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	l _{IG}	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h _{min}	[mm]	•	30 mm 0 mm		h _{ef} +	- 2d₀	
Minimum spacing	s _{min}	[mm]	50	60	75	95	115	140
Minimum edge distance	c _{min}	[mm]	40	45	50	60	65	80
¹⁾ With metric threads according to	EN 1993-1-8:20	005+AC	:2009					

Chemofast Injection System UM-H for concrete

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Installation parameters



Table B4			ning and s		raumu	HAMMAN				
Threaded Rod	Rebar	Internal threaded rod	d ₀ Drill bit - Ø HD, HDB, CD		ь h - Ø	d _{b,min} min. Brush - Ø	Piston plug		on direction f piston plu	
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]		Ļ	\Rightarrow	
M8	8		10	RB10	11,5	10,5		*		
M10	8 / 10	IG-M6	12	RB12		12,5		.		
M12	10/12	IG-M8	14	RB14		14,5		No plug	required	
	12		16	RB16		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			
	20		25	RB25	27,0	25,5	VS25	1	h >	
M24		IG-M16	28	RB28	30,0	28,5	VS28	h _{ef} >	h _{ef} >	all
M27	24 / 25		30	RB30	31,8	30,5	VS30	250 mm	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			
		(volume 7				- Rec. com			(min 6 ba	r)
Drill hole o	.meter (d ₀): lepth (h ₀): < n-cracked ce	•	mm		Drill	bit diameter (d ₀): all dia	ameters		

HDB – Hollow drill bit system

Drill bit diameter (d₀): all diameters

The hollow drill bit system contains the Heller Duster Expert hollow drill bit and a class M vacuum with minimum negative pressure of 253 hPa and flow rate of minimum 150 m³/h (42 l/s).

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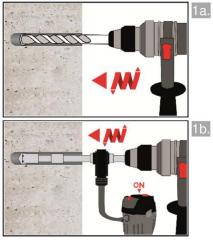
Z84472.20

Cleaning and setting tools



Installation instructions

Drilling of the bore hole



Hammer (HD) or compressed air drilling (CD)

Drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2, or B3). Proceed with Step 2.

In case of aborted drill hole, the drill hole shall be filled with mortar.

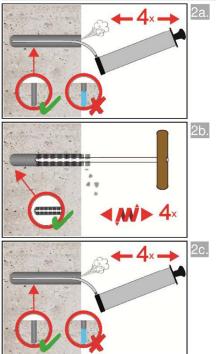
Hollow drill bit system (HDB) (see Annex B 3)

Drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2, or B3). This drilling system removes the dust and cleans the bore hole during drilling (all conditions). Proceed with Step 3.

In case of aborted drill hole, the drill hole shall be filled with mortar.

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

MAC: Cleaning for dry and wet bore hole with diameter $d_0 \le 20$ mm and bore hole depth $h_0 \le 10d_{nom}$ (uncracked concrete only!)



Starting from the bottom or back of the bore hole, blow the hole clean with handpump (Annex B 4) a minimum of four times until return air stream is free of noticeable dust.

Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush $> d_{b,min}$ (Table B4) a minimum of four times in a twisting motion. If the bore hole ground is not reached with the brush, a brush extension must be used.

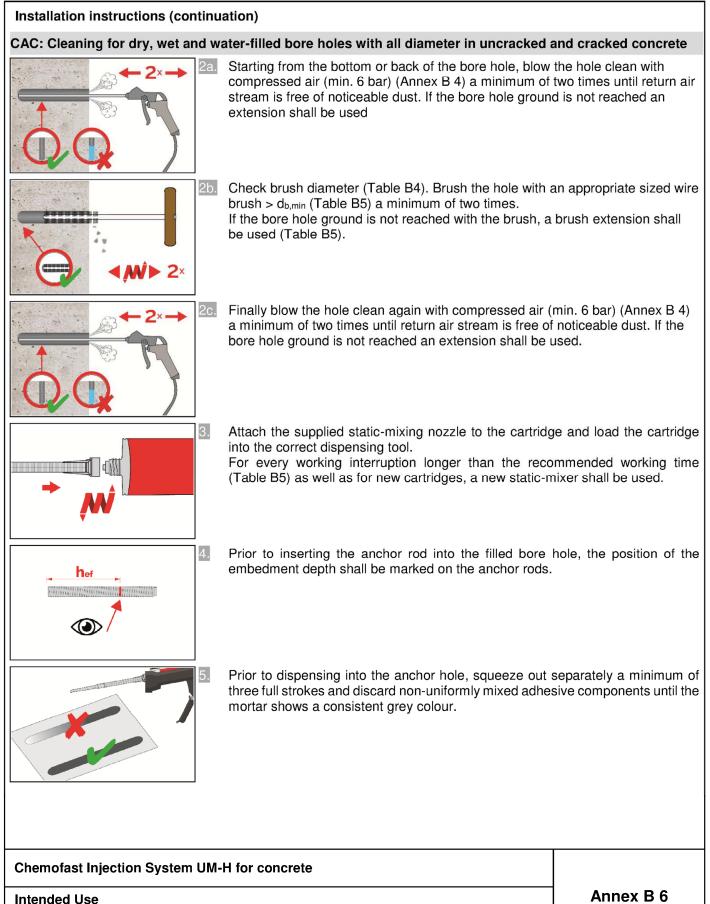
Finally blow the hole clean again with handpump (Annex B 4) a minimum of four times until return air stream is free of noticeable dust.

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

Chemofast Injection System UM-H for concrete

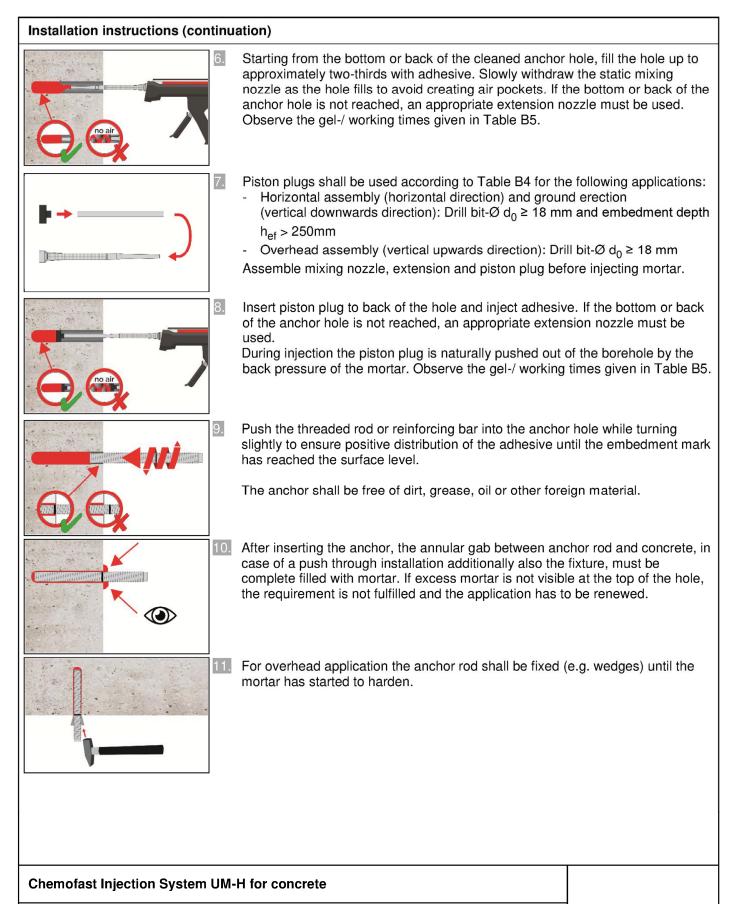
Intended Use Installation instructions





Installation instructions (continuation)



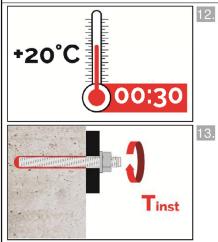


Intended Use

Installation instructions (continuation)



Installation instructions (continuation)



After full curing, the add-on part can be installed with up to the max. torque (Table B1 or B3) by using a calibrated torque wrench. In case of prepositioned installation the annular gab between anchor and fixture can be optional filled with mortar. Therefor substitute the washer by the filling washer and connect the mixer reduction nozzle to the tip of the mixer. The annular gap is filled with mortar,

Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B5).

Table B5: Maximum working time and minimum curing time

Concrete	temp	erature	Gelling	Minimum curing time in	Minimum curing time in
			working time	dry concrete	wet concrete
- 5 °C	to	- 1 °C	50 min	5 h	10 h
0 °C	to	+ 4 °C	25 min	3,5 h	7 h
+ 5 °C	to	+ 9 °C	15 min	2 h	4 h
+ 10 °C	to	+ 14 °C	10 min	1 h	2 h
+ 15 °C	to	+ 19 °C	6 min	40 min	80 min
+ 20 °C	to	+ 29 °C	3 min	30 min	60 min
+ 30 °C	to	+ 40 °C	2 min	30 min	60 min
Cartridge	e temp	erature		+5°C to +40°C	

when mortar oozes out of the washer.

Chemofast Injection System UM-H for concrete

Installation instructions (continuation) Curing time



Si	ze			M8	M10	M12	M16	M20	M24	M27	M30
Cr	oss section area	A _s	[mm²]	36,6	58	84,3	157	245	353	459	561
Cł	aracteristic tension resistance, Steel failu	re ¹⁾	•	•							
St	eel, Property class 4.6 and 4.8	N _{Rk,s}	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
St	eel, Property class 5.6 and 5.8	N _{Rk,s}	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
St	eel, Property class 8.8	N _{Rk,s}	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
St	ainless steel A2, A4 and HCR, class 50	N _{Rk,s}	[kN]	18	29	42	79	123	177	230	281
St	ainless steel A2, A4 and HCR, class 70	N _{Rk,s}	[kN]	26	41	59	110	171	247	_3)	_3)
St	ainless steel A4 and HCR, class 80	N _{Rk,s}	[kN]	29	46	67	126	196	282	_3)	_3)
Cł	naracteristic tension resistance, Partial fac	tor ²⁾									
St	eel, Property class 4.6 and 5.6	γ _{Ms,N}	[-]				2,0	C			
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,N}	[-]				1,5	5			
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,N}	[-]				2,8	6			
St	ainless steel A2, A4 and HCR, class 70	γMs,N	[-]				1,8	7			
St	ainless steel A4 and HCR, class 80	γ _{Ms,N}	[-]				1,6	6			
Cł	naracteristic shear resistance, Steel failure	1)									
Ē	Steel, Property class 4.6 and 4.8	V ⁰ _{Rk,s}	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
arm.	Steel, Property class 5.6 and 5.8	V ⁰ Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
evel	Steel, Property class 8.8	V ⁰ Rk.s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
Without lever	Stainless steel A2, A4 and HCR, class 50	V ⁰ Rk.s	[kN]	9	15	21	39	61	88	115	140
Vitho	Stainless steel A2, A4 and HCR, class 70	V ⁰ _{Rk,s}	[kN]	13	20	30	55	86	124	_3)	_3)
>	Stainless steel A4 and HCR, class 80	V ⁰ Rk,s	[kN]	15	23	34	63	98	141	_3)	_3)
	Steel, Property class 4.6 and 4.8	M ⁰ _{Rk,s}	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M ⁰ Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
	Steel, Property class 8.8	M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
th lever	Stainless steel A2, A4 and HCR, class 50	M ⁰ _{Rk,s}	[Nm]	19	37	66	167	325	561	832	1125
Wit	Stainless steel A2, A4 and HCR, class 70	M ⁰ Rk,s	[Nm]	26	52	92	232	454	784	_3)	_3)
	Stainless steel A4 and HCR, class 80	M ⁰ _{Rk,s}	[Nm]	30	59	105	266	519	896	_3)	_3)
Cł	haracteristic shear resistance, Partial facto	or ²⁾	•	•							
St	eel, Property class 4.6 and 5.6	γ _{Ms,V}	[-]				1,6	7			
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,V}	[-]				1,2	5			
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,V}	[-]				2,3	8			
St	ainless steel A2, A4 and HCR, class 70	γ _{Ms,V}	[-]				1,5	6			
St	ainless steel A4 and HCR, class 80	γ _{Ms,V}	[-]				1,3	3			

²⁾ in absence of national regulation³⁾ Anchor type not part of the ETA

Chemofast Injection System UM-H for concrete

Performances

Characteristic values for steel tension resistance and steel shear resistance of threaded rods



Table C2: Characteristic values for Concrete cone failure and Splitting with all kind of action

Anchor size				All Anchor types and sizes	
Concrete cone f	ailure		·		
Non-cracked con	crete	k _{ucr,N}	[-]	11,0	
Cracked concrete	9	k _{cr,N}	[-]	7,7	
Edge distance		c _{cr,N}	[mm]	1,5 h _{ef}	
Axial distance		s _{cr,N}	[mm]	2 c _{cr,N}	
Splitting		·	·		
	h/h _{ef} ≥ 2,0			1,0 h _{ef}	
Edge distance	2,0 > h/h _{ef} > 1,3	c _{cr,sp}	[mm]	$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right)$	
	h/h _{ef} ≤ 1,3			2,4 h _{ef}	
Axial distance		s _{cr,sp}	[mm]	2 c _{cr,sp}	

Chemofast Injection System UM-H for concrete

Performances

Characteristic values for Concrete cone failure and Splitting with all kind of action



Table	e C3: Charac for a wo	teristic value orking life of		n loads u	Inder	stati	c and	l qua	si-sta	tic ac	tion	
	r size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M30
Steel fa												
Charac	teristic tension resi	istance	N _{Rk,s}	[kN]			A _s • f _l	ık (or s	ee Tab	le C1)		
Partial			γMs,N	[-]				see Ta	ble C1			
	ned pull-out and o											
	teristic bond resist	ance in non-cracl	ked concrete C2	20/25								
range	I: 40°C/24°C	Dry, wet	^τ Rk,ucr	[N/mm ²]	17	17	16	15	14	13	13	13
ture	II: 80°C/50°C	concrete and	^τ Rk,ucr	[N/mm ²]	17	17	16	15	14	13	13	13
Temperature range	III: 120°C/72°C	flooded bore hole	^τ Rk,ucr	[N/mm²]	15	14	14	13	12	12	11	11
Ter	IV: 160°C/100°C		^τ Rk,ucr	[N/mm ²]	12	11	11	10	9,5	9,0	9,0	9,0
	teristic bond resist	ance in cracked o	oncrete C20/25	5								
ange	I: 40°C/24°C		^τ Rk,cr	[N/mm ²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
nre r:	II: 80°C/50°C	Dry, wet concrete and	^τ Rk,cr	[N/mm²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
Temperature range	III: 120°C/72°C	flooded bore hole	^τ Rk,cr	[N/mm²]	6,0	6,5	7,0	7,5	7,0	6,0	6,0	6,0
Tem	IV: 160°C/100°C		^τ Rk,cr	[N/mm²]	5,5	5,5	6,0	6,5	6,0	5,5	5,5	5,5
Redukt	ion factor $\psi^0{}_{sus}$ in	cracked and nor	-cracked concr	ete C20/25								
ange	l: 40°C/24°C							0,	90			
Temperature range	II: 80°C/50°C	Dry, wet concrete and	Ψ ⁰ sus	[-]				0,	87			
Ipera	III: 120°C/72°C	flooded bore hole	* SUS					0,	75			
Terr	IV: 160°C/100°C							0,	66			
			C25/30	•				1,	02			
			C30/37						04			
	sing factors for cond	crete	C35/45						07			
Ψ_{c}			C40/50						08			
			C45/55						09			
Concre	ete cone failure		C50/60					Ι,	10			
		elevant paramete	er					see Ta	ble C2			
Splittin	ng											
		elevant paramete	er					see Ta	ble C2			
Installa	ation factor	T									4	
for dry	and wet concrete	MAC					1,2			No Per ass	formar essed	ICE
	and wet concrete	CAC	γinst	[-]					,0			
		HDB	4						,2			
tor flood	ded bore hole	CAC						1	,4			
Chem	ofast Injection S	ystem UM-H fo	r concrete									
	mances cteristic values of ter	nsion loads under	static and quasi	-static actior	<u>–</u>					Anne	x C 3	3



Table C4: Charac for a w	teristic value orking life of		n loads i	unde	r stat	ic and	d qua	si-sta	atic a	ction	
Anchor size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure							·	•	·	I	
Characteristic tension resi	stance	N _{Rk,s}	[kN]			$A_s \cdot f$	_{uk} (or s	ee Tab	le C1)		
Partial factor		γ _{Ms,N}	[-]				see Ta	able C1			
Combined pull-out and o	concrete failure	1= ,		L							
Characteristic bond resist		ked concrete C2	20/25								
I: 80°C/24°C	Dry, wet concrete and flooded bore	⁷ Rk,ucr,100	[N/mm²]	17	17	16	15	14	13	13	13
ll: 80°C/50°C	hole	^τ Rk,ucr,100	[N/mm²]	17	17	16	15	14	13	13	13
Characteristic bond resist	ance in cracked c	concrete C20/25	5								
I: 80°C/20°C	Dry, wet concrete and	^τ Rk,cr,100	[N/mm²]	5,5	6,0	6,5	6,5	6,5	6,5	6,5	6,5
= = = = = = = = = = = = = = = = = = =	flooded bore hole	^τ Rk,cr,100	[N/mm²]	5,5	6,0	6,5	6,5	6,5	6,5	6,5	6,5
	1	C25/30					1,	,02			
		C30/37						,04			
Increasing factors for cond	crete	C35/45						,07			
ψC		C40/50						,08			
		C45/55 C50/60						,09 10			
Concrete cone failure		00/00					١,	,10			
	elevant paramete	er					see Ta	able C2	2		
Splitting				. <u> </u>							
	elevant paramete	er					see Ta	able C2	2		
Installation factor											
for dry and wet concrete	МАС					1,2				rformar sessed	ice
	CAC	γ _{inst}	[-]					,0			
for the only the set of the set o	HDB	-						,2			
for flooded bore hole	CAC						1	,4			
Chemofast Injection S	ystem UM-H fo	r concrete							A		
Performances									Anne	ex C 4	ļ

Characteristic values of tension loads under static and quasi-static action



Table C5: Characteristic va	lues of	shear	r loads	s unde	er stat	ic and	quas	i-statio	c action	
Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm						•	•	•		
Characteristic shear resistance Steel, strength class 4.6, 4.8 and 5.6, 5.8	V ⁰ _{Rk,s}	[kN]			0,6 •	A _s ∙f _{uk}	(or see	Table C	1)	
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all strength classes	V ⁰ _{Rk,s}	[kN]			0,5 •	A _s ∙f _{uk}	(or see	Table C	1)	
Partial factor	γ _{Ms,V}	[-]				see	Table C	:1		
Ductility factor	k ₇	[-]					1,0			
Steel failure with lever arm		1								
Characteristic bending moment	M ⁰ _{Rk,s}	[Nm]			1,2 • 1	W _{el} ∙ f _u ⊧	(or see	Table C	21)	
Elastic section modulus	W _{el}	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γMs,V	[-]				see	Table C	1		
Concrete pry-out failure										
Factor	k ₈	[-]					2,0			
Installation factor	γ _{inst}	[-]					1,0			
Concrete edge failure										
Effective length of fastener	۱ _f	[mm]		m	nin(h _{ef} ; 1	2 · d _{nor}	m)		min(h _{ef} ;	300mm)
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	16	20	24	27	30
Installation factor	γinst	[-]					1,0			

Chemofast Injection System UM-H for concrete

Performances

Characteristic values of shear loads under static and quasi-static action



	r size internal thre	eaded anchor ro	ds		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel fa	ailure ¹⁾					1	1	1		1
	teristic tension resi	·	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, s	trength class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
	factor, strength clas		γMs,N	[-]			1	,5		
	teristic tension resi 4 and HCR, Streng		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial f			γMs,N	[-]			1,87			2,86
	ned pull-out and o									
	teristic bond resista	ance in non-cracł	ed concrete	-		1	1	1		1
iure	I: 40°C/24°C		^τ Rk,ucr	[N/mm ²]	17	16	15	14	13	13
nperat range	II: 80°C/50°C	Dry, wet concre	te ⁷ Rk,ucr	[N/mm ²]	17	16	15	14	13	13
Temperature range	III: 120°C/72°C	flooded bore ho	le ^τ Rk,ucr	[N/mm ²]	14	14	13	12	12	11
Tel	IV: 160°C/100°C		^τ Rk,ucr	[N/mm ²]	11	11	10	9,5	9,0	9,0
Charact	teristic bond resista	ance in cracked c	oncrete C20)/25						
<u>e</u> r	I: 40°C/24°C		^τ Rk,cr	[N/mm ²]	7,5	8,0	9,0	8,5	7,0	7,0
Temperature range	II: 80°C/50°C	Dry, wet concre	te _{τ_{Rk,cr}}	[N/mm ²]	7,5	8,0	9,0	8,5	7,0	7,0
nperat range	III: 120°C/72°C	and flooded bore ho	_	[N/mm ²]	6,5	7,0	7,5	7,0	6,0	6,0
Ten	IV: 160°C/100°C		τ _{Rk,cr}	[N/mm ²]	5,5	6,0	6,5	6,0	5,5	5,5
	ion factor ψ^0 sus in	cracked and non				-,-	-,-	-,-	-,-	-,-
	I: 40°C/24°C				/20		0	90		
e atur	II: 80°C/50°C	Dry, wet concre	te							
Temperature range		and	Ψ^{0} sus	[-]				87		
	III: 120°C/72°C	flooded bore ho	le					75		
Ĕ	IV: 160°C/100°C							66		
				25/30 30/37			,	02 04		
ncreas	ing factors for cond	crete		35/45			,	04 07		
Ψc				10/50			,	08		
•				15/55				09		
			CS	50/60			1,	10		
	ete cone failure									
	nt parameter						see Ta	able C2		
-	g failure							able C2		
	nt parameter Ition factor						566 12			
nstana		MAC				1,2		No Perfo	ormance a	issessec
for dry a	and wet concrete	CAC				.,_	1	,0		
-		HDB	γinst	[-]			1	,2		
or flood	ded bore hole	CAC					1	,4		
The o	enings (incl. nut and characteristic tensio G-M20 strength clas	n resistance for st								d rod.
Cham	ofast Injection S	vstem UM-H fo	r concrete							



		eaded anchor rod	S		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel fa	ailure ¹⁾						1			
Charac	teristic tension res	istance, <u>5.8</u>	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, s	strength class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial	factor, strength cla	ss 5.8 and 8.8	γMs,N	[-]			1	,5		
	teristic tension res 4 and HCR, Streng		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial	factor		γ _{Ms,N}	[-]			1,87			2,86
Combi	ned pull-out and o	concrete cone fail								
	teristic bond resist	ance in non-cracke	d concrete	C20/25		-		-		-
Temperature range	I: 40°C/24°C	Dry, wet concrete and	⁷ Rk,ucr,100	[N/mm²]	17	16	15	14	13	13
Temp ra	II: 80°C/50°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	17	16	15	14	13	13
Charac	teristic bond resist	ance in cracked co	ncrete C20/	25			-			
Temperature range	I: 40°C/24°C	Dry, wet concrete	^τ Rk,cr,100	[N/mm²]	6,0	6,5	6,5	6,5	6,5	6,5
Tempor	II: 80°C/50°C	flooded bore hole	^τ Rk,cr,100	[N/mm²]	6,0	6,5	6,5	6,5	6,5	6,5
		•	C25/				,	02		
			C30/				,	04		
	ing factors for con	crete	C35/					07		
[∉] c			C40/ C45/				,	08 09		
			C45/					10		
Concre	ete cone failure		000,				.,			
Releva	nt parameter						see Ta	able C2		
Splittin	ng failure									
Releva	nt parameter						see Ta	able C2		
nstalla	ation factor	1								
		MAC	-			1,2			ormance a	assessed
or dry	and wet concrete	CAC	γ _{inst}	[-]				,0		
	ded bore hole	HDB CAC						,2 ,4		
¹⁾ Fast The	enings (incl. nut and	washer) must component of the state of the s					erty class o	f the interr		d rod.

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Anchor size for internal threade	d anch	or rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure without lever arm ¹⁾						•			
Characteristic shear resistance,	5.8	V ⁰ _{Rk,s}	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V ⁰ _{Rk,s}	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]				1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾		V ⁰ Rk,s	[kN]	7	13	20	30	55	40
Partial factor		γ _{Ms,V}	[-]			1,56			2,38
Ductility factor		k ₇	[-]				1,0		
Steel failure with lever arm ¹⁾		•							
Characteristic bending moment,	5.8	M ⁰ Rk,s	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M ⁰ _{Rk,s}	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]			•	1,25		
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 ²⁾		M ⁰ Rk,s	[Nm]	11	26	52	92	233	456
Partial factor		γ _{Ms,V}	[-]			1,56			2,38
Concrete pry-out failure			•						
actor		k ₈	[-]				2,0		
nstallation factor		γinst	[-]				1,0		
Concrete edge failure		•	•						
Effective length of fastener		I _f	[mm]		min	(h _{ef} ; 12 • c	I _{nom})		min(h _{ef} ; 300m
Dutside diameter of fastener		d _{nom}	[mm]	10	12	16	20	24	30
nstallation factor		γinst	[-]			1	1,0	I	
 ¹⁾ Fastenings (incl. nut and washer The characteristic tension resista ²⁾ For IG-M20 strength class 50 is 	ance for								

Performances

Characteristic values of shear loads under static and quasi-static action



Ancho	r size reinforcing	bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 3:
Steel f						~ 10	~ 12	~ 17		20	~ 27	20	20	
Charac	cteristic tension resi	stance	N _{Rk,s}	[kN]					A _s •	f _{uk} 1)				
Cross s	section area		A _s	[mm ²]	50	79	113	154	201	314	452	491	616	804
Partial	factor		γ _{Ms,N}	[-]					1,	4 ²⁾				
Combi	ined pull-out and o	concrete fail		1										
Charac	cteristic bond resista	ance in non-c	racked cond	crete C20/2	25				1	1	1		1	
ure	I: 40°C/24°C	Dry, wet	^τ Rk,ucr	[N/mm ²]	14	14	14	14	13	13	13	13	13	13
Temperature range	II: 80°C/50°C	concrete and	^τ Rk,ucr	[N/mm ²]	14	14	14	14	13	13	13	13	13	13
rar	III: 120°C/72°C	flooded	^τ Rk,ucr	[N/mm ²]	13	12	12	12	12	11	11	11	11	11
Te	IV: 160°C/100°C	bore hole	^τ Rk,ucr	[N/mm ²]	9,5	9,5	9,5	9,0	9,0	9,0	9,0	9,0	8,5	8,5
Charac	cteristic bond resista	ance in crack	ed concrete	C20/25					1			1		
ure	I: 40°C/24°C	Dry, wet	^τ Rk,cr	[N/mm ²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0
nperatı range	II: 80°C/50°C	concrete and	^τ Rk,cr	[N/mm ²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0
Temperature range	III: 120°C/72°C	flooded	^τ Rk,cr	[N/mm ²]	4,5	5,0	5,0	5,5	5,5	5,5	5,5	6,0	6,0	6,0
Те	IV: 160°C/100°C	bore hole	^τ Rk,cr	[N/mm ²]	4,0	4,5	4,5	5,0	5,0	5,0	5,0	5,0	5,0	5,0
Redukt	tion factor ψ^0_{sus} in	cracked and	non-cracke	d concrete	C20/2	5								
ange	I: 40°C/24°C	Dry, wet							0,	90				
ure ra	II: 80°C/50°C	concrete and	Ψ ⁰ sus	[-]					0,	87				
Temperature range	III: 120°C/72°C	flooded bore hole	Ψ sus						0,	75				
Ter	IV: 160°C/100°C									66				
			C25						,	02				
Increas	sing factors for cond	crete	C30							04 07				
Ψc			C40							08				
U			C45						,	09				
			C50)/60					1,	10				
	ete cone failure				1									
	int parameter								see Ta	able C2	2			
Splittir	•													
	int parameter								see Ta	able C2	2			
Installa	ation factor			1			10			Na	Deufeu			
for dry	and wet concrete	MAC CAC	-				1,2		1	,0 ,0	Perfor	mance	asses	sea
lor dry		HDB	γinst	[-]						, <u>0</u> ,2				
for floo	ded bore hole	CAC	-							,4				
	hall be taken from th osence of national re		ns of reinforc	ing bars										
Chem	nofast Injection S	ystem UM-ł	H for concr	ete										
	r mances cteristic values of te	nsion loads ur	nder static an	ıd quasi-sta	tic acti	on					Α	nne>	с С 9	



Table	e C10: Charao for a w	cteristic va /orking life			oads	und	er st	atic a	and c	luasi	-stati	ic ac	tion	
Anchor	size reinforcing	bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel fa	ailure				1	1	1			1	1	1		1
Charact	teristic tension res	sistance	N _{Rk,s}	[kN]					A _s ·	f _{uk} 1)				
Cross s	ection area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial fa	actor		γ _{Ms,N}	[-]					1,	4 ²⁾				
Combir	ned pull-out and	concrete fail			1									
Charact	teristic bond resis	tance in non-o	racked conc	rete C20/2	25									
Temperature range	I: 40°C/24°C	Dry, wet concrete and	^τ Rk,ucr,100	[N/mm²]	14	14	14	14	13	13	13	13	13	13
Temp	II: 80°C/50°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	14	14	14	14	13	13	13	13	13	13
Charact	teristic bond resis	tance in crack	ed concrete	C20/25				1						
Temperature range	l: 40°C/24°C	Dry, wet concrete	^τ Rk,cr,100	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
Temperan	II: 80°C/50°C	and flooded bore hole	^τ Rk,cr,100	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
			C25	/30					1,	02		•		
			C30							04				
	ing factors for cor	ncrete	C35							07				
ψ C			C40							08				
			C45 C50							09 10				
Concre	te cone failure		000	/00						10				
Relevar	nt parameter								see Ta	able C	2			
Splittin	g													
Relevar	nt parameter								see Ta	able C	2			
Installa	tion factor				•									
		MAC					1,2			No	Perfor	mance	asses	ssed
for dry a	and wet concrete	CAC	γ _{inst}	[-]						,0				
f fl		HDB								,2				
	ded bore hole								1	,4				
	all be taken from t sence of national r													
Perfor	ofast Injection s					ion					A	nnex	C 10)



Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure without lever arm							1	1			1	1
Characteristic shear resistance	V ⁰ Rk,s	[kN]					0,50	• A _s •	f _{uk} 1)			
Cross section area	A _s	[mm ²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γ _{Ms,V}	[-]					•	1,5 ²⁾	•			
Ductility factor	k ₇	[-]						1,0				
Steel failure with lever arm			-									
Characteristic bending moment	M ⁰ _{Rk,s}	[Nm]					1.2	w _{el} ·	f _{uk} 1)			
Elastic section modulus	W _{el}	[mm ³]	50	98	170	269	402	785	1357	1534	2155	3217
Partial factor	γ _{Ms,V}	[-]						1,5 ²⁾			•	
Concrete pry-out failure	·	•										
Factor	k ₈	[-]						2,0				
Installation factor	γinst	[-]						1,0				
Concrete edge failure												
Effective length of fastener	۱ _f	[mm]		I	min(h _e	_{ef} ; 12 •	d _{nom})		min(h _{ef} ; 300	mm)
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	14	16	20	24	25	28	32
Installation factor	γinst	[-]						1,0				

²⁾ in absence of national regulation

Chemofast Injection System UM-H for concrete

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Characteristic values of shear loads under static and quasi-static action



Anchor size threaded	l rod		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concret	e C20/25 under	r static and quasi	-static ad	ction for	a work	ing life o	of 50 and	d 100 ye	ars	
Temperature range	δ_{N0} -factor	[mm/(N/mm ²)]	0,031	0,032	0,034	0,037	0,039	0,042	0,044	0,046
I: 40°C/24°C II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,040	0,042	0,044	0,047	0,051	0,054	0,057	0,060
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,032	0,034	0,035	0,038	0,041	0,044	0,046	0,048
III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,042	0,044	0,045	0,049	0,053	0,056	0,059	0,062
Temperature range	δ_{N0} -factor	[mm/(N/mm ²)]	0,121	0,126	0,131	0,142	0,153	0,163	0,171	0,179
IV: 160°C/100°Č	$\delta_{N^{\infty}}$ -factor	[mm/(N/mm ²)]	0,124	0,129	0,135	0,146	0,157	0,168	0,176	0,184
Cracked concrete un	der static and	quasi-static actio	n for a w	orking l	ife of 50	and 10) years			
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,081	0,083	0,085	0,090	0,095	0,099	0,103	0,10
I: 40°C/24°C II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,104	0,107	0,110	0,116	0,122	0,128	0,133	0,137
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,084	0,086	0,088	0,093	0,098	0,103	0,107	0,110
III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,108	0,111	0,114	0,121	0,127	0,133	0,138	0,143
Temperature range	δ_{N0} -factor	[mm/(N/mm ²)]	0,312	0,321	0,330	0,349	0,367	0,385	0,399	0,412
IV: 160°C/100°Č	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,321	0,330	0,340	0,358	0,377	0,396	0,410	0,424
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \cdot \tau \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \cdot \tau \end{split}$ Table C13: Dis	;;	ction bond stress fo under shear I		thread	ed roc	I)	I		I	Γ
$\delta_{N\infty} = \delta_{N\infty} \text{-factor} + \epsilon$	placements			thread	ed roc M12	I) M16	M20	M24	M27	M30
$\delta_{N\infty} = \delta_{N\infty}$ -factor Table C13: Dis	placements I rod	under shear l	oad ²⁾ (M8	M10	M12	-	M20	M24	M27	M30
δN∞ = δN∞-factor Table C13: Dis Anchor size threaded Non-cracked and cra	placements I rod	under shear l	oad ²⁾ (M8	M10	M12	-	M20	M24	M27	M30 0,03
$ \delta_{N\infty} = \delta_{N\infty} $ -factor Table C13: Dis Anchor size threaded Non-cracked and crace All temperature $ \delta_{N\infty} = \delta_{N\infty} $	placements I rod cked concrete	under shear l	oad ²⁾ (M8 quasi-sta	M10 atic acti	M12 on	M16	1		1	0,03
$ \delta_{N\infty} = \delta_{N\infty} $ -factor Table C13: Dis Anchor size threaded Non-cracked and crace All temperature $ \delta_{N\infty} = \delta_{N\infty} $	placements I rod cked concrete δ_{V0} -factor $\delta_{V\infty}$ -factor displacement	under shear I under static and [mm/kN]	oad ²⁾ (M8 quasi-sta 0,06 0,09	M10 atic action 0,06	M12 on 0,05	M16	0,04	0,03	0,03	
$\delta_{N\infty} = \delta_{N\infty} \text{-factor}$ Table C13: Dis Anchor size threaded Non-cracked and crac All temperature ranges $^{2)} \text{ Calculation of the c} \delta_{V0} = \delta_{V0} \text{-factor} \cdot V$	placements I rod cked concrete δ_{V0} -factor $\delta_{V\infty}$ -factor displacement	under shear I under static and [mm/kN] [mm/kN]	oad ²⁾ (M8 quasi-sta 0,06 0,09	M10 atic action 0,06	M12 on 0,05	M16	0,04	0,03	0,03	0,03



	nal threaded rod			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Ion-cracked con	crete under static	and quasi-sta	atic act	tion for a v	vorking lif	e of 50 an	d 100 year	s	
Temperature ra		[mm/(N/r	nm²)]	0,032	0,034	0,037	0,039	0,042	0,046
I: 40°C/24°C II: 80°C/50°C		[mm/(N/r	nm²)]	0,042	0,044	0,047	0,051	0,054	0,060
Temperature ra				0,034	0,035	0,038	0,041	0,044	0,048
III: 120°C/72°			/-	0,044	0,045	0,049	0,053	0,056	0,062
Temperature ra			· -	0,126	0,131	0,142	0,153	0,163	0,179
IV: 160°C/100			nm²)]	0,129	0,135	0,146	0,157	0,168	0,184
racked concrete	under static and	quasi-static a	action f	ior a work	ing life of	50 and 100) years		1
Temperature ra		[mm/(N/r	nm²)]	0,083	0,085	0,090	0,095	0,099	0,106
I: 40°C/24°C II: 80°C/50°C		[mm/(N/r	nm²)]	0,170	0,110	0,116	0,122	0,128	0,137
Temperature ra		[mm/(N/r	nm²)]	0,086	0,088	0,093	0,098	0,103	0,110
III: 120°C/72°		[mm/(N/r	mm²)]	0,111	0,114	0,121	0,127	0,133	0,143
Temperature ra	nge _{δN0} -factor	[mm/(N/r	nm²)]	0,321	0,330	0,349	0,367	0,385	0,412
IV: 160°C/100	°Č δ _{N∞} -factor	[mm/(N/r	nm²)]	0,330	0,340	0,358	0,377	0,396	0,424
Anchor size Inter			IG-N	IG IG	-M8 IC	G-M10	G-M12	IG-M16	IG-M20
Ion-cracked and	cracked concrete	under static	and qu	asi-static	action				
Il temperature	δ_{V0} -factor	[mm/kN]	0,0	7 0	,06	0,06	0,05	0,04	0,04
anges	$\delta_{V\infty}$ -factor	[mm/kN]	0,1	0 0	,09	0,08	0,08	0,06	0,06
²⁾ Calculation of	r · V; V:	action shear loa	he						

Performances

Displacements under static and quasi-static action (Internal threaded anchor rod)



Anchor size reinf	orcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Non-cracked con	crete under	static and quas	i-static	action	or a wo	orking li	ife of 50) and 1	00 year	S		
Temperature	δ_{N0} -factor	[mm/(N/mm ²)]	0,031	0,032	0,034	0,035	0,037	0,039	0,042	0,043	0,045	0,048
range I: 40°C/24°C II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,040	0,042	0,044	0,045	0,047	0,051	0,054	0,055	0,058	0,063
Temperature	δ_{N0} -factor	[mm/(N/mm ²)]	0,032	0,034	0,035	0,036	0,038	0,041	0,044	0,045	0,047	0,050
range III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,042	0,044	0,045	0,047	0,049	0,053	0,056	0,057	0,060	0,065
Temperature	δ_{N0} -factor	[mm/(N/mm ²)]	0,121	0,126	0,131	0,137	0,142	0,153	0,163	0,164	0,172	0,18
range IV: 160°C/100°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,124	0,129	0,135	0,141	0,146	0,157	0,168	0,169	0,177	0,19
Cracked concrete	e under stati	c and quasi-sta	tic actio	on for a	workin	g life of	f 50 and	l 100 ye	ears			
Temperature range	δ_{N0} -factor	[mm/(N/mm ²)]	0,081	0,083	0,085	0,087	0,090	0,095	0,099	0,099	0,103	0,108
I: 40°C/24°C II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,104	0,107	0,110	0,113	0,116	0,122	0,128	0,128	0,133	0,14
Temperature	δ_{N0} -factor	[mm/(N/mm ²)]	0,084	0,086	0,088	0,090	0,093	0,098	0,103	0,103	0,107	0,113
range III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,108	0,111	0,114	0,118	0,121	0,127	0,133	0,133	0,138	0,148
			0.010	0.001		0.040	0,349	0,367	0,385	0.005	0.000	0.40
Temperature	δ_{N0} -factor	[mm/(N/mm ²)]	0,312	0,321	0,330	0,340	0,349	0,307	0,365	0,385	0,399	0,42
range IV: 160°C/100°C ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto	$\frac{\delta_{N\infty}\text{-factor}}{\delta_{N\infty}\text{-factor}}$ the displacement τ ; or $\cdot \tau$;	[mm/(N/mm ²)]	0,321 stress f	0,330 or tensic	0,340 n	0,349	0,349	0,377	0,396	0,396	0,399	
range <u>IV: 160°C/100°C</u> ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C17:	$\delta_{N\infty}$ -factor the displacem or $\cdot \tau$; or $\cdot \tau$; Displacem	ent τ: action bonc	0,321 stress f	0,330 or tensic load ²⁾	0,340 n (reba	0,349 r)	0,358	0,377	0,396	0,396	0,410	0,449
range <u>IV: 160°C/100°C</u> ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C17: I Anchor size reinf	$\delta_{N\infty}$ -factor the displacem or $\cdot \tau$; Displacem orcing bar	ient τ: action bonc	0,321 stress f shear Ø 8	0,330 or tensic load ²⁾ Ø 10	0,340 n (reba Ø 12	0,349 r) Ø 14	0,358	0,377			-	0,449
range <u>IV: 160°C/100°C</u> ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C17: I Anchor size reinf Non-cracked and	$\delta_{N\infty}$ -factor the displacem or $\cdot \tau$; Displacem orcing bar cracked cor	ient τ: action bonc nents under a ncrete under sta	0,321 stress f shear Ø 8 atic and	0,330 or tensic load ²⁾ Ø 10	0,340 n (reba Ø 12 static a	0,349 r) Ø 14 ction	0,358 Ø 16	0,377 Ø 20	0,396 Ø 24	0,396 Ø 25	0,410 Ø 28	0,425 0,449 Ø 32 0.03
range IV: 160°C/100°C ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C17: I Anchor size reinf Non-cracked and All temperature ranges	$\frac{\delta_{N\infty}\text{-factor}}{\delta_{N\infty}\text{-factor}}$ the displacem ir $\cdot \tau$; or $\cdot \tau$; Displacem orcing bar cracked cou $\delta_{V0}\text{-factor}$ $\delta_{V\infty}\text{-factor}$	ient τ: action bonc ients under increte under sta [mm/kN] [mm/kN]	0,321 stress f shear Ø 8	0,330 or tensic load ²⁾ Ø 10 I quasi- 0,05	0,340 n (reba Ø 12 static a 0,05	0,349 r) Ø 14 ction	0,358	0,377	0,396	0,396	0,410	0,44
range IV: 160°C/100°C ¹⁾ Calculation of $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C17: I Anchor size reinf Non-cracked and All temperature	$\frac{\delta_{N\infty}\text{-factor}}{\delta_{N\infty}\text{-factor}}$ the displacem ir $\cdot \tau$; or $\cdot \tau$; Displacem orcing bar cracked con $\delta_{V0}\text{-factor}$ $\delta_{V\infty}\text{-factor}$ the displacem r $\cdot V$;	ient τ: action bonc ients under increte under sta [mm/kN] [mm/kN]	0,321 stress f shear Ø 8 atic and 0,06 0,09	0,330 or tensic load ²⁾ Ø 10 I quasi- 0,05	0,340 n (reba Ø 12 static a 0,05	0,349 r) Ø 14 ction 0,04	0,358 Ø 16 0,04	0,377 Ø 20 0,04	0,396 Ø 24 0,03	0,396 Ø 25 0,03	0,410 Ø 28 0,03	0,44 Ø 3:



Table C18: Characteristic values of tension loads under seismic action(performance category C1) for a working life of 50 and 100 years

Ancho	r size threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel f	ailure			_								
Charac	teristic tension resis	tance	N _{Rk,s,eq,C1}	[kN]				1,0 ·	N _{Rk,s}			
Partial	factor		γMs,N	[-]				see Ta	able C1			
Combi	ined pull-out and co	oncrete failure										
Charac	cteristic bond resista	nce in cracked a	nd non-cracked	d concrete (020/25							
e	I: 40°C/24°C	Derivert	^τ Rk,eq,C1	[N/mm ²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
nperatu range	II: 80°C/50°C	Dry, wet	^τ Rk,eq,C1	[N/mm ²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
Temperature range	III: 120°C/72°C	flooded bore	^τ Rk,eq,C1	[N/mm ²]	6,0	6,5	7,0	7,5	7,0	6,0	6,0	6,0
Те	IV: 160°C/100°C		^τ Rk,eq,C1	[N/mm ²]	5,5	5,5	6,0	6,5	6,0	5,5	5,5	5,5
Increas	sing factors for conci	rete ψ_{C}	C25/30 to	C50/60				1	,0			
Installa	ation factor											
forder	and wat concrete	CAC						1	,0			
lor dry	and wet concrete	HDB	γinst	[-]				1	,2			
for floo	ded bore hole	CAC						1	,4			

Table C19: Characteristic values of shear loads under seismic action (performance category C1)

Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure										
Characteristic shear resistance (Seismic C1)	V _{Rk,s,eq,C1}	[kN]				0,70) • V ⁰ Rk	,S		
Partial factor	γMs,V	[-]				see	Table C	21		
Factor for annular gap	α_{gap}	[-]				0,	5 (1,0) ¹⁾			

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

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Characteristic values of tension and shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (threaded rod)



Table	e C20: Charact (perforr		alues of te ategory C1										ars			
	size reinforcing	bar			Ø	8 🖉	ð 10	Ø 12	Ø	14 🖉	ð 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel fa	teristic tension resi	atanaa	N-	[LN]						1 (٥. ۵	• f _{uk} 1))			
	ection area	stance	N _{Rk,s,eq,C1}	[kN] [mm²]	5	0	79	113	15			314	452	491	616	804
Partial f			γ _{Ms,N}	[-]			79	115		14 4	<u>- 1,4</u>		452	431	010	004
	ned pull-out and c	oncrete fai	,	[]							۰,-	r				
	teristic bond resista			cracked o	concr	ete C	220/2	25								
range	I: 40°C/24°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]] 5,	,5	5,5	6,0	6,	5	6,5	6,5	6,5	7,0	7,0	7,0
nre	II: 80°C/50°C	concrete and	^τ Rk,eq,C1	[N/mm ²] 5	,5	5,5	6,0	6,	5	6,5	6,5	6,5	7,0	7,0	7,0
Temperature range	III: 120°C/72°C	flooded bore hole	^τ Rk,eq,C1	[N/mm²] 4	,5	5,0	5,0	5,	5	5,5	5,5	5,5	6,0	6,0	6,0
Ter	IV: 160°C/100°C		^τ Rk,eq,C1	[N/mm ²]] 4	,0	4,5	4,5	5,	0	5,0	5,0	5,0	5,0	5,0	5,0
Increas	ing factors for cond	rete ψ_{C}	C25/30 to	c50/60		1	I				1,	0			•	•
Installa	tion factor		-													
for dry a	and wet concrete	CAC HDB	γ _{inst}	[-]							1, 1,					
for flood	ded bore hole	CAC									1,	4				
	size reinforcing l		ategory C1	-	Ø 8	Ø 1	0 Ø ·	12 Ø	14 🗴	ð 16	Ø 20) Ø 24	Ø 2	5 Ø	ð 28	Ø 32
Steel fa	nilure															
Charact	teristic shear resist	ance	V _{Rk,s,eq}	[kN]						0,35	۰A _s	• f _{uk} ¹⁾				
Cross s	ection area		A _s	[mm²]	50	79	11	3 1	54	201	314	452	49 [.]	1 (616	804
Partial f	actor		γMs,V	[-]							1,5 ²⁾)				
Factor	for annular gap		α_{gap}	[-]						0,	,5 (1,0	0) ³⁾				
²⁾ in abs ³⁾ Value	all be taken from the sence of national re e in brackets valid fo x A 3 is recommend	gulation or filled annu		-	and	clear	ance	hole	in the	e fixtu	ure. U	lse of s	pecial	filling	wash	er
Perfori Charac	ofast Injection S mances steristic values of ter orking life of 50 and	sion and sh	ear loads unde		actic	on (pe	erforr	nance	e cat	egory	/ C1)		Ar	nex	(C 1)	6



Table C22: Characte (perform	eristic valu ance cate								ears	
Anchor size threaded rod					M1	2	M16		M20	M24
Steel failure						•		•		•
Characteristic tension resist Steel, strength class 8.8 Stainless Steel A4 and HCF Strength class ≥70	·	N _{Rk,s,ec}	q,C2	[kN]			1	,0 • N	Rk,s	
Partial factor		γ _{Ms,N}		[-]			se	e Tab	le C1	
Combined pull-out and co	ncrete failui									
Characteristic bond resistar	ice in cracke	d and non-c	rackec	concrete C	20/25					
⊉ I: 40°C/24°C	Dry wot	^τ Rk,eq,C	2	[N/mm²]	3,0	6	3,5		3,3	2,3
ा: 80°C/50°C	Dry, wet concrete an	_		[N/mm ²]	3,0	6	3,5		3,3	2,3
end I: 40°C/24°C is an end II: 80°C/50°C III: 120°C/72°C III: 120°C/72°C IV: 160°C/100°C IV: 160°C/100°C	flooded bore			[N/mm ²]	3,	1	3,0		2,8	2,0
IV: 160°C/100°C	hole	⁷ Rk,eq,C		[N/mm ²]	2,5	5	2,7		2,5	1,8
Increasing factors for concre	ete ψ _c			C50/60				1,0)	
Installation factor								.,-		
for dry and wet concrete	CAC HDB	γ _{inst}		[-]				1,0 1,2		
for flooded bore hole	CAC							1,4	•	
Table C23: Characte (perform Anchor size threaded rod	ance cate			M12		M16			Л20	M24
Steel failure										
Characteristic shear resista Steel, strength class 8.8 Stainless Steel A4 and HCF Strength class ≥70		Rk,s,eq,C2	[kN]				0,70 • V	^{′0} Rk,s		
Partial factor	γι	Ms,V	[-]			\$	see Tab	le C1		
Factor for annular gap	α	gap	[-]				0,5 (1,	0) ¹⁾		
¹⁾ Value in brackets valid for Annex A 3 is recommende		gab betwee	n anch	or and clear	ance ho	le in the	fixture. l	Jse of	special fill	ing washer
Chemofast Injection Sy	stem UM-H	for concre	ete							
Performances Characteristic values of tens for a working life of 50 and 1			er seisn	nic action (pe	erforma	nce cateç	gory C2)		Ann	ex C 17



Anchor size threa	ded rod		M12	M16	M20	M24
Cracked concrete	under seismic act	tion (performan	ce category C2)			
All temperature	δ _{N,eq,C2(DLS)}	[mm]	0,24	0,27	0,29	0,27
ranges	δ _{N,eq,C2(ULS)}	[mm]	0,55	0,51	0,50	0,58
Table C25:	Displacements	under shear	· load (threade	d rod)		
		under shear	load (threade	d rod) M16	M20	M24
Anchor size threa			M12	-	M20	M24
Anchor size threa	ided rod		M12	-	M20 3,1	M24 3,5

Chemofast Injection System UM-H for concrete

Performances

Displacements under seismic action (performance category C2) (threaded rods)

Annex 18