



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

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

of 10 October 2014

ETA-09/0006

Deutsches Institut für Bautechnik

Chemofast Injection system C-RE 385 for concrete

Bonded anchor with anchor rod for use in concrete

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

Chemofast Anchoring GmbH

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

Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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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 injection mortar Chemofast 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 or a reinforcing bar in the range of diameter 8 to 32 mm.

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 design according to TR 029 and TR 045	See Annex C 1 to C6
Characteristic resistance for design according to CEN/TS 1992-4:2009 and TR 045	See Annex C 7 to C 12
Displacements under tension and shear loads	See Annex C 13 / C 14

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 determined (NPD)

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.



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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.

- 3.5 Protection against noise (BWR 5) Not applicable.
- 3.6 Energy economy and heat retention (BWR 6) Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

The sustainable use of natural resources was not investigated.

3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

According to Decision of the Commission of 24 June 1996 (96/582/EC) (OJ L 254 of 08.10.96 p. 62-65), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete (heavy-duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	_	1

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.

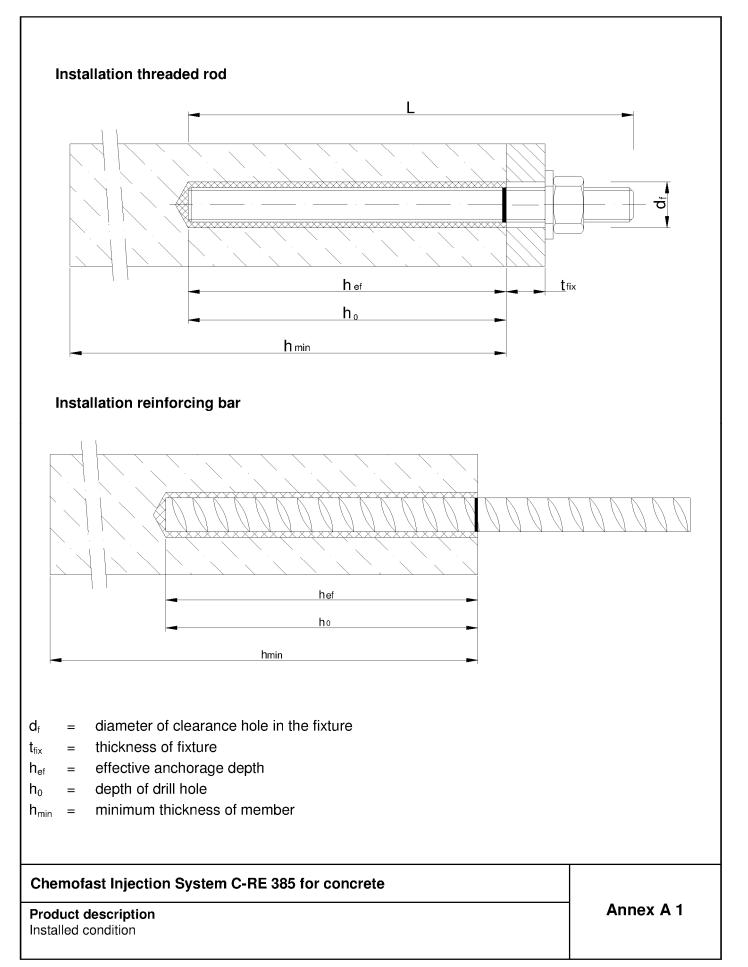
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Uwe Bender Head of Department *beglaubigt:* Baderschneider

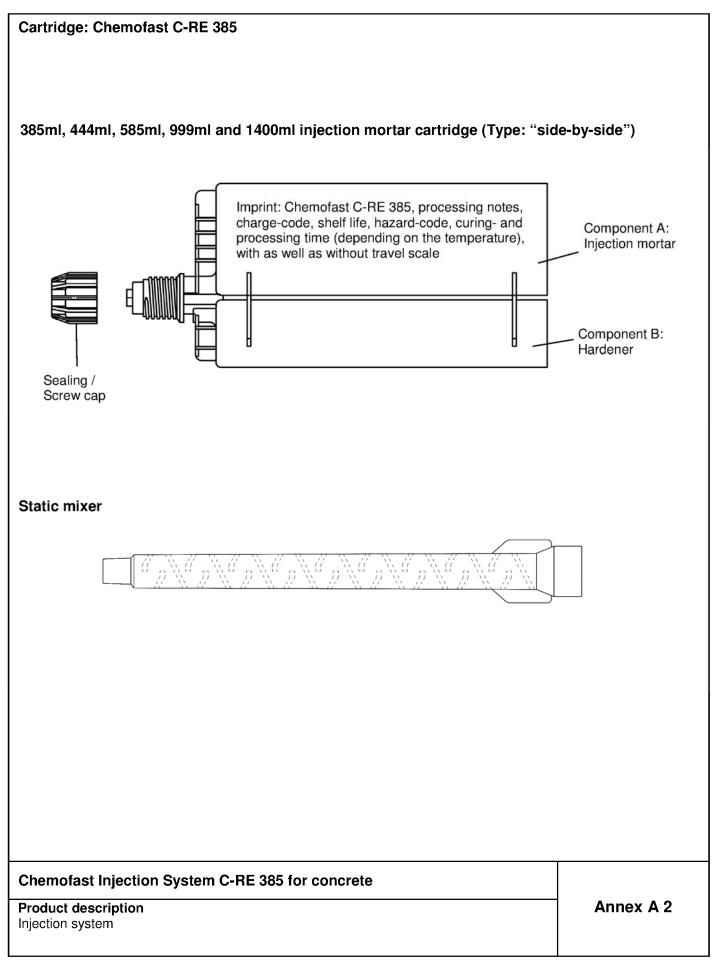
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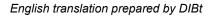
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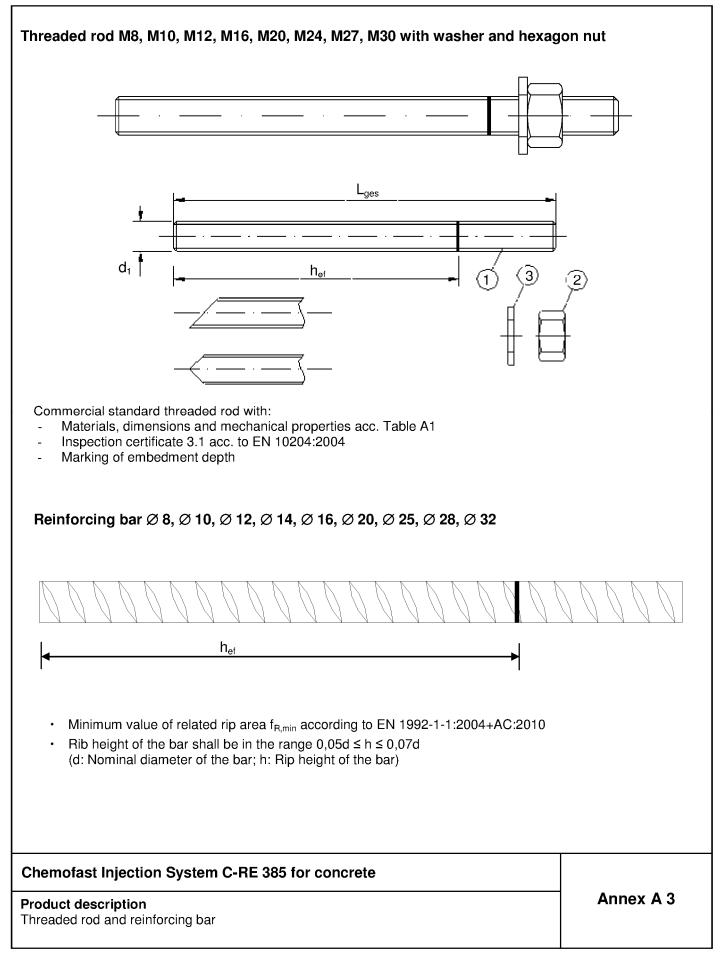




Table A1: Materials

D	B	1	
Part	-	Material	
	, zinc plated ≥ 5 μm acc. to EN ISO 4042:1§ , hot-dip galvanised ≥ 40 μm acc. to EN IS		C:2009
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:200 Property class 4.6, 5.8, 8.8, EN 1993-1-8	
2	Hexagon nut, EN ISO 4032:2012	Steel acc. to EN 10087:1998 or EN 102 Property class 4 (for class 4.6 rod) EN IS Property class 5 (for class 5.8 rod) EN IS Property class 8 (for class 8.8 rod) EN IS	SO 898-2:2012, SO 898-2:2012,
3	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	
Stain	less steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 10 > M24: Property class 50 EN ISO 3506- ≤ M24: Property class 70 EN ISO 3506-	1:2009 1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10 > M24: Property class 50 (for class 50 rc ≤ M24: Property class 70 (for class 70 rc	od) EN ISÓ 3506-2:2009
3	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	0088-1:2005
High	corrosion resistance steel		
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:20 > M24: Property class 50 EN ISO 3506- ≤ M24: Property class 70 EN ISO 3506-	1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4529 / 1.4565 EN 10088-1:20 > M24: Property class 50 (for class 50 rc ≤ M24: Property class 70 (for class 70 rc	05, od) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4529 / 1.4565, EN 10088-1:20	
Reinf	orcing bars		
1	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 $f_{uk} = f_{tk} = k \cdot f_{yk}$	l 1992-1-1/NA:2013
	mofast Injection System C-RE 385 for	concrete	A
Prod Mate	luct description rials		Annex A 4



Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: M8 to M30, Rebar Ø8 to Ø32.
- Seismic action for Performance Category C1: M12 to M30, Rebar Ø12 to Ø32.
- Seismic action for Performance Category C2: M12 and M16.

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.
- Cracked concrete: M12 to M30, Rebar Ø12 to Ø32.

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 are not allowed.

Installation:

- Dry or wet concrete: M8 to M30, Rebar Ø8 to Ø32.
- Flooded holes (not sea water): M8 to M30, Rebar Ø8 to Ø32.
- 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.

Chemofast Injection System C-RE 385 for concrete

Intended Use

Specifications

Annex B 1



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 encharge depth	h _{ef,min} [mm] =	60	60	70	80	90	96	108	120
Effective anchorage depth	h _{ef,max} [mm] =	96	120	144	192	240	288	324	360
Diameter of clearance hole in the fixture	d _f [mm] ≤	9	12	14	18	22	26	30	33
Diameter of steel brush	d _b [mm] ≥	12	14	16	20	26	30	34	37
Torque moment	T _{inst} [Nm] ≤	10	20	40	80	120	160	180	200
Thickness of fixture	t _{fix,min} [mm] >				()			
Thickness of fixture	t _{fix,max} [mm] <				15	00			
Minimum thickness of member	h _{min} [mm]		_{ef} + 30 m ≥ 100 mn				$h_{ef} + 2d_0$		
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

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
Effective anchorage depth	h _{ef,max} [mm] =	96	120	144	168	192	240	300	336	384
Diameter of steel brush	d _b [mm] ≥	14	16	18	20	22	26	34	37	41,5
Minimum thickness of member	h _{min} [mm]		30 mm 0 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

Chemofast Injection System C-RE 385 for concrete

Intended Use Installation parameters Annex B 2



Steel brush Table B3: Parameter cleaning and setting tools d_{b,min} Piston Threaded d₀ d_{b} Rebar min. Rod Drill bit - Ø Brush - Ø plug Brush - Ø (mm) (mm) (mm)(mm) (mm)(No.) M8 10 12 10.5 M10 8 12 14 12,5 No M12 10 14 16 14,5 piston plug 12 16 18 16,5 required M16 14 18 20 18,5 16 20 22 20,5 24 26 M20 20 24,5 # 24 M24 28 30 28,5 # 28 M27 25 32 34 32,5 # 32

37

41,5

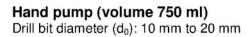
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40



28

32







35,5

40,5

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

M30

Cleaning and setting tools

Annex B 3

35

38



Installation inst	ructions
	1. Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1 or Table B2). 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.
2x	2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) or a hand pump (Annex B 3) a minimum of two times. If the bore hole ground is not reached an extension shall be used.
or	The hand-pump can be used for anchor sizes up to bore hole diameter 20 mm.
2x 2x	For bore holes larger than 20 mm or deeper 240 mm, compressed air (min. 6 bar) must be used.
<u>*******</u> **	 Check brush diameter (Table B3) 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 B3) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B3).
or	 Finally blow the hole clean again with compressed air (min. 6 bar) or a hand pump (Annex B 3) a minimum of two times. If the bore hole ground is not reached an extension shall be used. The hand-pump can be used for anchor sizes up to bore hole diameter 20 mm. For bore holes larger than 20 mm or deeper 240 mm, compressed air (min. 6 bar) must be used.
2x	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.
	3. Attach a supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. Cut off the foil tube clip before use. For every working interruption longer than the recommended working time (Table B4) 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.
min. 3 full stroke	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 colour. For foil tube cartridges is must be discarded a minimum of six full strokes.
Chemofast Injecti	on System C-RE 385 for concrete

Intended Use Installation instructions Annex B 4

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Installation inst	ructions (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 B4.
	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 should 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).
20°C e.g.	 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 B4).
Tinst.	 After full curing, the add-on part can be installed with the max. torque (Table B2) by using a calibrated torque wrench.

Table B4: Minimum curing time

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

Chemofast Injection System C-RE 385 for concrete

Intended Use Installation instructions (continuation) Curing time Annex B 5



Anchor size threaded roo	k			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure											
Characteristic tension resis Steel, property class 4.6	stance,	N _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
Characteristic tension resis Steel, property class 5.8	stance,	N _{Rk,s}	[kN]	18	29	42	78	122	176	230	280
Characteristic tension resis Steel, property class 8.8	stance,	N _{Rk,s}	[kN]	29	46	67	125	196	282	368	449
Characteristic tension resis Stainless steel A4 and HC property class 50 (>M24) a	R,	N _{Rk,s}	[kN]	26	41	59	110	171	247	230	281
Combined pull-out and c	oncrete cone failure										
Characteristic bond resista	nce in non-cracked con	crete C20/	25								
Temperature range I:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	15	15	15	14	13	12	12	12
40°C/24°C	flooded bore hole	τ _{Rk,ucr}	[N/mm ²]	15	14	13	10	9,5	8,5	7,5	7,0
Temperature range II:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	9,5	9,5	9,0	8,5	8,0	7,5	7,5	7,5
emperature range II:	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	9,5	9,5	9,0	8,5	7,5	7,0	6,5	6,0
Temperature range III:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	7,0	6,5	6,5
72°Ċ/43°C	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
		C30/37					1,	04	•		•
Increasing factors for conc Ψ_c	rete	C40/50					1,	08			
то		C50/60					1,	10			
Splitting failure											
Edge distance		C _{cr,sp}	[mm]		1,0) ⋅ h _{ef} ≤2	2 · h _{ef} 2	$5 - \frac{h}{h_{ef}}$) ≤ 2,4 ·	h _{ef}	
Axial distance		S _{cr,sp}	[mm]				2 c	cr,sp			
Install safety factor (dry an	d wet concrete)	γ2	·		1	,2			1	,4	
Install safety factor (floode	d bore hole)	γ2					1	,4			
		1		1							

Chemofast Injection System C-RE 385 for concrete

Performances

Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete (Design according to TR 029)

Annex C 1

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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Anchor size threaded r	od			M 12	M 16	M 20	M24	M 27	M 30
Steel, property class 4.6 Nik_s=N ² (kicos) [KN] 34 0.3 93 141 194 2 Steel, property class 6.8 Nik_s=N ² (kicos) [KN] 42 7.8 122 17.6 23.0 2 Steel, property class 6.8 Nik_s=N ² (kicos) [KN] 67 125 196 262 36.6 4 Characteristic tension resistance, Stand tresis tension resistance, Combined pull bott and concrete cone failure Nik_s=N ² (kicos) [KN] 59 110 17.1 247 230 2 Combined pull bott and concrete cone failure Characteristic bond resistance in cracked concrete C20/25 5.	Steel failure									
Steel, property class 5.8 Nm.s.=N ¹ /m.s.ame [RN] 42 78 122 170 230 2 Characteristic tension resistance, Statel, property class 8.8 Nm.s.=N ¹ /m.s.ame [RN] 67 125 196 282 368 4 Characteristic tension resistance, Statel, property class 50 (-M24) and 70 (< M24).			N _{Rk,s} =N ⁰ _{Rk,s,seis}	[kN]	34	63	98	141	184	224
$\begin{array}{c c c c c c c c c c c c c c c c c c c $,	N _{Rk,s} =N ⁰ _{Rk,s,seis}	[kN]	42	78	122	176	230	280
	Steel, property class 8.8	,	N _{Rk,s} =N ⁰ _{Rk,s,seis}	[kN]	67	125	196	282	368	449
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Stainless steel A4 and ⊢	ICR,	$N_{\text{Rk,s}} = N^0_{\text{Rk,s,seis}}$	[kN]	59	110	171	247	230	281
$ \begin{split} \mbox{Temperature range I:} & \mbox{dry and wet concrete} & \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Combined pull-out and	l concrete cone failure								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Characteristic bond resis	stance in cracked concret	e C20/25							
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			τ _{Rk,or}	[N/mm ²]	7,5	6,5	6,0	5,5	5,5	5,5
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	7,1	6,2	5,7	5,5	5,5	5,5
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Femperature range I:			[N/mm²]	2,4	2,2	No Pe	formance	Determined	(NPD)
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$				[N/mm²]	7,5	6,0	5,0	4,5	4,0	4,0
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		flooded bore hole	τ ⁰ _{Rk,seis,C1}	[N/mm²]	7,1	5,8	4,8	4,5	4,0	4,0
$ \frac{r_{\rm Rk,cr}}{r_{\rm Rk,sh,C2}} = [N/m^2] = 4,5 = 4,0 = 3,5 = 3,$				[N/mm²]	2,4	2,1	No Pe	formance	Determined	(NPD)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		dry and wet concrete	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	4,3	3,8	3,4	3,5	3,5	3,5
$\frac{1}{100^{\circ}\text{C}/43^{\circ}\text{C}}{\text{flooded bore hole}} = \frac{\frac{1}{1^{\circ}\text{R}_{k,\text{off}}} [N/\text{mm}^2]}{\frac{1}{10^{\circ}\text{R}_{k,\text{sdis},\text{C1}}} [N/\text{mm}^2]}{\frac{1}{1},4} \frac{4,5}{3,8} \frac{4,0}{3,5} \frac{3,5}{3,5} \frac{3,5}$	emperature range II:		τ ⁰ _{Rk,seis,C2}	[N/mm ²]	1,4	1,4	No Pe	formance	Determined	(NPD)
$ \frac{1}{r^{0}} \frac{1}{R_{k,Sells,C1}} = [N/mm^{2}] + 4,3 + 3,8 + 3,4 + 3,5$				[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5
$\frac{\tau^{0}_{\text{Fk}, \text{seis,C2}}}{\tau^{0}_{\text{Fk}, \text{seis,C2}}} [N/\text{mm}^{2}] 1,4 1,4 No \text{ Performance Determined (NPI)} \\ \frac{\tau^{0}_{\text{Fk}, \text{seis,C1}}}{\tau^{0}_{\text{Fk}, \text{seis,C2}}} [N/\text{mm}^{2}] 4,0 3,5 3,0 3,0 3,0 3,0 3,0 3,0 3,0 3,0 3,0 3,0$		flooded bore hole		[N/mm ²]	4,3	3,8	3,4	3,5	3,5	3,5
$\begin{array}{c c c c c c c c } \label{eq:remperature range} \mbox{III:} & \begin{tabular}{ c c c c c c c } \hline $r_{\rm RK, {\rm cefs}, C1}$ & $[\rm N/mm^2]$ & $4,0$ & $3,5$ & $3,0$ & $				[N/mm ²]	1,4	1,4	No Pe	formance	Determined	(NPD)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				[N/mm ²]	4,0	3,5	3,0	3,0	3,0	3,0
Temperature range III: $72^{\circ}C/43^{\circ}C$ $\tau^{0}_{\text{Rk,seik, C2}}$ $[N/mm^{2}]$ $1,3$ $1,2$ No Performance Determined (NP $72^{\circ}C/43^{\circ}C$ $\tau_{\text{Rk,cor}}$ $[N/mm^{2}]$ $4,0$ $3,5$ $3,0$ <t< td=""><td></td><td>dry and wet concrete</td><td></td><td>[N/mm²]</td><td>3,9</td><td>3,4</td><td>3,0</td><td>3,0</td><td>3,0</td><td>3,0</td></t<>		dry and wet concrete		[N/mm ²]	3,9	3,4	3,0	3,0	3,0	3,0
$\frac{r_{\text{Fik,cr}}}{r_{\text{Fik,seis,C1}}} \left[\text{N/mm}^2 \right] \begin{array}{c} 4,0 & 3,5 & 3,0 & $	Cemperature range III:			[N/mm ²]	1,3	1,2	No Pe	formance	Determined	(NPD)
$\frac{\tau^{0}_{\text{Fk,seis,C2}}}{r_{\text{Fk,seis,C2}}} \begin{bmatrix} \text{N/mm}^{2} \end{bmatrix} 1,3 \\ 1,2 \\ No Performance Determined (NPI of the second $				[N/mm ²]	4,0	3,5	3,0	3,0	3,0	3,0
$\frac{\tau^{0}_{\text{Pk,seis,C2}}}{r_{\text{only static or quasi-static actions}}} = \frac{\tau^{0}_{\text{Pk,seis,C2}}}{r_{\text{only static or quasi-static actions}}} = \frac{r_{\text{O}}^{0}}{r_{\text{Pk,seis,C2}}} = \frac{r_{\text{O}}^{0}}{r_{\text{O}}^{0}} = \frac{r_{\text{O}$		flooded bore hole	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	3,9	3,4	3,0	3,0	3,0	3,0
$\begin{array}{c c} C30/37 & 1,04 \\ \hline C40/50 & 1,08 \\ \hline C50/60 & 1,10 \\ \hline Splitting failure \\ \hline Edge distance \\ \hline Axial distance \\ \hline S_{ar,sp} \\ \hline Imm] \\ \hline Imm] \\ \hline C30/37 & 1,04 \\ \hline C40/50 & 1,08 \\ \hline C50/60 & 1,10 \\ \hline Imm] \\ \hline Imm] \\ \hline Imm] \\ \hline Imm] \\ \hline C_{ar,sp} \\ \hline Imm] \\ \hline C_{ar,sp} \\ \hline C$				[N/mm ²]	1,3	1,2	No Pe	formance	Determined	(NPD)
$\begin{array}{c c} C40/50 & 1,08 \\ \hline P_{c} & C50/60 & 1,10 \\ \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		·					1,	04		
v_e C50/60 1,10 Splitting failure Edge distance $c_{cr,sp}$ [mm] $1,0 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}}\right) \leq 2,4 \cdot h_{ef}$ Axial distance $s_{cr,sp}$ [mm] $2 c_{cr,sp}$			C40/50				1.	08		
Splitting failure Edge distance $c_{or,sp}$ [mm] $1,0 \cdot h_{ef} \leq 2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}}\right) \leq 2,4 \cdot h_{ef}$ Axial distance $s_{or,sp}$ [mm] $2 c_{or,sp}$	Ψc		C50/60				1,	10		
Axial distance $s_{cr,sp}$ [mm] $2 c_{cr,sp}$	Splitting failure									
Axial distance $s_{\alpha,sp}$ [mm] $2 c_{\alpha,sp}$	Edge distance		C _{cr,sp}	[mm]		1,0 · h _{ef} ≤	$\leq 2 \cdot h_{ef} \left(2 \right)$	$5 - \frac{h}{h_{ef}}$	≤ 2,4 · h _{ef}	
	Axial distance		S _{cr,sp}	[mm]			-			
nstallation safety factor (dry and wet concrete) γ_2 1,2 1,4	nstallation safety factor	(dry and wet concrete)	γ2		1	,2		1	,4	
Installation safety factor (flooded bore hole) γ ₂ 1,4	nstallation safety factor	(flooded bore hole)	γ2				. 1	,4		

Performances

Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to TR 029 or TR 045)



[kN] [kN] [kN] [kN] [kN] [kN] [kN] [kN]	Deter (NI 9 No Perfe Deter (NI 15 No Perfe (NI 13 No Perfe	23 prmance mined PD) 20 prmance mined	17 14 13 21 18 17 34 30 27 30 26 24 24 52 No Perfe	31 27 25 39 34 31 63 55 50 55 48 44 133 ormance	61 53 No Perfe 98 85 No Perfe 86 75 No Perfe 260	88 70 ormance 141 111 ormance 124 98 ormance 449	92 72 Determine 115 91 Determine 184 145 Determine 115 91 Determine 666	140 111 d (NPD 224 177 d (NPD 140 111					
[KN] [Nm] [Nm] [Nm] [Nm] [Nm]	No Perfe Deter (NI 9 No Perfe 15 No Perfe Deter (NI 13 No Perfe Deter (NI 15	ormance mined PD) 15 ormance mined PD) 23 ormance mined PD) 20 ormance mined PD) 30	14 13 21 18 17 34 30 27 30 26 24 52 No Perfe	27 25 39 34 31 63 55 50 55 48 44 44	42 No Perf 61 53 No Perf 86 75 No Perf 86 75 No Perf	56 ormance 88 70 ormance 141 111 ormance 124 98 ormance 449	72 Determine 115 91 Determine 184 145 Determine 115 91 Determine	88 d (NPD 140 111 d (NPD 224 177 d (NPD 140 111 d (NPD					
[kN] [Nm] [Nm] [Nm] [Nm]	Deter (NI 9 No Perfo Deter (NI 13 No Perfo Deter (NI 13 No Perfo Deter (NI 15	mined PD) 15 ormance mined PD) 23 ormance mined PD) 20 ormance mined PD) 30	13 21 18 17 34 30 27 30 26 24 24 52 No Perfe	25 39 34 31 63 55 50 55 48 44 133	No Perf 61 53 No Perf 98 85 No Perf 86 75 No Perf 260	ormance 88 70 ormance 141 111 ormance 124 98 ormance 449	Determine 115 91 Determine 184 145 Determine 115 91 Determine	d (NPD) 140 111 d (NPD) 224 1777 d (NPD) 140 111 d (NPD)					
[kN] [[Nm] [[Nm] [[Nm] [[Nm] [(NI 9 No Perfa 15 No Perfa 0eter (NI 13 No Perfa Deter (NI 15	PD) 15 ormance mined D) 23 ormance mined D) 20 ormance mined D) 30 30	21 18 17 34 30 27 30 26 24 52 No Perfe	39 34 31 63 55 50 55 48 44 133	61 53 No Perfe 98 85 No Perfe 86 75 No Perfe 260	88 70 ormance 141 111 ormance 124 98 ormance 449	11591Determine184145Determine11591Determine	140 111 d (NPD 224 177 d (NPD 140 111 d (NPD					
[kN] [Nm] [Nm] [Nm] [Nm]	No Perfe Deter (NI 15 No Perfe (NI 13 No Perfe Deter (NI 15	ormance mined PD) 23 ormance mined PD) 20 ormance mined PD) 30	18 17 34 30 27 30 26 24 52 No Perfe	34 31 63 55 50 55 48 44 133	53 No Perfe 98 85 No Perfe 86 75 No Perfe 260	70 ormance 141 111 ormance 124 98 ormance 449	91 Determine 184 145 Determine 115 91 Determine	111 d (NPD 224 177 d (NPD 140 111 d (NPD					
[kN] [Nm] [Nm] [Nm] [Nm] [Nm]	Deter (NI 15 No Perfe (NI 13 No Perfe Deter (NI 15	mined PD) 23 ormance mined PD) 20 ormance mined PD) 30	17 34 30 27 30 26 24 52 No Perfe	31 63 55 50 55 48 44 133	No Perf 98 85 No Perf 86 75 No Perf 260	ormance 141 111 ormance 124 98 ormance 449	Determine 184 145 Determine 115 91 Determine	d (NPD 224 177 d (NPD 140 111 d (NPD					
[kN] [Nm] [Nm] [Nm] [Nm] [Nm] [Nm]	(NI 15 No Perfe 0eter (NI 13 No Perfe Deter (NI 15	PD) 23 prmance mined PD) 20 prmance mined PD) 30	34 30 27 30 26 24 52 No Perfe	63 55 50 55 48 44 133	98 85 No Perfe 86 75 No Perfe 260	141 111 ormance 124 98 ormance 449	184 145 Determine 115 91 Determine	224 177 d (NPD 140 111 d (NPD					
[KN] [KN] [KN] [KN] [KN] [KN] [Nm] [Nm] [Nm] [Nm] [Nm]	No Perfe Deter (NI 13 No Perfe Deter (NI 15	ormance mined PD) 20 ormance mined PD) 30	30 27 30 26 24 52 No Perfe	55 50 55 48 44 133	85 No Perf 86 75 No Perf 260	111 ormance 124 98 ormance 449	145 Determine 115 91 Determine	177 d (NPD 140 111 d (NPD					
[KN] [KN] [KN] [KN] [KN] [Nm] [Nm] [Nm] [Nm]	Deter (NI 13 No Perfo Deter (NI 15	mined PD) 20 ormance mined PD) 30	27 30 26 24 52 No Perfe	50 55 48 44 133	No Perf 86 75 No Perf 260	ormance 124 98 ormance 449	Determine 115 91 Determine	d (NPD 140 111 d (NPD					
[kN] [kN] [kN] [Nm] [Nm] [Nm] [Nm] [Nm]	(NI 13 No Perfo Deter (NI 15	PD) 20 prmance mined PD) 30	30 26 24 52 No Perfe	55 48 44 133	86 75 No Perf 260	124 98 ormance 449	115 91 Determine	140 111 d (NPD					
[kN] [kN] [kN] [Nm] [Nm] [Nm] [Nm] [Nm]	No Perfe Deter (NI 15	ormance mined PD) 30	26 24 52 No Perfe	48 44 133	75 No Perf	98 ormance 449	91 Determine	111 d (NPD)					
[Nm] [Nm] [Nm] [Nm] [Nm] [Nm]	Deter (NI 15	mined PD) 30	24 52 No Perfe	44	No Perf	ormance	Determine	d (NPD					
[Nm] [Nm] [Nm] [Nm] [Nm] [Nm]	(NI	PD) 30	52 No Perfe	133	260	449	1	х —					
[Nm] [Nm] [Nm] [Nm] [Nm]			No Perfe				666	900					
[Nm] [Nm] [Nm] [Nm] [Nm]			No Perfe				666	900					
[Nm] [Nm] [Nm] [Nm]	19	37		ormance	Determine								
[Nm] [Nm] [Nm]	19	37		ormance	Jetemine	No Performance Determined (NPD)							
[Nm] [Nm]	19	37	C.F.			u (INPD)							
[Nm]			65	166	324	560	833	1123					
			No Porf	ormance	Determine	d (NPD)							
[Nim1				Simance	Jetennine								
[1,11,1]	30	60	105	266	519	896	1333	1797					
[Nm]			No Perf	ormance l	Determine	d (NPD)							
[Nm]						- (/							
[Nm]	26	52	92	232	454	784	832	1125					
[Nm]			No Perfe	ormance l	Determine	d (NPD)							
[Nm]						. ,							
[-]				2	,0								
				1	,0								
				1	,0								
				[Nm]	Nm] [-] 2 1	[Nm]	[-] 2,0	[-] 2,0 1,0					



	aracteristic va -cracked co								on loa	ds in		
Anchor size reinforcing t	oar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure					•							
Characteristic tension resis	stance	N _{Rk,s}	[kN]					$A_{s} \boldsymbol{\cdot} f_{uk}$				
Combined pull-out and c	oncrete cone failur	e										
Characteristic bond resista	nce in uncracked co	ncrete C20)/25									
Temperature range I:	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	14	14	13	13	12	12	11	11	11
40°C/24°C	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:	dry and wet concrete	$ au_{\mathrm{Rk},\mathrm{ucr}}$	[N/mm²]	8,5	8,5	8,0	8,0	7,5	7,0	7,0	6,5	6,5
60°C/43°C	flooded bore hole	τ _{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:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	7,5	7,5	7,5	7,0	7,0	6,5	6,0	6,0	6,0
72°C/43°C	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,0	5,5	5,0	4,5
	•	C30/37	•					1,04			•	
Increasing factors for conc ψ_c	rete	C40/50						1,08				
		C50/60						1,10				
Splitting failure												
Edge distance		C _{cr,sp}	[mm]			1,0 · h _{ef}	≤2·h _e	_{ef} (2,5 -	$\left(\frac{h}{h_{ef}}\right) \le 2$	2,4 · h _{ef}		
Axial distance		S _{cr,sp}	[mm]					2 c _{cr,sp}				
Installation safety factor (d concrete)	ry and wet	γ2				1,2				1	,4	
Installation safety factor (fl	ooded bore hole)	γ2						1,4				

Performances

Characteristic values of resistance for rebar under tension loads in non-cracked concrete (Design according to TR 029) $\,$



	naracteristic valu acked concrete							ads in	l	
Anchor size reinforcing	g bar			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure										
Characteristic tension re	esistance	N _{Rk,s} =N ⁰ _{Rk,s,seis,C1}	[kN]				$A_{s} \boldsymbol{\cdot} f_{uk}$			
Combined pull-out and	l concrete cone failure	•	·							
Characteristic bond resis	stance in cracked concret	e C20/25								
	dry and wet concrete	τ _{Rk,cr}	[N/mm ²]	7,5	7,0	6,5	6,0	5,5	5,5	5,5
Temperature range I:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm²]	6,9	6,4	6,2	5,7	5,5	5,5	5,5
40°C/24°C	flooded bore hole	$\tau_{Rk,cr}$	[N/mm ²]	7,5	6,5	6,0	5,0	4,5	4,0	4,0
		$\tau^0_{\text{Rk,seis,C1}}$	[N/mm²]	6,9	6,0	5,7	4,8	4,5	4,0	4,0
	dry and wet concrete	$ au_{Rk,cr}$	[N/mm²]	4,5	4,0	4,0	3,5	3,5	3,5	3,5
Temperature range II:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,1	3,7	3,8	3,3	3,5	3,5	3,5
60°C/43°C	flooded bore hole	τ _{Rk,cr}	[N/mm²]	4,5	4,0	4,0	3,5	3,5	3,5	3,0
		$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,1	3,7	3,8	3,3	3,5	3,5	3,0
	dry and wat concrete	τ _{Rk,cr}	[N/mm²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
Temperature range III:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
72°C/43°C	flooded bore hole	$ au_{\mathrm{Rk,cr}}$	[N/mm ²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
		$\tau^0_{Rk,seis,G1}$	[N/mm²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
		C30/37					1,04			
Increasing factors for co (only static or quasi-stati		C40/50					1,08			
Ψc		C50/60					1,10			
Splitting failure		·								
Edge distance		C _{cr,sp}	[mm]		1,0 · h _e	_{ef} ≤2 ⋅ h	ef (2,5 -	$\frac{h}{h_{ef}} \le 2$,4 · h _{ef}	
Axial distance		S _{cr,sp}	[mm]				2 C _{cr,sp}			
Installation safety factor	(dry and wet concrete)	γ ₂			1,2			1	,4	
Installation safety factor	(flooded bore hole)	γ2					1,4			
Chemofast Injec	ction System C-R	E 385 for con	crete							

(Design according to TR 029 or TR 045)

Characteristic values of resistance for rebar under tension loads in cracked concrete

Performances



Table C6: Characteristi and non-crac										racke	d
Anchor size reinforcing bar		•	Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm			I								
	$V_{\text{Rk},s}$	[kN]				0,	50 • A _s •	f _{uk}			
Characteristic shear resistance	$V^0_{Rk,s,seis,C1}$	[kN]	Perfor Deter	lo mance mined PD)			0	,44 • A₅ •	f _{uk}		
Steel failure with lever arm											
Characteristic bending moment	$M^{0}_{\ Rk,s}$	[Nm]				1.	2 ∙ W _{el} ∙	f _{uk}			
	$M^0_{\rm Rk,s,seis,C1}$	[Nm]			No F	Performa	nce Dete	rmined (I	NPD)		
Concrete pry-out failure											
Factor k in equation (5.7) of Technical Report TR 029 for the design of bonded anchors	k	[-]					2,0				
Installation safety factor	γ2						1,0				
Concrete edge failure											
Installation safety factor	γ2						1,0				

Chemofast Injection System C-RE 385 for concrete

Performances

Characteristic values of resistance for rebar under shear loads in cracked and non-cracked concrete, (Design according to TR 029 or TR 045)



Anchor size threaded rod				M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure										•	
Characteristic tension resis Steel, property class 4.6	tance,	N _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
Characteristic tension resis	tance,	N _{Rk,s}	[kN]	18	29	42	78	122	176	230	280
Steel, property class 5.8 Characteristic tension resis	tance,	N _{Rk.s}	[kN]	29	46	67	125	196	282	368	449
Steel, property class 8.8 Characteristic tension resis	tance	IN _{Rk,s}	[KIN]	29	40	07	120	190	202	300	449
Stainless steel A4 and HCF	۲,	N _{Rk,s}	[kN]	26	41	59	110	171	247	230	281
property class 50 (>M24) a Combined pull-out and co											
Characteristic bond resistar		0.020/25									
	dry and wet concrete		[N]/mm2]	15	15	15	14	13	12	12	12
Temperature range I: 40°C/24°C	flooded bore hole	τ _{Rk,ucr}	[N/mm ²]	15	15	13	14	9,5	8,5	7,5	7,0
		τ _{Rk,ucr}	[N/mm ²]	9,5	9,5	9,0	8,5	9,5 8,0	8,5 7,5	7,5	7,0
Temperature range II: 60°C/43°C	dry and wet concrete flooded bore hole	τ _{Rk,ucr}	[N/mm ²]		,	,		,			
		τ _{Rk,ucr}	[N/mm ²]	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	τ _{Rk,ucr}	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	7,0	6,5	6,5
	flooded bore hole	τ _{Rk,ucr}	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
Increasing factors for concr	ete	C30/37 C40/50						04			
ψ_{c}		C40/50					,	08 10			
Factor according to CEN/TS 1992-4-5 Section (3.2.2.3	k ₈	[-]),1			
Concrete cone failure		I	1								
Factor according to CEN/TS 1992-4-5 Section (5.2.3.1	k _{ucr}	[-]				10),1			
Edge distance		C _{cr,N}	[mm]				1,5	i h _{ef}			
Axial distance		S _{cr,N}	[mm]				3,0) h _{ef}			
Splitting failure											
Edge distance		C _{cr,sp}	[mm]		1	,0 ⋅ h _{ef} ≤	2 · h _{ef} 2	$5 - \frac{h}{h_{ef}}$	≤ 2,4 · h _e	əf	
Axial distance		S _{cr,sp}	[mm]					cr,sp			
Installation safety factor (dr	y and wet concrete)	γ2			1	,2			1	,4	
installation surery fusion (a							1	,4			

Performances

Characteristic values of resistance for threaded rods under tension loads in non-cracked concrete (Design according to CEN/TS 1992-4)



Table C8: Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to CEN/TS 1992-4 or TR 045) Anchor size threaded rod M 12 M 16 M 20 M24 M27 M30 Steel failure Characteristic tension resistance, [kN] 34 63 98 141 184 224 N_{Rk,s} = N⁰_{Rk,s,seis} Steel, property class 4.6 Characteristic tension resistance, [kN] 42 122 176 230 280 N_{Rk.s} = N⁰_{Rk.s.seis} 78 Steel, property class 5.8 Characteristic tension resistance, N_{Rk.s}=N⁰_{Rk.s.seis} [kN] 67 125 196 282 368 449 Steel, property class 8.8 Characteristic tension resistance, Stainless steel A4 and HCR, [kN] 59 110 171 247 230 281 N_{Rk,s} = N⁰_{Rk,s,seis} property class 50 (>M24) and 70 (≤ M24) Combined pull-out and concrete failure Characteristic bond resistance in cracked concrete C20/25 [N/mm²] 7,5 5,5 5,5 6,5 6,0 5,5 $\tau_{Rk,cr}$ dry and wet concrete $\tau^0_{Rk,seis,C1}$ [N/mm²] 7,1 6,2 5,7 5,5 5,5 5,5 $\tau^0_{Rk,seis,C2}$ No Performance Determined (NPD) Temperature range I: [N/mm²] 2,4 2,2 40°C/24°C [N/mm²] 7,5 6,0 5,0 4,0 4,0 4.5 $\tau_{Rk.cr}$ flooded bore hole $\tau^0_{Rk,seis,C1}$ 7,1 5,8 4.5 4.0 [N/mm²] 4.8 4.0 $\tau^0_{Rk,seis,C2}$ [N/mm²] 2,4 2,1 No Performance Determined (NPD) [N/mm²] 4.5 4.0 3,5 3,5 3,5 3,5 $\tau_{\text{Rk,cr}}$ $\tau^0_{\underline{Rk,seis,C1}}$ 3,5 3,5 [N/mm²] 4,3 3,8 3,4 3,5 drv and wet concrete No Performance Determined (NPD) τ⁰_{Rk,seis,C2} [N/mm²] 1,4 1,4 Temperature range II: 60°C/43°C 4,5 4,0 3,5 $\tau_{\text{Rk,cr}}$ [N/mm²] 3,5 3,5 3,5 $\tau^0_{Rk,seis,C1}$ flooded bore hole [N/mm²] 4,3 3,8 3,4 3,5 3,5 3,5 $\tau^0_{Rk,seis,C2}$ [N/mm²] 1,4 1,4 No Performance Determined (NPD) [N/mm²] 4,0 3,5 3,0 3,0 3,0 3,0 $\tau_{\text{Rk,cr}}$ $\tau^0_{Rk,seis,C1}$ dry and wet concrete [N/mm²] 3,9 3,4 3,0 3,0 3.0 3,0 $\tau^0_{Rk,seis,C2}$ 1,3 1,2 No Performance Determined (NPD) [N/mm²] Temperature range III: 72°C/43°C 3,0 [N/mm²] 4,0 3,5 3,0 3,0 3.0 $\tau_{\text{Rk,cr}}$ $\tau^0_{Rk,seis,C1}$ flooded bore hole [N/mm²] 3,9 3,4 3,0 3,0 3,0 3,0 [N/mm²] 1,3 1,2 No Performance Determined (NPD) $\tau^0_{Rk,seis,C2}$ C30/37 1,04 Increasing factors for concrete (only static or quasi-static actions) C40/50 1,08 Ψ_{c} C50/60 1,10 Factor according to 7,2 k_8 [-] CEN/TS 1992-4-5 Section 6.2.2.3 Concrete cone failure Factor according to 7.2 k_{cr} [-] CEN/TS 1992-4-5 Section 6.2.3.1 Edge distance 1,5 h_{ef} C_{cr,N} [mm] Axial distance [mm] 3,0 h_{ef} S_{cr,N} Splitting failure h $1,0 \cdot h_{ef} \leq 2 \cdot h_{ef}$ 2,5 \leq 2,4 \cdot h_{ef} Edge distance [mm] C_{cr,sp} h_{ef} Axial distance [mm] 2 c_{cr,sp} S_{cr,sp} Installation safety factor (dry and wet concrete) 1,2 1,4 γz Installation safety factor (flooded bore hole) 1,4 γ₂

Chemofast Injection System C-RE 385 for concrete

Performances

Characteristic values of resistance for threaded rods under tension loads in cracked concrete (Design according to CEN/TS 1992-4 or TR 045)



Table C9: Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete (Design according to CEN/TS 1992-4 or TR 045)

Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 3
Steel failure without lever arm										
	V _{Rk,s}	[kN]	7	12	17	31	49	71	92	112
Characteristic shear resistance, Steel, property class 4.6	$V^0_{Rk,s,seis,C1}$	[kN]	No Perf	ormance	14	27	42	56	72	88
21 1 2	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ned (NPD)	13	25	No Per	formance	Determined	ל (NPD
	V _{Rk,s}	[kN]	9	15	21	39	61	88	115	14
Characteristic shear resistance, Steel, property class 5.8	$V^0_{Rk,s,seis,C1}$	[kN]		ormance	18	34	53	70	91	11
	$V^0_{Rk,s,seis,C2}$	[kN]	Determir	ned (NPD)	17	31	No Per	formance	Determined	ל (NPD
	V _{Rk,s}	[kN]	15	23	34	63	98	141	184	22
Characteristic shear resistance, Steel, property class 8.8	$V^0_{Rk,s,seis,C1}$	[kN]		ormance	30	55	85	111	145	17
	$V^0_{\rm Rk,s,seis,C2}$	[kN]	Determir	ned (NPD)	27	50	No Per	formance	Determined	ן (NPC
Characteristic shear resistance,	V _{Rk,s}	[kN]	13	20	30	55	86	124	115	14
Stainless steel A4 and HCR,	$V^0_{\rm Rk,s,seis,C1}$	[kN]		ormance	26	48	75	98	91	11
property class 50 (>M24) and 70 (\leq M24)	$V^0_{\rm Rk,s,seis,C2}$	[kN]	Determir	ned (NPD)	24	44	No Per	formance	Determined	א (NPC
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k ₂					0	,8			
Steel failure with lever arm	•		I							
	M ⁰ _{Rk,s}	[Nm]	15	30	52	133	260	449	666	90
Characteristic bending moment, Steel, property class 4.6	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Por	formance I	Dotorminor			
	M ⁰ _{Rk,s,seis,C2}	[Nm]					Jeterminet			
	M ⁰ _{Rk,s}	[Nm]	19	37	65	166	324	560	833	112
Characteristic bending moment, Steel, property class 5.8	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Per	formance I	Determiner			
	M ⁰ _{Rk,s,seis,C2}	[Nm]								
	M ⁰ _{Rk,s}	[Nm]	30	60	105	266	519	896	1333	179
Characteristic bending moment, Steel, property class 8.8	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Per	formance I	Determiner			
	M ⁰ _{Rk,s,seis,C2}	[Nm]								
Characteristic bending moment,	M ⁰ _{Rk,s}	[Nm]	26	52	92	232	454	784	832	112
Stainless steel A4 and HCR, property class 50 (>M24) and 70 (\leq M24)	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Per	formance l	Determiner			
	M ⁰ _{Rk,s,seis,C2}	[Nm]								
Concrete pry-out failure										
Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	k ₃					2	,0			
Installation safety factor	γ2					1	,0			
Concrete edge failure ³⁾	•									
Effective length of anchor	l _t	[mm]				$I_t = min(h$	_{et} ; 8 d _{nom})			
Outside diameter of anchor	d _{nom}	[mm]	8	10	12	16	20	24	27	30
Installation safety factor	γ_2					1	,0			
			-							

Performances

Characteristic values of resistance for threaded rods under shear loads in cracked and non-cracked concrete, (Design according to CEN/TS 1992-4 or TR 045)



	acteristic value cracked concre									ls in		
Anchor size reinforcing ba	r			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure										1		
Characteristic tension resista	nce	N _{Rk,s}	[kN]					$A_{s}\boldsymbol{\cdot}f_{uk}$				
Combined pull-out and cor	crete failure											
Characteristic bond resistance	e in non-cracked concre	te C20/25	5									
Temperature range I:	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	14	14	13	13	12	12	11	11	11
40°C/24°C	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	14	13	11	10	9,5	8,5	7,5	7,0	6,0
Temperature range II:	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
60°C/43°C	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:	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	7,5	7,5	7,5	7,0	7,0	6,5	6,0	6,0	6,0
72°C/43°C	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
Increasing factors for concret	ła	C30/37						1,04				
Increasing factors for concret Ψ_c	le	C40/50						1,08				
		C50/60						1,10				
Factor according to CEN/TS 1992-4-5 Section 6.	2.2.3	k ₈	[-]					10,1				
Concrete cone failure												
Factor according to CEN/TS 1992-4-5 Section 6.	2.3.1	k _{ucr}	[-]					10,1				
Edge distance		C _{cr,N}	[mm]					1,5 h _{ef}				
Axial distance		S _{cr,N}	[mm]					$3,0 \ h_{\text{ef}}$				
Splitting failure				-								
Edge distance		C _{cr,sp}	[mm]			1,0 · h _e	_{ef} ≤2 ⋅ h _e	ef (2,5-	<u>h</u> h _{ef})≤2	,4 ⋅ h _{ef}		
Axial distance		S _{cr,sp}	[mm]					$2 c_{\rm cr,sp}$				
Installation safety factor (dry	and wet concrete)	γ2				1,2				1	,4	
Installation safety factor (floo	ded bore hole)	γ2						1,4				
Chemofast Injectio	n System C-RE 3	885 for	concret	е						Anne		n

Characteristic values of resistance for rebar under tension loads in non-cracked concrete

(Design according to CEN/TS 1992-4)



	aracteristic valu ncrete (Design a							ds in (cracke	ed
Anchor size reinforcing	g bar			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure			_				I	1		
Characteristic tension re	esistance	$N_{Rk,s} = N^0_{Rk,s,seis,C1}$	[kN]				$A_{s}\boldsymbol{\cdot}f_{uk}$			
Combined pull-out and	l concrete failure									
Characteristic bond resis	stance in cracked concre	ete C20/25								
		τ _{Rk,cr}	[N/mm ²]	7,5	7,0	6,5	6,0	5,5	5,5	5,5
Temperature range I:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	6,9	6,4	6,2	5,7	5,5	5,5	5,5
40°C/24°C		$\tau_{Rk,cr}$	[N/mm ²]	7,5	6,5	6,0	5,0	4,5	4,0	4,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	6,9	6,0	5,7	4,8	4,5	4,0	4,0
		$\tau_{\rm Rk,cr}$	[N/mm ²]	4,5	4,0	4,0	3,5	3,5	3,5	3,5
Temperature range II:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,1	3,7	3,8	3,3	3,5	3,5	3,5
60°C/43°C		$ au_{ m Rk,cr}$	[N/mm ²]	4,5	4,0	4,0	3,5	3,5	3,5	3,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,1	3,7	3,8	3,3	3,5	3,5	3,0
		τ _{Rk,cr}	[N/mm ²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
Temperature range III:	dry and wet concrete	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
72°C/43°C		τ _{Rk,cr}	[N/mm ²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
	flooded bore hole	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
Increasing factors for co	ncrete	C30/37				,	1,04	,	,	,
(only static or quasi-stati		C40/50					1,08			
Ψc		C50/60	•				1,10			
Factor according to CEN/TS 1992-4-5 Section	on 6.2.2.3	k ₈	[-]				7,2			
Concrete cone failure										
Factor according to CEN/TS 1992-4-5 Section	on 6.2.3.1	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		C _{cr,sp}	[mm]		1,0 ·	h _{ef} ≤2 ⋅ h	$r_{ef}\left(2,5-\frac{1}{r}\right)$	<u>h</u> n _{ef})≤ 2,4	∙h _{ef}	
Axial distance		S _{cr,sp}	[mm]				2 c _{cr,sp}			
Installation safety factor	(dry and wet concrete)	γ2			1,2			1	4	
Installation safety factor	(flooded bore hole)	γ2					1,4			
Performances Characteristic values	ction System C-F	ar under tension lo		ked cond	crete			Ann	ex C 1	1



Table C12: Characteristic values and non-cracked co											
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											
	V _{Rk,s}	[kN]				0,	50 • A _s •	f _{uk}			
Characteristic shear resistance	V ⁰ Rk,s,seis,C1	[kN]	Perfor Deter	lo mance mined PD)			0,4	14 • A _s •	f _{uk}		
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k ₂						0,8				
Steel failure with lever arm											
Characteristic bending moment	M ^o _{Rk,s}	[Nm]				1.:	2 ∙ W _{el} ∙	f _{uk}			
	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Pe	erformar	ice Dete	rmined	(NPD)		
Concrete pry-out failure											
Factor in equation (27) of CEN/TS 1992-4-5 Section 6.3.3	k ₃						2,0				
Installation safety factor	γ2						1,0				
Concrete edge failure											
Effective length of anchor	l _f	[mm]				$I_f = rr$	nin(h _{ef} ; 8	d _{nom})			
Outside diameter of anchor	d _{nom}	[mm]	8	10	12	14	16	20	25	28	32
Installation safety factor	γ2						1,0				

Chemofast Injection System C-RE 385 for concrete

Performances

Characteristic values of resistance for rebar under shear loads in cracked and non-cracked concrete, (Design according to CEN/TS 1992-4 or TR 045)



Anchor size threa	ded rod		M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked conc	rete C20/25	under static and	quasi-statio	c action						•
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]	0,011	0,013	0,015	0,020	0,024	0,029	0,032	0,03
40°C/24°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm ²)]	0,044	0,052	0,061	0,079	0,096	0,114	0,127	0,14
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,04
60°C/43°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,023	0,028	0,033	0,037	0,04
72°C/43°C	$\delta_{N\infty}\text{-factor}$	[mm/(N/mm ²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Cracked concrete	C20/25 und	ler static, quasi-sta	atic and sei	ismic C	1 action					
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]			0,032	0,037	0,042	0,048	0,053	0,05
40°C/24°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm ²)]			0,21	0,21	0,21	0,21	0,21	0,21
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]		ormance mined	0,037	0,043	0,049	0,055	0,061	0,06
60°C/43°C	$\delta_{N\infty}\text{-}factor$	[mm/(N/mm ²)]		PD)	0,24	0,24	0,24	0,24	0,24	0,24
Temperature range III:	δ_{N0} -factor	[mm/(N/mm ²)]			0,037	0,043	0,049	0,055	0,061	0,06
72°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm ²)]			0,24	0,24	0,24	0,24	0,24	0,24
Cracked concrete	C20/25 und	ler seismic C2 acti	on							
Temperature range I:	$\delta_{N,seis(DLS)}$	[mm/(N/mm ²)]			0,03	0,05				
40°C/24°C	$\delta_{N,seis(ULS)}$	[mm/(N/mm ²)]			0,06	0,09				
Temperature range II:	$\delta_{N,seis(DLS)}$	[mm/(N/mm ²)]		ormance	0,03	0,05			.	
60°C/43°C	$\delta_{N,seis(ULS)}$	[mm/(N/mm ²)]		mined	0,06	0,09	No Pert	ormance I	Jetermine	d (NPL
			1 (1)	PD)		0,00				
Temperature range III:	δ _{N,seis} (DLS)	[mm/(N/mm ²)]	(1)	PD)	0,03	0,05				
	$\begin{array}{ c c c c }\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displaceme \\ & \tau; \\\hline \end{array}$	[mm/(N/mm ²)] [mm/(N/mm ²)]		PD)	0,03	,				
Temperature range III: 72°C/43°C ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	$\begin{array}{ c c c c }\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\\hline \end{array}$	[mm/(N/mm ²)] [mm/(N/mm ²)]			0,06	0,05				
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di	$ \begin{array}{ c c c c }\hline \delta_{N,seis(DLS)} \\\hline \delta_{N,seis(ULS)} \\\hline e \ displaceme \\ \cdot \ \tau; \\\cdot \ \tau; \\\hline splaceme \\\hline \end{array} $	[mm/(N/mm ²)] [mm/(N/mm ²)] nt			0,06	0,05	M 20	M24	M 27	M 30
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread		[mm/(N/mm ²)] [mm/(N/mm ²)] nt	ur load ¹⁾ (1	thread M 10	0,06 ed rod M 12	0,05 0,09) M 16			M 27	M 30
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread		[mm/(N/mm ²)] [mm/(N/mm ²)] nt ents under shea	ur load ¹⁾ (1	thread M 10	0,06 ed rod M 12	0,05 0,09) M 16			M 27	
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and o All temperature		[mm/(N/mm ²)] [mm/(N/mm ²)] nt ents under shea	Ir load ¹⁾ (1 M 8 er static, qu	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s	0,05 0,09) M 16 seismic	C1 act	ion		0,03
Temperature range III: 72°C/43°C ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and of All temperature ranges	$\begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline e \ splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{Vo} \ factor \\ \hline \delta_{V_{\infty}} \ factor \\ \hline \end{array}$	[mm/(N/mm ²)] [mm/(N/mm ²)] nt ents under shea crete C20/25 unde [mm/(kN)] [mm/(kN)]	Ir load ¹⁾ (1 M 8 Pr static, qu 0,06 0,09	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s 0,05	0,05 0,09) M 16 seismic 0,04	C1 act 0,04	ion 0,03	0,03	0,03
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and o All temperature ranges Cracked concrete	$\begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \end{array}$	[mm/(N/mm ²)] [mm/(N/mm ²)] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)]	er static, qu 0,06 0,09 0n	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04	ion 0,03	0,03	M 30 0,03 0,05
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and d All temperature ranges Cracked concrete All temperature	$\begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline e \ splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V0} \mbox{-} factor \\ \hline cr20/25 \ und \\ \hline \delta_{V,seis(DLS)} \\ \hline \end{array}$	[mm/(N/mm²)] [mm/(N/mm²)] [mm/(N/mm²)] nt ents under shea ncrete C20/25 under [mm/(kN)] [mm/(kN)] [mm/(kN)] ler seismic C2 acti [mm/kN]	Ir load ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perfu Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03	0,03	0,03
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and d All temperature ranges Cracked concrete All temperature ranges	$\begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline e \ splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V_0} \ factor \\ \hline \delta_{V_{oo}} \ factor \\ \hline c20/25 \ und \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(ULS)} \\ \hline \end{array}$	[mm/(N/mm²)] [mm/(N/mm²)] [mm/(N/mm²)] int ents under shea increte C20/25 under [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/kN] [mm/kN]	Ir load ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perfu Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03 0,05	0,03	0,0
Temperature range III: $72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Non-cracked and d All temperature ranges Cracked concrete All temperature	$\begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline e \ splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V_0} \ factor \\ \hline \delta_{V_0} \ factor \\ \hline cracked \ cor \\ \hline \delta_{V_0} \ factor \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ V; \\ \hline \end{array}$	[mm/(N/mm²)] [mm/(N/mm²)] [mm/(N/mm²)] int ents under shea increte C20/25 under [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/kN] [mm/kN]	Ir load ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perfu Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03 0,05	0,03	0,0
Temperature range III: 72°C/43°C ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Anchor size thread thread Anchor size thread thread thread thread t	$ \begin{array}{ c c c c c } \hline \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \hline splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V0} \mbox{-} factor \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ V; \\ \cdot \ V; \\ \hline \end{array} $	[mm/(N/mm²)] [mm/(N/mm²)] [mm/(N/mm²)] int ents under shea increte C20/25 under [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/kN] [mm/kN]	nr Ioad ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perfi Deter (Ni	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03 0,05	0,03	0,03
Temperature range III: 72°C/43°C ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size thread Anchor size thread th	$ \begin{array}{ c c c c c } \hline \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \hline splaceme \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline ded \ rod \\ \hline cracked \ cor \\ \hline \delta_{V0} \mbox{-} factor \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(DLS)} \\ \hline \delta_{V,seis(ULS)} \\ \hline e \ displaceme \\ \cdot \ V; \\ \cdot \ V; \\ \hline \end{array} $	[mm/(N/mm²)] [mm/(N/mm²)] [mm/(N/mm²)] nt ents under shea ncrete C20/25 under [mm/(kN)] [mm/(kN)] [mm/(kN)] [mm/kN] [mm/kN] nt	nr Ioad ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perfi Deter (Ni	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 tic and s 0,05 0,08	0,05 0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03 0,05 ormance I	0,03	0,03 0,05 d (NPE



Anchor size reinfo	orcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked cone	crete C20/	25 under static	and qua	asi-stati	ic action	้า			•		
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]	0,011	0,013	0,015	0,018	0,020	0,024	0,030	0,033	0,03
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,044	0,052	0,061	0,070	0,079	0,096	0,118	0,132	0,14
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,04
60°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm ²)]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,17
Temperature range III:	δ_{N0} -factor	[mm/(N/mm ²)]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,04
72°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm ²)]	0,050	0,060	0,070	0,081	0,091	0,111	0,136	0,151	0,17
Cracked concrete	C20/25 u	nder static, qua	si-statio	c and se	eismic C	C1 actio	n				
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]			0,032	0,035	0,037	0,042	0,049	0,055	0,06
40°C/24°Cັ	$\delta_{\text{N}_{\infty}}\text{-factor}$	[mm/(N/mm²)]	1	-	0,21	0,21	0,21	0,21	0,21	0,21	0,21
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]			0,037	0,040	0,043	0,049	0,056	0,063	0,07
60°C/43°C	$\delta_{N_\infty}\text{-factor}$	[mm/(N/mm²)]		-	0,24	0,24	0,24	0,24	0,24	0,24	0,24
Temperature range III:	δ_{N0} -factor	[mm/(N/mm ²)]		-	0,037	0,040	0,043	0,049	0,056	0,063	0,07
72°C/43°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]			0,24	0,24	0,24	0,24	0,24	0,24	0,24
¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C16: D	· τ; · τ;		hear Ic	oad ¹⁾ (r	ebar)						Γ
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$ Table C16: D	τ; τ; isplacen	nent under s	hear lo	9 ad¹⁾ (r Ø 10	ebar) Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø3
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C16: D Anchor size reinfo	τ; τ; isplacen prcing bar	nent under s	Ø 8	Ø 10	Ø 12		Ø 16	Ø 20	Ø 25	Ø 28	Ø3
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-} \text{factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-} \text{factor} \end{split}$ Table C16: D Anchor size reinfor For concrete C20/ All temperature	τ; τ; isplacen prcing bar	nent under s	Ø 8	Ø 10	Ø 12		Ø 16	Ø 20 0,04	Ø 25	Ø 28 0,03	Ø 3 0,03
$\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C16: D Anchor size reinfor For concrete C20/ All temperature ranges ¹⁾ Calculation of th	τ; τ; isplacen prcing bar 25 under s δ_{V0} -factor $\delta_{V\infty}$ -factor ne displacen	nent under s static, quasi-sta [mm/(kN)] [mm/(kN)]	Ø 8 atic and	Ø 10 seismid	Ø 12 c C1 act	tion					1
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C16: D Anchor size reinfo For concrete C20/ All temperature ranges	τ; τ; isplacen prcing bar 25 under s δ_{Vo} -factor δ_{Vo} -factor le displacen V;	nent under s static, quasi-sta [mm/(kN)] [mm/(kN)]	Ø 8 atic and 0,06	Ø 10 seismid 0,05	Ø 12 c C1 act 0,05	t ion	0,04	0,04	0,03	0,03	0,0