Deutsches Institut für Bautechnik
DIBt

Approval body for construction products and types of construction
Bautechnisches Prüfamt
An institution established by the Federal and Laender Governments

European Technical Assessment

ETA-09/0006 of 7 September 2017

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 C-RE 385 for concrete
Product family to which the construction product belongs	Bonded anchor for use in concrete
Manufacturer	CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich DEUTSCHLAND
Manufacturing plant	Chemofast Anchoring GmbH
This European Technical Assessment contains	23 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	ETAG 001 Part 5: "Bonded anchors", April 2013, used as EAD according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.
This version replaces	ETA-09/0006 issued on 6 September 2016

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Specific Part

1 Technical description of the product

The "Chemofast Injection system C-RE 385 for concrete" is a bonded anchor consisting of a cartridge with Chemofast injection mortar C-RE 385 and a steel element. The steel element consist of a commercial threaded rod with washer and hexagon nut in the range of M8 to M30, reinforcing bar in the range of diameter ∅8 to ∅32 mm or internal threaded rod IG-M6 to IG-M20.

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 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 for static and quasi-static action and seismic performance categories C1, C2	See Annex C 1 to C 7
Displacements	See Annex C 8 to C 10

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply..

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, 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

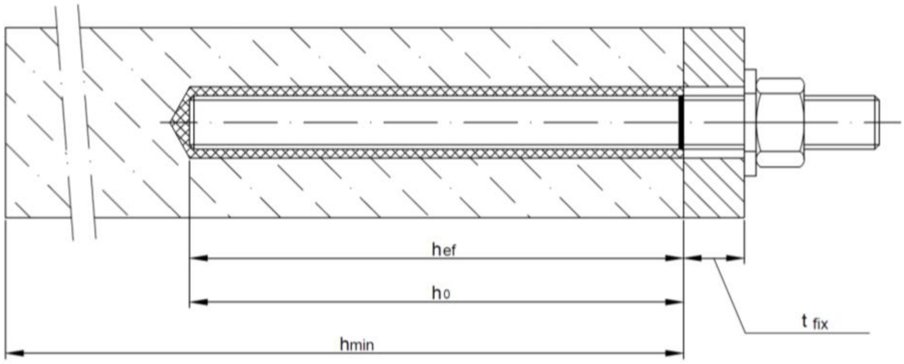
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 7 September 2017 by Deutsches Institut für Bautechnik

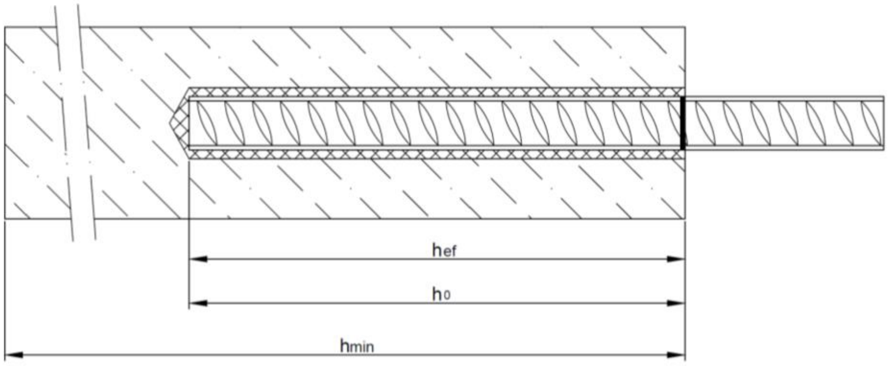
Andreas Kummerow
Head of Department

beglaubigt:
Baderschneider

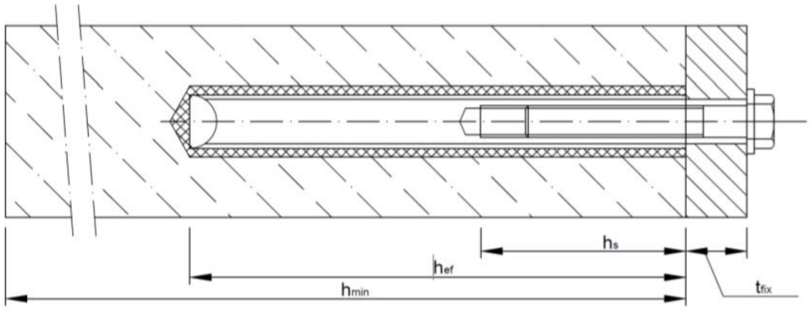
Installation threaded rod M8 to M30



Installation reinforcing bar Ø8 to Ø32



Installation internal threaded rod IG-M6 to IG-M20



d_f = diameter of clearance hole in the fixture
t_{fix} = thickness of fixture
h_{ef} = effective anchorage depth
h_0 = depth of drill hole
h_{min} = minimum thickness of member

Chemofast Injection System C-RE 385 for concrete	**Annex A 1**
Product description Installed condition	

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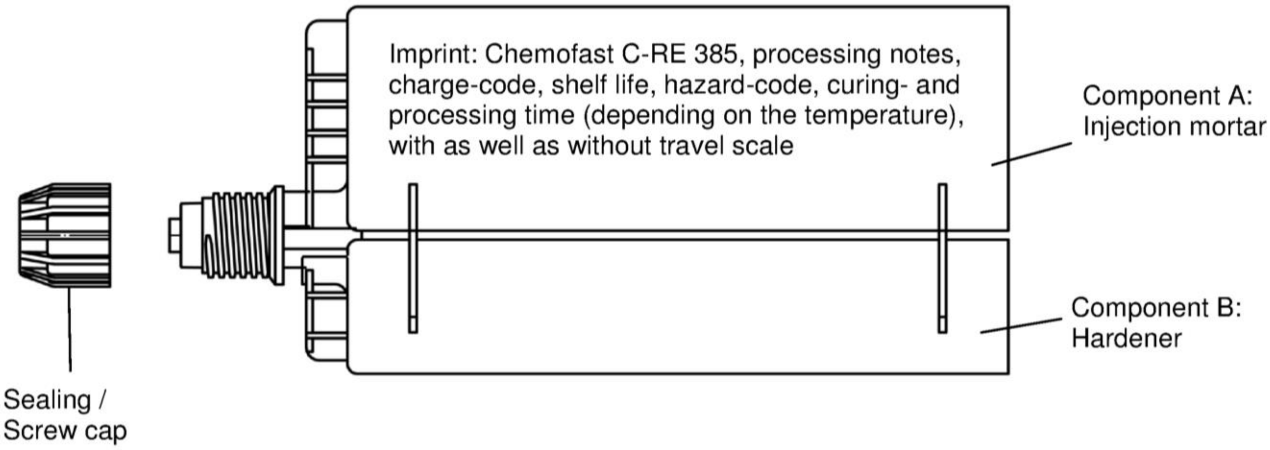
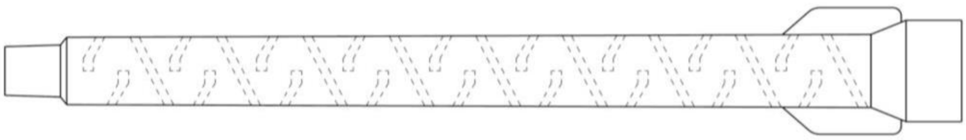
Cartridge: Chemofast C-RE 385

385ml, 444ml, 585ml, 999ml and 1400ml injection mortar cartridge (Type: "side-by-side")

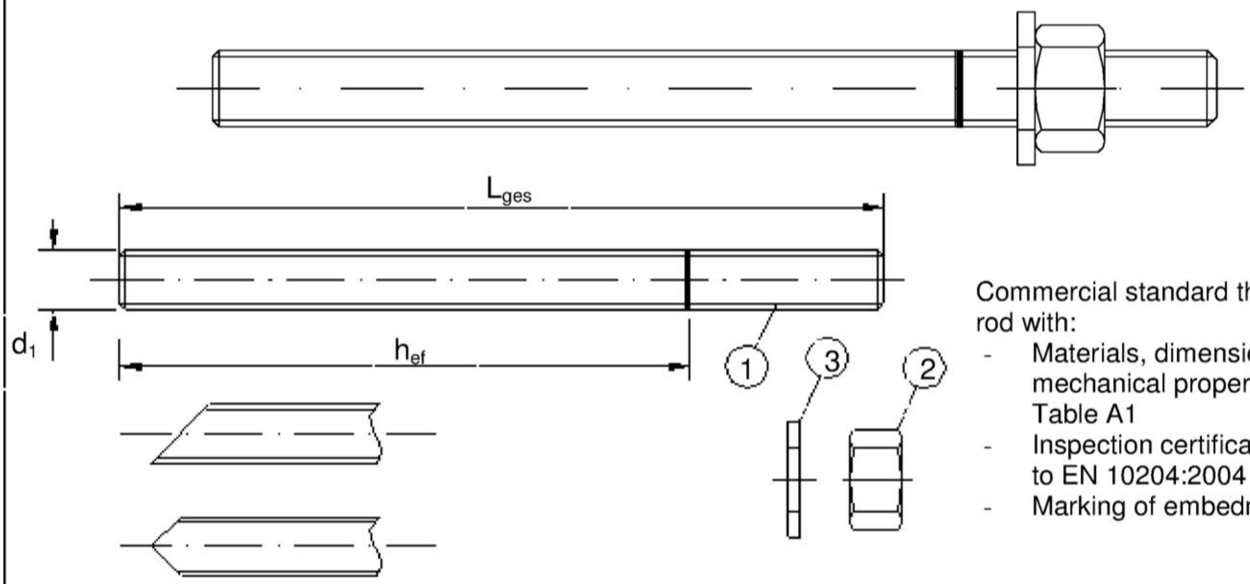


Static mixer



Chemofast Injection System C-RE 385 for concrete	**Annex A 2**
Product description Injection system	

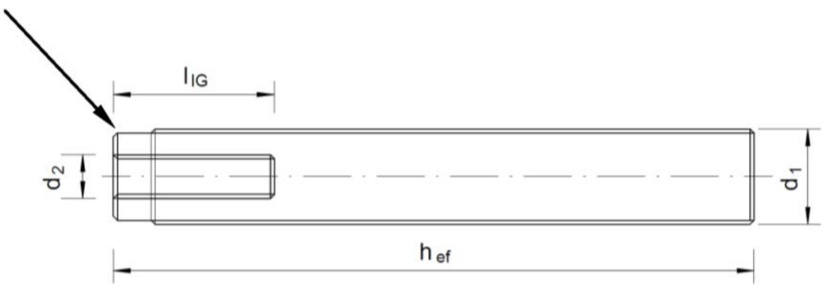
Threaded rod M8, M10, M12, M16, M20, M24, M27, M30 with washer and hexagon nut



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

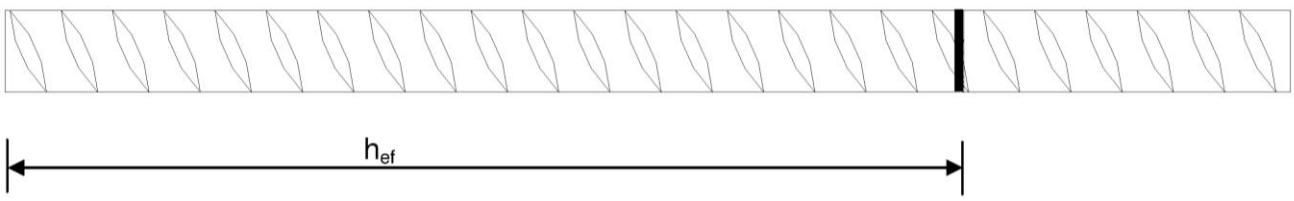
Internal Threaded Sleeve IG-M6, IG-M8, IG-M10, IG-M12, IG-M16, IG-M20

Mark of the producer



Marking: e.g. ◇I◇ M8

Reinforcing bar ∅ 8, ∅ 10, ∅ 12, ∅ 14, ∅ 16, ∅ 20, ∅ 25, ∅ 28, ∅ 32



- Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010
- Rib height of the bar shall be in the range 0,05d ≤ h ≤ 0,07d
  (d: Nominal diameter of the bar; h: Rip height of the bar)

Chemofast Injection System C-RE 385 for concrete

Product description
Threaded rod, Internal Threaded Sleeve and reinforcing bar

Annex A 3

Table A1: Materials

Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009	
Anchor rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 4.8, 5.8, 8.8, EN 1993-1-8:2005+AC:2009 A_5 > 8% fracture elongation
Hexagon nut, EN ISO 4032:2012	Steel acc. to EN 10087:1998 or EN 10263:2001 Property class 4 (for class 4.6 and 4.8 rod) EN ISO 898-2:2012, Property class 5 (for class 5.8 rod) EN ISO 898-2:2012, Property class 8 (for class 8.8 rod) EN ISO 898-2:2012
Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised
Internally threaded sleeve	Steel, zinc plated
Stainless steel	
Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 10088-1:2005, Property class 50 EN ISO 3506-1:2009 Property class 70 (≤ M24) EN ISO 3506-1:2009 A_5 > 8% fracture elongation
Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10088:2005, Property class 50 (for class 50 rod) EN ISO 3506-2:2009 Property class 70 (≤ M24) (for class 70 rod) EN ISO 3506-2:2009
Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4401, 1.4404 or 1.4571, EN 10088-1:2005
Internally threaded sleeve	Material 1.4401, 1.4404 or 1.4571, EN 10088-1:2005
High corrosion resistance steel	
Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:2005, Property class 50 EN ISO 3506-1:2009 Property class 70 (≤ M24) EN ISO 3506-1:2009 A_5 > 8% fracture elongation
Hexagon nut, EN ISO 4032:2012	Material 1.4529 / 1.4565 EN 10088-1:2005, Property class 50 (for class 50 rod) EN ISO 3506-2:2009 Property class 70 (≤ M24) (for class 70 rod) EN ISO 3506-2:2009
Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4529 / 1.4565, EN 10088-1:2005
Internally threaded sleeve	Material 1.4529 / 1.4565, EN 10088-1:2005
Reinforcing bars	
Rebar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Chemofast Injection System C-RE 385 for concrete	**Annex A 4**
Product description Materials	

Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.
- Seismic action for Performance Category C1: M8 to M30 (except hot-dip galvanised rods), Rebar Ø8 to Ø32.
- Seismic action for Performance Category C2: M12 and M16 (except hot-dip galvanised rods).

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Non-cracked concrete: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.
- Cracked concrete: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.

Temperature Range:
- I: - 40 °C to +40 °C (max long term temperature +24 °C and max short term temperature +40 °C)
- II: - 40 °C to +60 °C (max long term temperature +43 °C and max short term temperature +60 °C)
- III: - 40 °C to +72 °C (max long term temperature +43 °C and max short term temperature +72 °C)

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist
  (high corrosion resistant steel).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution
  (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

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.
- Anchorages under static or quasi-static actions are designed in accordance with:
  - EOTA Technical Report TR 029 "Design of bonded anchors", Edition September 2010 or
  - CEN/TS 1992-4:2009
- Anchorages under seismic actions (cracked concrete) are designed in accordance with:
  - EOTA Technical Report TR 045 "Design of Metal Anchors under Seismic Action", Edition February 2013
  - Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.
  - Fastenings in stand-off installation or with a grout layer for seismic loading are not allowed.

Installation:
- Dry or wet concrete.
- Flooded holes (not sea water).
- Hole drilling by hammer or compressed air drill mode.
- 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.
- Fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the internally threaded sleeve.

Chemofast Injection System C-RE 385 for concrete	**Annex B 1**
Intended Use Specifications	

Table B1: Installation parameters for threaded rod

Anchor size		**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M 24**	**M 27**	**M 30**
Nominal drill hole diameter	d_0 [mm] =	10	12	14	18	24	28	32	35
Effective anchorage depth	$h_{ef,min}$ [mm] =	60	60	70	80	90	96	108	120
	$h_{ef,max}$ [mm] =	96	120	144	192	240	288	324	360
Diameter of clearance hole in the fixture[1]	d_f [mm] ≤	9	12	14	18	22	26	30	33
Torque moment	T_{inst} [Nm] ≤	10	20	40	80	120	160	180	200
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm			$h_{ef} + 2d_0$				
Minimum spacing	s_{min} [mm]	40	50	60	80	100	120	135	150
Minimum edge distance	c_{min} [mm]	40	50	60	80	100	120	135	150

[1] For larger clearance hole see TR029 section 1.1

Table B2: Installation parameters for rebar

Rebar size		**Ø 8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
Nominal drill hole diameter	d_0 [mm] =	12	14	16	18	20	24	32	35	40
Effective anchorage depth	$h_{ef,min}$ [mm] =	60	60	70	75	80	90	100	112	128
	$h_{ef,max}$ [mm] =	96	120	144	168	192	240	300	336	384
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm	$h_{ef} + 2d_0$							
Minimum spacing	s_{min} [mm]	40	50	60	70	80	100	125	140	160
Minimum edge distance	c_{min} [mm]	40	50	60	70	80	100	125	140	160

Table B3: Installation parameters for internally threaded sleeve

Anchor size		**IG-M 6**	**IG-M 8**	**IG-M 10**	**IG-M 12**	**IG-M 16**	**IG-M 20**
Internal diameter of sleeve	d_2 [mm] =	6	8	10	12	16	20
Outer diameter of sleeve[2]	$d_1 = d_{nom}$ [mm] =	10	12	16	20	24	30
Nominal drill hole diameter	d_0 [mm] =	12	14	18	24	28	35
Effective anchorage depth	$h_{ef,min}$ [mm] =	60	70	80	90	96	120
	$h_{ef,max}$ [mm] =	120	144	192	240	288	360
Diameter of clearance hole in the fixture[1]	d_f [mm] =	7	9	12	14	18	22
Installation torque moment	T_{inst} [Nm] ≤	10	10	20	40	60	100
Thread engagement length Min/max	l_{IG} [mm] =	8/20	8/20	10/20	12/30	16/40	20/50
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm		$h_{ef} + 2d_0$			
Minimum spacing	s_{min} [mm]	50	60	80	100	120	150
Minimum edge distance	c_{min} [mm]	50	60	80	100	120	150

[1] For larger clearance hole see TR029 section 1.1
[2] With metric threads according to EN 1993-1-8:2005+AC:2009

Chemofast Injection System C-RE 385 for concrete

Intended Use
Installation parameters

Annex B 2

Steel brush RBT

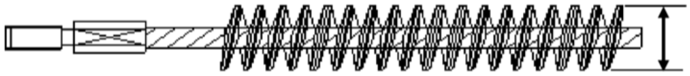
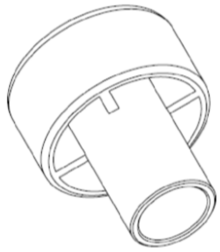


Table B4: Parameter cleaning and setting tools

Threaded Rod	Rebar	Internal Threaded Sleeve	d_0 Drill bit - Ø	d_b Brush - Ø		$d_{b,min}$ min. Brush - Ø	Piston plug
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[No.]
M8			10	RBT10	12	10,5	No piston plug required
M10	8	IG-M6	12	RBT12	14	12,5	
M12	10	IG-M8	14	RBT14	16	14,5	
	12		16	RBT16	18	16,5	
M16	14	IG-M10	18	RBT18	20	18,5	
	16		20	RBT20	22	20,5	
M20	20	IG-M12	24	RBT24	26	24,5	VS24
M24		IG-M16	28	RBT28	30	28,5	VS28
M27	25		32	RBT32	34	32,5	VS32
M30	28	IG-M20	35	RBT35	37	35,5	VS35
	32		40	RBT40	41,5	40,5	VS40

MAC: Hand pump (volume 750 ml)
Drill bit diameter (d_0): 10 mm to 20 mm

CAC: Recommended compressed air tool (min 6 bar)
Drill bit diameter (d_0): 10 mm to 40 mm



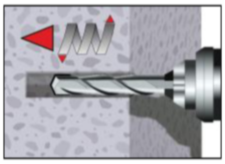
Piston plug for overhead or horizontal installation
Drill bit diameter (d_0): 24 mm to 40 mm

Chemofast Injection System C-RE 385 for concrete

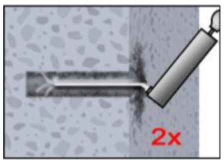
Intended Use
Cleaning and setting tools

Annex B 3

Installation instructions



1. Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2 or B3). In case of aborted drill hole: the drill hole shall be filled with mortar



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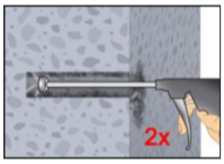

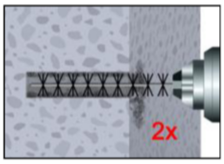

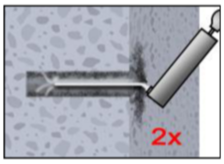

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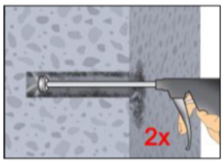


Attention! Standing water in the bore hole must be removed before cleaning.

2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (CAC) (min. 6 bar) or a hand pump (MAC) (Annex B 3) a minimum of two times. If the bore hole ground is not reached an extension shall be used.

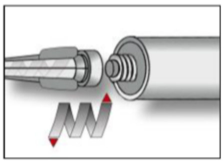
MAC: The hand-pump[1)] can **only** be used for anchor sizes in uncracked concrete, either up to bore hole diameter 20mm or embedment depth up to 240mm.
CAC: Compressed air (min. 6 bar, oil-free) can be used for all sizes in cracked and uncracked concrete.

2b. Check brush diameter (Table B4) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (Table B4) a minimum of two times.
If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B4).

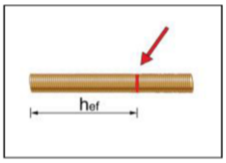
2c. Finally blow the hole clean again with compressed air (CAC) (min. 6 bar) or a hand pump (MAC) (Annex B 3) a minimum of two times. If the bore hole ground is not reached an extension shall be used.
MAC: The hand-pump[1)] can **only** be used for anchor sizes in uncracked concrete, either up to bore hole diameter 20mm or embedment depth up to 240mm.
CAC: Compressed air (min. 6 bar, oil-free) can be used for all sizes in cracked and uncracked concrete.

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 repeated has to be directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

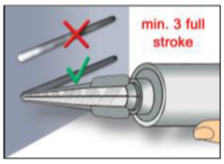
[1)] It is permitted to blow bore holes with diameter between 14 mm and 20 mm and an embedment depth up to 240 mm also in cracked concrete with hand-pump.



3. Attach a supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.
For every working interruption longer than the recommended working time (Table B5) as well as for new cartridges, a new static-mixer shall be used.



4. Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.



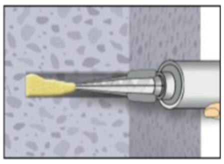
5. Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey or red colour.

Chemofast Injection System C-RE 385 for concrete

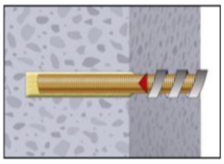
Intended Use
Installation instructions

Annex B 4

Installation instructions (continuation)

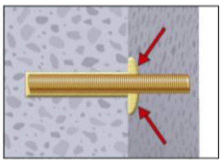


6. Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190 mm an extension nozzle shall be used. For overhead and horizontal installation a piston plug (Annex B 3) and extension nozzle shall be used. Observe the gel-/ working times given in Table B5.

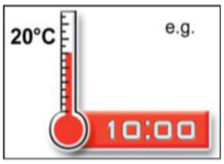


7. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached.

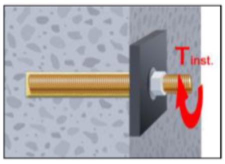
   The anchor shall be free of dirt, grease, oil or other foreign material.



8. Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed. For overhead application the anchor rod should be fixed (e.g. wedges).



9. 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).



10. 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.

Table B5: Minimum curing time

Concrete temperature	Gelling-working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
+ 5 °C to + 9 °C	120 min	50 h	100 h
+ 10 °C to + 19 °C	90 min	30 h	60 h
+ 20 °C to + 29 °C	30 min	10 h	20 h
+ 30 °C to + 39 °C	20 min	6 h	12 h
+ 40 °C	12 min	4 h	8 h
Cartridge temperature	+5°C to +40°C		

Chemofast Injection System C-RE 385 for concrete

Intended Use
Installation instructions (continuation)
Curing time

Annex B 5

Table C1: Characteristic values for steel tension resistance and steel shear resistance of threaded rods

Size				M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Characteristic tension resistance, Steel failure											
Steel, Property class 4.6 and 4.8		$N_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Steel, Property class 5.8		$N_{Rk,s}$	[kN]	18	29	42	78	122	176	230	280
Steel, Property class 8.8		$N_{Rk,s}$	[kN]	29	46	67	125	196	282	368	449
Nichtrostender Stahl A4 and HCR, Property class 50		$N_{Rk,s}$	[kN]	18	29	42	79	123	177	230	281
Nichtrostender Stahl A4 and HCR, Property class 70		$N_{Rk,s}$	[kN]	26	41	59	110	171	247	-	-
Characteristic tension resistance, Partial safety factor											
Steel, Property class 4.6		$\gamma_{Ms,N}$ [1]	[-]	2,0							
Steel, Property class 4.8		$\gamma_{Ms,N}$ [1]	[-]	1,5							
Steel, Property class 5.8		$\gamma_{Ms,N}$ [1]	[-]	1,5							
Steel, Property class 8.8		$\gamma_{Ms,N}$ [1]	[-]	1,5							
Stainless steel A4 and HCR, Property class 50		$\gamma_{Ms,N}$ [1]	[-]	2,86							
Stainless steel A4 and HCR, Property class 70		$\gamma_{Ms,N}$ [1]	[-]	1,87							
Characteristic shear resistance, Steel failure											
Without lever arm	Steel, Property class 4.6 and 4.8	$V_{Rk,s}$	[kN]	7	12	17	31	49	71	92	112
	Steel, Property class 5.8	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
	Steel, Property class 8.8	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
	Stainless steel A4 and HCR, Property class 50	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
	Stainless steel A4 and HCR, Property class 70	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	-	-
With lever arm	Steel, Property class 4.6 and 4.8	$M_{Rk,s}$	[Nm]	15	30	52	133	260	449	666	900
	Steel, Property class 5.8	$M_{Rk,s}$	[Nm]	19	37	65	166	324	560	833	1123
	Steel, Property class 8.8	$M_{Rk,s}$	[Nm]	30	60	105	266	519	896	1333	1797
	Stainless steel A4 and HCR, Property class 50	$M_{Rk,s}$	[Nm]	19	37	66	167	325	561	832	1125
	Stainless steel A4 and HCR, Property class 70	$M_{Rk,s}$	[Nm]	26	52	92	232	454	784	-	-
Characteristic shear resistance, Partial safety factor											
Steel, Property class 4.6		$\gamma_{Ms,V}$ [1]	[-]	1,67							
Steel, Property class 4.8		$\gamma_{Ms,V}$ [1]	[-]	1,25							
Steel, Property class 5.8		$\gamma_{Ms,V}$ [1]	[-]	1,25							
Steel, Property class 8.8		$\gamma_{Ms,V}$ [1]	[-]	1,25							
Stainless steel A4 and HCR, Property class 50		$\gamma_{Ms,V}$ [1]	[-]	2,38							
Stainless steel A4 and HCR, Property class 70		$\gamma_{Ms,V}$ [1]	[-]	1,56							

[1] in absence of national regulation

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Table C2: Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1 and C2)

Anchor size threaded rod				M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure											
Characteristic tension resistance		$N_{Rk,s}$	[kN]	see Table C1							
		$N_{Rk,s,C1}$	[kN]	$1,0 \cdot N_{Rk,s}$							
		$N_{Rk,s,C2}$	[kN]	NPD		$1,0 \cdot N_{Rk,s}$		No Performance Determined (NPD)			
Partial safety factor		$\gamma_{Ms,N}$	[-]	see Table C1							
Combined pull-out and concrete cone failure											
Characteristic bond resistance in non-cracked concrete C20/25											
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	15	15	15	14	13	12	12	12
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	15	14	13	10	9,5	8,5	7,5	7,0
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,5	9,0	8,5	8,0	7,5	7,5	7,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,5	9,0	8,5	7,5	7,0	6,5	6,0
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,0	7,0	6,5	6,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	7,0	7,0	7,5	6,5	6,0	5,5	5,5	5,5
		$\tau_{Rk,C1}$	[N/mm²]	5,9	7,0	7,1	6,2	5,7	5,5	5,5	5,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		2,4	2,2	No Performance Determined (NPD)			
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	7,0	7,0	7,5	6,0	5,0	4,5	4,0	4,0
		$\tau_{Rk,C1}$	[N/mm²]	5,9	7,0	7,1	5,8	4,8	4,5	4,0	4,0
		$\tau_{Rk,C2}$	[N/mm²]	NPD		2,4	2,1	No Performance Determined (NPD)			
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	3,5	3,5	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm²]	3,7	4,5	4,3	3,8	3,4	3,5	3,5	3,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		1,4	1,4	No Performance Determined (NPD)			
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	3,5	3,5	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm²]	3,7	4,5	4,3	3,8	3,4	3,5	3,5	3,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		1,4	1,4	No Performance Determined (NPD)			
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	4,0	3,5	3,0	3,0	3,0	3,0
		$\tau_{Rk,C1}$	[N/mm²]	3,2	4,0	3,9	3,4	3,0	3,0	3,0	3,0
		$\tau_{Rk,C2}$	[N/mm²]	NPD		1,3	1,2	No Performance Determined (NPD)			
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	4,0	3,5	3,0	3,0	3,0	3,0
		$\tau_{Rk,C1}$	[N/mm²]	3,2	4,0	3,9	3,4	3,0	3,0	3,0	3,0
		$\tau_{Rk,C2}$	[N/mm²]	NPD		1,3	1,2	No Performance Determined (NPD)			
Increasing factors for concrete ψ_c		C25/30		1,02							
		C30/37		1,04							
		C35/45		1,07							
		C40/50		1,08							
		C45/55		1,09							
		C50/60		1,10							
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3	Non-cracked concrete	k_8	[-]	10,1							
	Cracked concrete			7,2							
Concrete cone failure											
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1	Non-cracked concrete	k_{ucr}	[-]	10,1							
	Cracked concrete	k_{cr}	[-]	7,2							
Edge distance		$c_{cr,N}$	[mm]	$1,5\ h_{ef}$							
Axial distance		$s_{cr,N}$	[mm]	$3,0\ h_{ef}$							
Splitting failure											
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	$1,0\ h_{ef}$							
	$2,0 > h/h_{ef} > 1,3$			$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}}\right)$							
	$h/h_{ef} \leq 1,3$			$2,4\ h_{ef}$							
Axial distance		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$							
Installation safety factor (dry and wet concrete)		$\gamma_2 = \gamma_{inst}$	[-]	1,2				1,4			
Installation safety factor (flooded bore hole)		$\gamma_2 = \gamma_{inst}$	[-]	1,4							

Chemofast Injection System C-RE 385 for concrete

Performances
Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1 and C2)

Annex C 2

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Table C3: Characteristic values of shear loads under static, quasi-static action and seismic action (performance category C1 and C2)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure without lever arm										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	see Table C1							
	$V_{Rk,s,C1}$	[kN]	$0{,}87 \cdot V_{Rk,s}$		$0{,}88 \cdot V_{Rk,s}$			$0{,}80 \cdot V_{Rk,s}$		
	$V_{Rk,s,C2}$	[kN]	NPD		$0{,}80 \cdot V_{Rk,s}$		No Performance Determined (NPD)			
Partial safety factor	$\gamma_{Ms,V}$	[-]	see Table C1							
Steel failure with lever arm										
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	see Table C1							
	$M^0_{Rk,s,C1}$	[Nm]	No Performance Determined (NPD)							
	$M^0_{Rk,s,C2}$	[Nm]								
Partial safety factor	$\gamma_{Ms,V}$	[-]	see Table C1							
Concrete pry-out failure										
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 Factor k in equation (5.7) of Technical Report TR 029	$k_{(3)}$	[-]	2,0							
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							
Concrete edge failure										
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef};\ 8\ d_{nom})$							
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24	27	30
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							

Chemofast Injection System C-RE 385 for concrete

Performances
Characteristic values of shear loads under static, quasi-static action and seismic action (performance category C1 and C2)

Annex C 3

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic values of tension loads for internal threaded sleeves under static and quasi-static action

Anchor size internally threaded sleeves				IG-M 6	IG-M 8	IG-M 10	IG-M 12	IG-M 16	IG-M 20
Steel failure									
Characteristic tension resistance, Steel, strength class 5.8		$N_{Rk,s}$	[kN]	10	17	29	42	76	123
Partial safety factor		$\gamma_{Ms,N}$	[-]	1,5					
Characteristic tension resistance, Steel, strength class 8.8		$N_{Rk,s}$	[kN]	16	27	46	67	121	196
Partial safety factor		$\gamma_{Ms,N}$	[-]	1,5					
Characteristic tension resistance, Stainless Steel A4 Strength class 70		$N_{Rk,s}$	[kN]	14	26	41	59	110	172
Partial safety factor		$\gamma_{Ms,N}$	[-]	1,87					
Combined pull-out and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	15	15	14	13	12	12
	flooded bore hole			14	13	10	9,5	8,5	7,0
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,0	8,5	8,0	7,5	7,5
	flooded bore hole			9,5	9,0	8,5	7,5	7,0	6,0
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,0	7,5	7,0	7,0	6,5
	flooded bore hole			8,5	8,0	7,5	7,0	6,0	5,5
Characteristic bond resistance in cracked concrete C20/25									
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	7,0	7,5	6,5	6,0	5,5	5,5
	flooded bore hole			7,0	7,5	6,0	5,0	4,5	4,0
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,0	3,5	3,5	3,5
	flooded bore hole			4,5	4,5	4,0	3,5	3,5	3,5
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	3,5	3,0	3,0	3,0
	flooded bore hole			4,0	4,0	3,5	3,0	3,0	3,0
Increasing factors for concrete ψ_c		C25/30		1,02					
		C30/37		1,04					
		C35/45		1,07					
		C40/50		1,08					
		C45/55		1,09					
		C50/60		1,10					
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3	Non-cracked concrete	k_8	[-]	10,1					
	Cracked concrete			7,2					
Concrete cone failure									
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1	Non-cracked concrete	k_{ucr}	[-]	10,1					
	Cracked concrete	k_{cr}	[-]	7,2					
Edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}					
Axial distance		$s_{cr,N}$	[mm]	3,0 h_{ef}					
Splitting failure									
Edge distance	$h/h_{ef} \geq 2{,}0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}					
	$2{,}0 > h/h_{ef} > 1{,}3$			$2 \cdot h_{ef} \left(2{,}5 - \frac{h}{h_{ef}}\right)$					
	$h/h_{ef} \leq 1{,}3$			2,4 h_{ef}					
Axial distance		$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$					
Installation safety factor (dry and wet concrete)		$\gamma_2 = \gamma_{inst}$	[-]	1,2			1,4		
Installation safety factor (flooded bore hole)		$\gamma_2 = \gamma_{inst}$	[-]	1,4					

Chemofast Injection System C-RE 385 for concrete

Performances
Characteristic values of tension loads for internal threaded sleeves under static and quasi-static action

Annex C 4

Table C5: Characteristic values of shear loads for internal threaded sleeves under static and quasi-static action

Anchor size for internally threaded sleeves			IG-M 6	IG-M 8	IG-M 10	IG-M 12	IG-M 16	IG-M 20
Steel failure without lever arm								
Characteristic shear resistance, Steel, strength class 5.8	$V_{Rk,s}$	[kN]	5	9	15	21	38	61
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic shear resistance, Steel, strength class 8.8	$V_{Rk,s}$	[kN]	8	14	23	34	60	98
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic shear resistance, Stainless Steel A4 Strength class 70	$V_{Rk,s}$	[kN]	7	13	20	30	55	86
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,56					
Steel failure with lever arm								
Characteristic bending moment, Steel, strength class 5.8	$M^0_{Rk,s}$	[Nm]	8	19	37	66	167	325
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic bending moment, Steel, strength class 8.8	$M^0_{Rk,s}$	[Nm]	12	30	60	105	267	519
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic bending moment, Stainless Steel A4 Strength class 70	$M^0_{Rk,s}$	[Nm]	11	26	52	92	233	454
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,56					
Concrete pry-out failure								
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 Factor k_3 in equation (5.7) of Technical Report TR 029	$k_{(3)}$	[-]	2,0					
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					
Concrete edge failure								
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$					
Outside diameter of anchor	d_{nom}	[mm]	10	12	16	20	24	30
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					

Chemofast Injection System C-RE 385 for concrete

Performances
Characteristic values of shear loads for internal threaded sleeves under static and quasi-static action

Annex C 5

Deutsches Institut für Bautechnik DIBt

Table C6: Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1)

Anchor size reinforcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic tension resistance		$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$ [1]								
		$N_{Rk,s,C1}$	[kN]	$1{,}0 \cdot A_s \cdot f_{uk}$ [1]								
Cross section area		A_s	[mm²]	50	79	113	154	201	214	491	616	804
Partial safety factor		$\gamma_{Ms,N}$	[-]	1,4 [2]								
Combined pull-out and concrete cone failure												
Characteristic bond resistance in non-cracked concrete C20/25												
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	14	14	13	13	12	12	11	11	11
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	14	13	11	10	9,5	8,5	7,5	7,0	6,0
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	8,0	7,5	7,0	7,0	6,5	6,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	8,5	8,5	8,0	8,0	7,5	7,0	6,0	5,5	5,0
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,5	6,0	6,0	6,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,0	5,5	5,0	4,5
Characteristic bond resistance in cracked concrete C20/25												
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	7,0	7,0	7,5	7,0	6,5	6,0	5,5	5,5	5,5
		$\tau_{Rk,C1}$	[N/mm²]	5,9	7,0	7,1	6,4	6,2	5,7	5,5	5,5	5,5
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	7,0	7,0	7,5	6,5	6,0	5,0	4,5	4,0	4,0
		$\tau_{Rk,C1}$	[N/mm²]	5,9	7,0	7,1	6,0	5,7	4,8	4,5	4,0	4,0
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	4,0	3,5	3,5	3,5	3,5
		$\tau_{Rk,C1}$	[N/mm²]	3,7	4,5	4,3	3,7	3,8	3,3	3,5	3,5	3,5
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	4,0	3,5	3,5	3,5	3,0
		$\tau_{Rk,C1}$	[N/mm²]	3,7	4,5	4,3	3,7	3,8	3,3	3,5	3,5	3,0
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	4,0	3,5	3,5	3,0	3,0	3,0	3,0
		$\tau_{Rk,C1}$	[N/mm²]	3,2	4,0	3,9	3,2	3,3	2,9	3,0	3,0	3,0
	flooded bore hole	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	4,0	3,5	3,5	3,0	3,0	3,0	3,0
		$\tau_{Rk,C1}$	[N/mm²]	3,2	4,0	3,9	3,2	3,3	2,9	3,0	3,0	3,0
Increasing factors for concrete ψ_c		C25/30		1,02								
		C30/37		1,04								
		C35/45		1,07								
		C40/50		1,08								
		C45/55		1,09								
		C50/60		1,10								
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3	Non-cracked concrete	k_8	[-]	10,1								
	Cracked concrete			7,2								
Concrete cone failure												
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1	Non-cracked concrete	k_{ucr}	[-]	10,1								
	Cracked concrete	k_{cr}	[-]	7,2								
Edge distance		$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$								
Axial distance		$s_{cr,N}$	[mm]	$3{,}0\ h_{ef}$								
Splitting failure												
Edge distance	$h/h_{ef} \geq 2{,}0$	$c_{cr,sp}$	[mm]	$1{,}0\ h_{ef}$								
	$2{,}0 > h/h_{ef} > 1{,}3$			$2 \cdot h_{ef} \left(2{,}5 - \frac{h}{h_{ef}}\right)$								
	$h/h_{ef} \leq 1{,}3$			$2{,}4\ h_{ef}$								
Axial distance		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$								
Installation safety factor (dry and wet concrete)		$\gamma_2 = \gamma_{inst}$	[-]	1,2					1,4			
Installation safety factor (flooded bore hole)		$\gamma_2 = \gamma_{inst}$	[-]	1,4								

[1] f_{uk} shall be taken from the specifications of reinforcing bars
[2] in absence of national regulation

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Performances
Characteristic values of tension loads under static, quasi-static action and seismic action (performance category C1)

Annex C 6

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Table C7: Characteristic values of shear loads under static, quasi-static action and seismic action (performance category C1)

Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm											
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0{,}50 \cdot A_s \cdot f_{uk}$ 1)								
	$V_{Rk,s,C1}$	[kN]	$0{,}40 \cdot A_s \cdot f_{uk}$ 1)		$0{,}44 \cdot A_s \cdot f_{uk}$ 1)						
Cross section area	A_s	[mm²]	50	79	113	154	201	214	491	616	804
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,5 2)								
Steel failure with lever arm											
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1.2 \cdot W_{el} \cdot f_{uk}$ 1)								
	$M^0_{Rk,s,C1}$	[Nm]	No Performance Determined (NPD)								
Elastic section modulus	W_{el}	[mm³]	50	98	170	269	402	785	1534	2155	3217
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,5 2)								
Concrete pry-out failure											
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 Factor k in equation (5.7) of Technical Report TR 029	$k_{(3)}$	[-]	2,0								
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0								
Concrete edge failure											
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef};\, 8\, d_{nom})$								
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	14	16	20	25	28	32
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0								

1) f_{uk} shall be taken from the specifications of reinforcing bars
2) in absence of national regulation

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Performances
Characteristic values of shear loads under static, quasi-static action and seismic action (performance category C1)

Annex C 7

Table C8: Displacements under tension load[1] (threaded rod)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked concrete C20/25 under static and quasi-static action										
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,011	0,013	0,015	0,020	0,024	0,029	0,032	0,035
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,044	0,052	0,061	0,079	0,096	0,114	0,127	0,140
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,161
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,161
Cracked concrete C20/25 under static, quasi-static and seismic C1 action										
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,032	0,037	0,042	0,048	0,053	0,058
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,210	0,210	0,210	0,210	0,210	0,210	0,210	0,210
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,037	0,043	0,049	0,055	0,061	0,067
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,037	0,043	0,049	0,055	0,061	0,067
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240
Cracked concrete C20/25 under seismic C2 action										
Temperature range I: 40°C/24°C	$\delta_{N,seis(DLS)}$-factor	[mm/(N/mm²)]	No Performance Determined (NPD)		0,03	0,05	No Performance Determined (NPD)			
	$\delta_{N,seis(ULS)}$-factor	[mm/(N/mm²)]			0,06	0,09				
Temperature range II: 60°C/43°C	$\delta_{N,seis(DLS)}$-factor	[mm/(N/mm²)]			0,03	0,05				
	$\delta_{N,seis(ULS)}$-factor	[mm/(N/mm²)]			0,06	0,09				
Temperature range III: 72°C/43°C	$\delta_{N,seis(DLS)}$-factor	[mm/(N/mm²)]			0,03	0,05				
	$\delta_{N,seis(ULS)}$-factor	[mm/(N/mm²)]			0,06	0,09				

[1] Calculation of the displacement

$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\delta_{N,seis(DLS)} = \delta_{N,seis(DLS)}\text{-factor} \cdot \tau$; τ: action bond stress for tension

$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$; $\delta_{N,seis(ULS)} = \delta_{N,seis(ULS)}\text{-factor} \cdot \tau$;

Table C9: Displacements under shear load[1] (threaded rod)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked and cracked concrete C20/25 under static, quasi-static and seismic C1 action										
All temperature ranges	δ_{V0}-factor	[mm/(kN)]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
	$\delta_{V\infty}$-factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
Cracked concrete C20/25 under seismic C2 action										
All temperature ranges	$\delta_{V,seis(DLS)}$-factor	[mm/kN]	No Performance Determined (NPD)		0,2	0,1	No Performance Determined (NPD)			
	$\delta_{V,seis(ULS)}$-factor	[mm/kN]			0,2	0,1				

[1] Calculation of the displacement

$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load

$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;

$\delta_{V,seis(DLS)} = \delta_{V,seis(DLS)}\text{-factor} \cdot V$;

$\delta_{V,seis(ULS)} = \delta_{V,seis(ULS)}\text{-factor} \cdot V$;

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Displacements (threaded rods)

Annex C 8

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Table C10: Displacements under tension load[1] (internally threaded sleeve)

Anchor size internally threaded sleeve			IG-M 6	IG-M 8	IG-M 10	IG-M 12	IG-M 16	IG-M 20
Non-cracked concrete C20/25 under static and quasi-static action								
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,020	0,024	0,029	0,035
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,052	0,061	0,079	0,096	0,114	0,140
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,023	0,028	0,033	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,091	0,111	0,131	0,161
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,023	0,028	0,033	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,091	0,111	0,131	0,161
Cracked concrete C20/25 under static and quasi-static action								
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,037	0,042	0,048	0,058
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,210	0,210	0,210	0,210	0,210	0,210
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,037	0,043	0,049	0,055	0,067
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,037	0,043	0,049	0,055	0,067
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240

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

Table C11: Displacements under shear load[1] (internally threaded sleeve)

Anchor size internally threaded sleeve			IG-M 6	IG-M 8	IG-M 10	IG-M 12	IG-M 16	IG-M 20
Non-cracked and cracked concrete C20/25 under static and quasi-static action								
All temperature ranges	δ_{V0}-factor	[mm/(kN)]	0,07	0,06	0,06	0,05	0,04	0,04
	$\delta_{V\infty}$-factor	[mm/(kN)]	0,10	0,09	0,08	0,08	0,06	0,06

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

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Table C12: Displacements under tension load[1] (rebar)

Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked concrete C20/25 under static and quasi-static action											
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,011	0,013	0,015	0,018	0,020	0,024	0,030	0,033	0,037
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,044	0,052	0,061	0,070	0,079	0,096	0,118	0,132	0,149
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,172
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,172
Cracked concrete C20/25 under static, quasi-static and seismic C1 action											
Temperature range I: 40°C/24°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,032	0,035	0,037	0,042	0,049	0,055	0,061
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,210	0,210	0,210	0,210	0,210	0,210	0,210	0,210	0,210
Temperature range II: 60°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,037	0,040	0,043	0,049	0,056	0,063	0,070
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240
Temperature range III: 72°C/43°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,032	0,037	0,040	0,043	0,049	0,056	0,063	0,070
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240	0,240

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

Table C13: Displacement under shear load[1] (rebar)

Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
For concrete C20/25 under static, quasi-static and seismic C1 action											
All temperature ranges	δ_{V0}-factor	[mm/(kN)]	0,06	0,05	0,05	0,04	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	0,04	0,04

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

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Displacements (rebar)

Annex C 10