



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

Deutsches Institut für Bautechnik

of 20 October 2014

ETA-14/0352

SORMAT Injection system ITH-EPOXe for concrete

Bonded anchor with anchor rod for use in concrete

Sormat Oy Harjutie 5 21290 RUSKO FINNLAND

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

SORMAT Plant 8

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 "SORMAT Injection System ITH-EPOXe for concrete" is a bonded anchor consisting of a cartridge with injection mortar SORMAT ITH-EPOXe 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

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

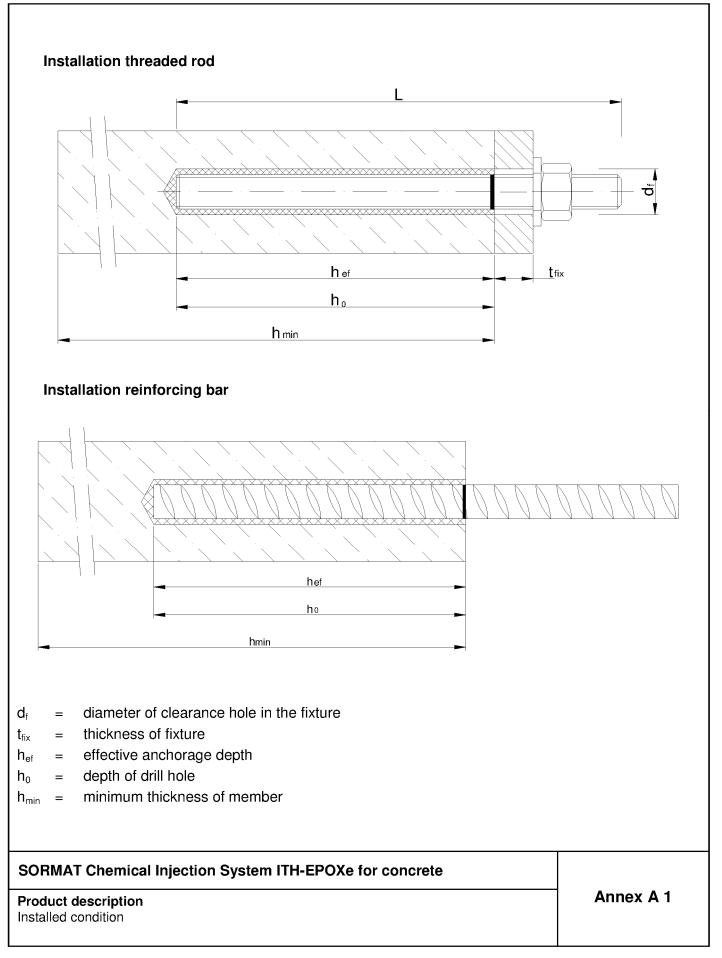
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 20 October 2014 by Deutsches Institut für Bautechnik

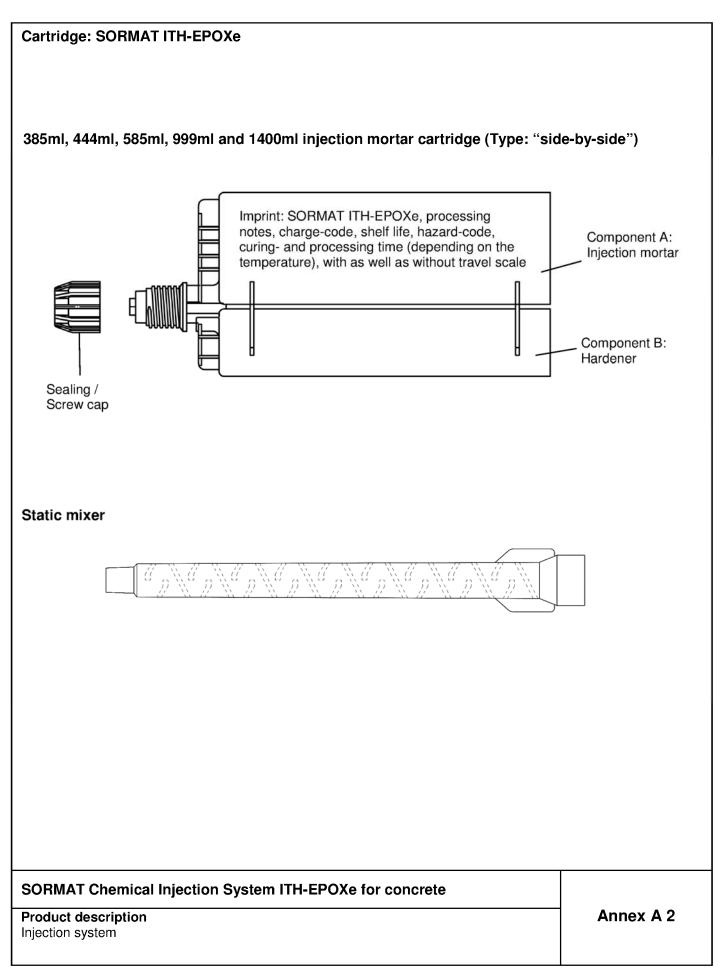
Uwe Bender Head of Department *beglaubigt:* Baderschneider

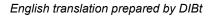
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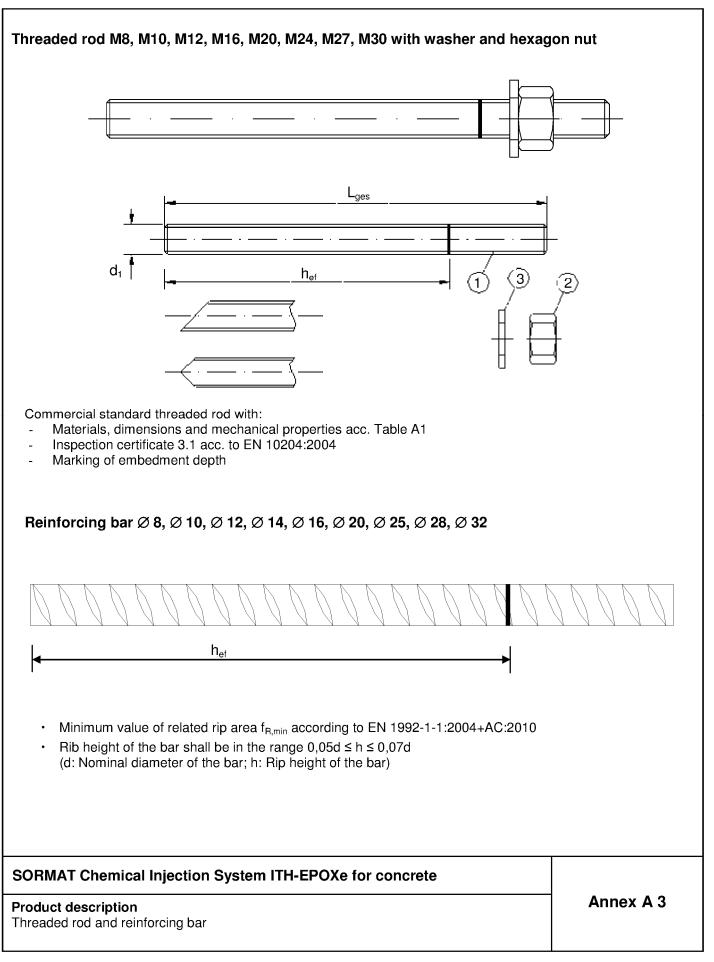




Table A1: Materials

		1	
Part	Designation	Material	
	zinc plated \ge 5 µm acc. to EN ISO 4042:19 hot-dip galvanised \ge 40 µm acc. to EN ISO		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
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10 > M24: Property class 50 (for class 50 ro ≤ M24: Property class 70 (for class 70 ro	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 1.4401, 1.4404 or 1.4571, EN	10088-1:2005
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 ro ≤ M24: Property class 70 (for class 70 ro	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	005
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
	MAT Chemical Injection System ITH-E	EPOXe for concrete	
Prod Mate	uct 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.

SORMAT Chemical Injection System ITH-EPOXe for concrete

Intended Use

Specifications



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
Thiskness of firsture	t _{fix,min} [mm] >	0							
Thickness of fixture	t _{fix,max} [mm] <				15	00			
Minimum thickness of member	h _{min} [mm]	n]							
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
Enective 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]	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

SORMAT Chemical Injection System ITH-EPOXe for concrete

Intended Use

Installation parameters



Steel brush Table B3: Parameter cleaning and setting tools d_{b,min} Threaded Piston 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 M30 28 35 37 35,5 # 35 32 40 41,5 40,5 # 38





Hand pump (volume 750 ml) Drill bit diameter (d₀): 10 mm to 20 mm



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 (d₀): 24 mm to 40 mm

SORMAT Chemical Injection System ITH-EPOXe for concrete

Intended Use

Cleaning and setting tools



Installation inst	ructions	
	 Drill with hammer drill a hole into the base material to the size a depth required by the selected anchor (Table B1 or Table B2). I drill hole: the drill hole shall be filled with mortar 	
2x	Attention! Standing water in the bore hole must be removed 2a. Starting from the bottom or back of the bore hole, blow the hole compressed air (min. 6 bar) or a hand pump (Annex B 3) a min the bore hole ground is not reached an extension shall be used	clean with imum of two times. If
or	The hand-pump can be used for anchor sizes up to bore hole d	
2x	For bore holes larger than 20 mm or deeper 240 mm, compress must be used.	
<u>*******</u> **	 2b. Check brush diameter (Table B3) and attach the brush to a drill or a battery screwdriver. Brush the hole with an appropriate size > d_{b,min} (Table B3) a minimum of two times. If the bore hole ground is not reached with the brush, a brush exshall be used (Table B3). 	ed wire brush
or	2c. Finally blow the hole clean again with compressed air (min. 6 b. (Annex B 3) a minimum of two times. If the bore hole ground is extension shall be used. The hand-pump can be used for anchor sizes up to bore hole d For bore holes larger than 20 mm or deeper 240 mm, compress <u>must</u> be used.	not reached an liameter 20 mm.
2x 1	After cleaning, the bore hole has to be protected against re an appropriate way, until dispensing the mortar in the bore the cleaning repeated has to be directly before dispensing In-flowing water must not contaminate the bore hole again.	hole. If necessary, the mortar.
	3. Attach a supplied static-mixing nozzle to the cartridge and load correct dispensing tool. Cut off the foil tube clip before use. For every working interruption longer than the recommended w (Table B4) as well as for new cartridges, a new static-mixer sha	orking time
her	Prior to inserting the anchor rod into the filled bore hole, the pose embedment depth shall be marked on the anchor rods.	sition of the
min. 3 full stroke	5. Prior to dispensing into the anchor hole, squeeze out separately full strokes and discard non-uniformly mixed adhesive compone shows a consistent grey colour. For foil tube cartridges is must to minimum of six full strokes.	nts until the mortar
	al Injection System ITH-EPOXe for concrete	Annex B 4
Intended Use Installation instruction	าร	



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.
	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.	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 B4).
Tinat.	 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

SORMAT Chemical Injection System ITH-EPOXe for concrete

Installation instructions (continuation) Curing time



Anchor size threaded ro	d			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure							1	1	1		1
Characteristic tension resi Steel, property class 4.6	stance,	N _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
Characteristic tension resi	Characteristic tension resistance,		[kN]	18	29	42	78	122	176	230	280
Steel, property class 5.8 Characteristic tension resi Steel, property class 8.8	stance,	N _{Rk,s}	[kN]	29	46	67	125	196	282	368	449
Characteristic tension resi 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											1
Characteristic bond resista	ance in non-cracked con	crete C20/2	25								
Temperature range I:	dry and wet concrete	τ _{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
60°C/43°C	flooded bore hole	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:	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	τ _{Rk,ucr}	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
creasing factors for concrete		C30/37					1,	04	1		
		C40/50		1,08				08			
		C50/60	C50/60 1,10				10	0			
Splitting failure		1									
Edge distance		C _{cr,sp}	[mm]	$1,0 \cdot h_{ef} \le 2 \cdot h_{ef} \left(2,5 - \right)$					$\left(\frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$		
Axial distance		S _{cr,sp}	[mm]				2 c	cr,sp			
Install safety factor (dry ar	nd wet concrete)	γ2			1	,2		1,4			
Install safety factor (floode	ed bore hole)	γ2					,4				



Anchor size threaded	rod			M 12	M 16	M 20	M24	M 27	M 30	
Steel failure						•				
Characteristic tension re Steel, property class 4.6		N _{Rk,s} =N ⁰ _{Rk,s,seis}	[kN]	34	63	98	141	184	224	
Characteristic tension re	esistance,	N _{Rk,s} =N ⁰ _{Rk,s,seis}	[kN]	42	78	122	176	230	280	
Steel, property class 5.8 Characteristic tension re	esistance,	N _{Rk.s} =N ⁰ _{Rk.s.seis}	[kN]	67	125	196	282	368	449	
Steel, property class 8.8 Characteristic tension re		IN _{Rk,s} =IN _{Rk,s,seis}	[KN]		123	130	202		++5	
Stainless steel A4 and H property class 50 (>M24	ICR,	$N_{Rk,s} = N_{Rk,s,seis}^0$	[kN]	59	110	171	247	230	281	
Combined pull-out and	concrete cone failure									
Characteristic bond resis	stance in cracked concret	e C20/25								
		$\tau_{\rm Rk, cr}$	[N/mm ²]	7,5	6,5	6,0	5,5	5,5	5,5	
	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	7,1	6,2	5,7	5,5	5,5	5,5	
Temperature range I:		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	2,4	2,2	No Pe	rformance [Determined	I (NPD)	
40°C/24°C	flooded bore hole	τ _{Rk,cr}	[N/mm ²]	7,5	6,0	5,0	4,5	4,0	4,0	
		$\tau^0_{Rk,seis,C1}$	[N/mm ²]	7,1	5,8	4,8	4,5	4,0	4,0	
		$\tau^0_{\text{Rk,seis,C2}}$	[N/mm ²]	2,4	2,1	No Performance Determined (NPE				
Temperature range II: 60°C/43°C		$\tau_{Rk,cr}$	[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5	
	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm²]	4,3	3,8	3,4	3,5	3,5	3,5	
		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	1,4	1,4	No Pe	rformance [Determined	I (NPD)	
		τ _{Rk,cr}	[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5	
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,3	3,8	3,4	3,5	3,5	3,5	
		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	1,4	1,4	No Pe	rformance [Determined	I (NPD)	
		$\tau_{Rk,cr}$	[N/mm ²]	4,0	3,5	3,0	3,0	3,0	3,0	
	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	3,9	3,4	3,0	3,0	3,0	3,0	
Temperature range III:		$\tau^0_{Rk,seis,C2}$	[N/mm²]	1,3	1,2	No Pe	No Performance Determined (NPD			
72°C/43°C		τ _{Rk,cr}	[N/mm²]	4,0	3,5	3,0	3,0	3,0	3,0	
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	3,9	3,4	3,0	3,0	3,0	3,0	
		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	1,3	1,2	No Pe	rformance [Determined	I (NPD)	
		C30/37	1		1	1,	04			
Increasing factors for co (only static or quasi-stat		C40/50		1,08						
Ψc		C50/60				1,	10			
Splitting failure										
Edge distance		C _{cr,sp}	[mm]		1,0 ⋅ h _{ef} ≤	≤2·h _{ef} (2	$(5-\frac{h}{h_{ef}}) \leq$	≤ 2,4 · h _{ef}		
Axial distance		S _{cr,sp}	[mm]			2 C _{αr,sp}				
Installation safety factor	(dry and wet concrete)	γ2	1	1	,2		1,4			
Installation safety factor	(flooded bore hole)	γ2				. 1	,4			

SORMAT Chemical Injection System ITH-EPOXe for concrete

Performances

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

Annex C 2



Anchor size threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Steel failure without lever arm			1	1				1	1	1
	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]		ormance	14	27	42	56	72	88
Steel, property class 4.0	V ⁰ _{Rk,s,seis,C2}	[kN]		mined PD)	13	25	No Perf	ormance	Determine	d (NPD
	V _{Rk,s}	[kN]	9	15	21	39	61	88	115	140
Characteristic shear resistance, Steel, property class 5.8	V ⁰ _{Rk,s,seis,C1}	[kN]		ormance	18	34	53	70	91	111
	V ⁰ _{Rk,s,seis,C2}	[kN]		mined PD)	17	31	No Perf	ormance	Determine	d (NPD
	V _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
Characteristic shear resistance, Steel, property class 8.8	V ⁰ _{Rk,s,seis,C1}	[kN]	No Performance Determined		30	55	85	111	145	177
	V ⁰ _{Rk,s,seis,C2}	[kN]		PD)	27	50	No Perf	ormance	Determine	ed (NPD
Characteristic shear resistance,	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	115	140
Stainless steel A4 and HCR, property class 50 (>M24) and 70 (\leq M24)	$V^0_{\text{Rk},s,seis,C1}$	[kN]		ormance mined	26	48	75	98	91	111
broperty class 50 (> $M24$) and 70 ($\leq M24$)	$V^0_{Rk,s,seis,C2}$	[kN]		PD)	24	44	No Perf	ormance	Determine	ed (NPD
Steel failure with lever arm										
	M ⁰ _{Rk,s}	[Nm]	15	30	52	133	260	449	666	900
Characteristic bending moment, Steel, property class 4.6	M ⁰ _{Rk,s,seis,C1}	[Nm]		1			· · ·		1	1
	M ⁰ _{Rk,s,seis,C2}	[Nm]			No Perfe	ormance [Jetermine	a (NPD)		
Characteristic bending moment	M ⁰ _{Rk,s}	[Nm]	19	37	65	166	324	560	833	1123
Characteristic bending moment, Steel, property class 5.8	M ⁰ _{Rk,s,seis,C1}	[Nm]		No Performance Determined (NPD)						
	M ⁰ _{Rk,s,seis,C2}	[Nm]			No Pena	Jimance i	Jetermine	u (NPD)		
	M ⁰ _{Rk,s}	[Nm]	30	60	105	266	519	896	1333	1797
Characteristic bending moment, Steel, property class 8.8	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Performance Determi			ined (NPD)		
	M ⁰ _{Rk,s,seis,C2}	[Nm]							,	
Characteristic bending moment,	M ⁰ _{Rk,s}	[Nm]	26	52	92	232	454	784	832	1125
Stainless steel A4 and HCR, property class 50 (>M24) and 70 (≤ M24)	$M^0_{Rk,s,seis,C1}$	[Nm]	_		No Perfe	ormance [Determine	d (NPD)		
	$M^0_{\rm Rk,s,seis,C2}$	[Nm]						- (
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			
Installation safety factor Concrete edge failure Installation safety factor SORMAT Chemical Injection	γ2	H-EPO	Xe for	concre	te				nex C	



	aracteristic va n-cracked cor								on loa	ds in		
Anchor size reinforcing l	bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure					·	L		1		·		
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	ance in uncracked co	increte 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/mm ²]	14	13	11	10	9,5	8,5	7,5	7,0	6,0
Temperature range II:	dry and wet concrete	τ _{Rk,ucr}	[N/mm ²]	8,5	8,5	8,0	8,0	7,5	7,0	7,0	6,5	6,5
60°Ċ/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/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	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]				_ ≤ 2 · h,	(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				

SORMAT Chemical Injection System ITH-EPOXe for concrete

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

(Design according to TR 029)

Annex C 4



	Characteristic val							ads in	l	
Anchor size reinford	cing bar			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure										
Characteristic tensior	n resistance	N _{Rk,s} =N ⁰ _{Rk,s,seis,C1}	[kN]				$A_{s} \boldsymbol{\cdot} f_{uk}$			
Combined pull-out a	and concrete cone failure									
Characteristic bond re	esistance in cracked concret	e C20/25								
	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	7,5	7,0	6,5	6,0	5,5	5,5	5,5
Temperature range I:	-	$\tau^0_{\text{Rk,seis,C1}}$	[N/mm²]	6,9	6,4	6,2	5,7	5,5	5,5	5,5
40°C/24°C	flooded bore hole	$ au_{\mathrm{Rk,cr}}$	[N/mm²]	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_{\mathrm{Rk,cr}}$	[N/mm²]	4,5	4,0	4,0	3,5	3,5	3,5	3,5
Temperature range II		$\tau^0_{Rk,seis,C1}$	[N/mm²]	4,1	3,7	3,8	3,3	3,5	3,5	3,5
60°C/43°C	flooded bore hole	$ au_{\mathrm{Rk,cr}}$	[N/mm²]	4,5	4,0	4,0	3,5	3,5	3,5	3,0
	hooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm²]	4,1	3,7	3,8	3,3	3,5	3,5	3,0
	de condition concrete	$\tau_{\rm Rk,cr}$	[N/mm²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
Temperature range II	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm²]	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/mm²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
	hooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
		C30/37					1,04			
Increasing factors for (only static or quasi-s		C40/50					1,08			
Ψc		C50/60					1,10			
Splitting failure										
Edge distance		C _{cr,sp}	[mm]		1,0 · h	_{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 fact	tor (dry and wet concrete)	γ2			1,2			1	,4	
Installation safety fact	tor (flooded bore hole)	γ2					1,4			
SORMAT Che	mical Injection Sys	tem ITH-EPO	Ke for co	ncrete						

Performances

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

Annex C 5



Table C6:Characteristand non-crast										racked	k
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			1					1		II	
	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,	,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 _{Rk,s,seis,C1}	[Nm]			No F	Performar	nce Dete	rmined (1	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				
SORMAT Chemical Injectio	n System I	IH-EPC	JXe fo	r conc	rete				Δnn	ex C 6	5
Characteristic values of resistance to concrete, (Design according to TR (ads in c	racked a	and non	-crackec	l		,		-



			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
ice,	N _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
nce,	N _{Rk,s}	[kN]	18	29	42	78	122	176	230	280
nce,						-				
	N _{Rk,s}	[kN]	29	46	67	125	196	282	368	449
rce, 70 (≤ M24)	N _{Rk,s}	[kN]	26	41	59	110	171	247	230	281
crete failure										
e in non-cracked concrete	e C20/25									
dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	15	15	15	14	13	12	12	12
flooded bore hole	$\tau_{Rk,ucr}$	[N/mm ²]	15	14	13	10	9,5	8,5	7,5	7,0
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
flooded bore hole	τ _{Rk,ucr}	[N/mm ²]	9,5	9,5	9,0	8,5	7,5	7,0	6,5	6,0
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	$\tau_{Rk,ucr}$	[N/mm ²]	8,5	8,5	8,0	7,5	7,0	6,0	5,5	5,5
	C30/37				I	1,	04			
9	C40/50					1,4	08			
	C50/60					1,	10			
2.3	k ₈	[-]				10),1			
		•								
2.1	k _{ucr}	[-]				10),1			
	C _{cr.N}	[mm]				1,5	h _{ef}			
	S _{cr,N}	[mm]				3,0	h _{ef}			
	C _{cr,sp}	[mm]		1	,0 ⋅ h _{ef} ≤	$2 \cdot h_{ef} (2,$	$5 - \frac{h}{h_{ef}}$	≤ 2,4 · h _e	əf	
	S _{cr,sp}	[mm]				2 c	cr,sp			
and wet concrete)	γ2	I		1	,2			1	,4	
led bore hole)	γ2					1	,4			
	crete failure e in non-cracked concrete dry and wet concrete flooded bore hole dry and wet concrete flooded bore hole dry and wet concrete flooded bore hole e 2.2.3	70 (\leq M24) N _{Rk,s} 70 (\leq M24) N _{Rk,s} crete failure r e in non-cracked concrete C20/25 dry and wet concrete dry and wet concrete $\tau_{Rk,ucr}$ flooded bore hole $\tau_{Rk,ucr}$ dry and wet concrete $\tau_{Rk,ucr}$ flooded bore hole $\tau_{Rk,ucr}$ dry and wet concrete $\tau_{Rk,ucr}$ flooded bore hole $\tau_{Rk,ucr}$ 620/37 C30/37 620/60 C50/60 2.3.1 Kucr .3.1 Kucr .3.1 Cor,N Sor,N Sor,Sp and wet concrete) γ_2	NR,s[kN]70 (\leq M24)NR,s[kN]crete failureIN/R,s[kN]crete failure $\tau_{Rk,uar}$ [N/mm²]dry and wet concrete $\tau_{Rk,uar}$ [N/mm²]flooded bore hole $\tau_{Rk,uar}$ [N/mm²]dry and wet concrete $\tau_{Rk,uar}$ [N/mm²]flooded bore hole $\tau_{Rk,uar}$ [N/mm²]dry and wet concrete $\tau_{Rk,uar}$ [N/mm²]flooded bore hole $\tau_{Rk,uar}$ [N/mm²]fl	$\begin{array}{c c c c c c } & N_{\text{Fk},s} & [\text{kN}] & 26 \\ \hline 70 (\leq M24) & & & & & & & \\ \hline 70 (\leq M24) & & & & & & & \\ \hline 70 (\leq M24) & & & & & & \\ \hline 70 (\leq M24) & & & & & & \\ \hline 70 (\leq M24) & & & & & & \\ \hline 70 (\leq M24) & & & & & \\ \hline 70 (\leq M24) & & & & & \\ \hline 70 (\leq M24) & & & & & \\ \hline 70 (\leq M24) & & & & & \\ \hline 71 (11000000000000000000000000000000000$	NRK,S [kN] 26 41 70 (\leq M24) NRK,S [kN] 26 41 Crete failure e in non-cracked concrete C20/25 dry and wet concrete $\tau_{RK,ucr}$ [N/mm²] 15 15 flooded bore hole $\tau_{RK,ucr}$ [N/mm²] 9,5 9,5 flooded bore hole $\tau_{RK,ucr}$ [N/mm²] 9,5 9,5 flooded bore hole $\tau_{RK,ucr}$ [N/mm²] 8,5 8,5 soloade $\tau_{RK,ucr}$ [N/mm²] 8,5 8,5 slass [-]	NRK,S [kN] 26 41 59 70 (\leq M24) Figure [kN] 26 41 59 crete failure crete failure [k,uar [N/mm²] 15 15 15 dry and wet concrete $\tau_{Fik,uar}$ [N/mm²] 15 14 13 dry and wet concrete $\tau_{Fik,uar}$ [N/mm²] 9,5 9,5 9,0 flooded bore hole $\tau_{Fik,uar}$ [N/mm²] 8,5 8,5 8,0 .2.3 Ka [-]	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c } N_{\text{ls},\text{s}} & [\text{kN}] & 26 & 41 & 59 & 110 & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 171 & 247 & 230 \\ \hline 70 (\leq M24) & 171 & 171 & 247 & 230 \\ \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$

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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	l			M 12	M 16	M 20	M24	M27	M30
Steel failure					1	1			
Characteristic tension resis Steel, property class 4.6		N _{Rk,s} = N ⁰ _{Rk,s,seis}	[kN]	34	63	98	141	184	224
Characteristic tension resis Steel, property class 5.8		$N_{Rk,s} = N^0_{Rk,s,seis}$	[kN]	42	78	122	176	230	280
Characteristic tension resis Steel, property class 8.8	stance,	$N_{Rk,s} = N_{Rk,s,seis}^{0}$	[kN]	67	125	196	282	368	44
Characteristic tension resis Stainless steel A4 and HCF property class 50 (>M24) a	R,	$N_{\text{Rk},s} = N^0_{\text{Rk},s,seis}$	[kN]	59	110	171	247	230	28 [.]
Combined pull-out and co	oncrete failure								
Characteristic bond resista	nce in cracked concrete C2	20/25							
		$ au_{Rk,cr}$	[N/mm ²]	7,5	6,5	6,0	5,5	5,5	5,5
	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	7,1	6,2	5,7	5,5	5,5	5,5
Temperature range I:		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	2,4	2,2	No Perf	ormance l	Determine	d (NP
40°C/24°C		$\tau_{\rm Rk, cr}$	[N/mm ²]	7,5	6,0	5,0	4,5	4,0	4,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	7,1	5,8	4,8	4,5	4,0	4,(
		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	2,4	2,1	No Perf	ormance l	Determine	d (NP
		$\tau_{\rm Rk,cr}$	[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5
	dry and wet concrete	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	4,3	3,8	3,4	3,5	3,5	3,5
Temperature range II:		$\tau^{0}_{Rk,seis,C2}$	[N/mm ²]	1,4	1,4	No Perf	ormance I	Determine	d (NP
60°C/43°C		τ _{Rk,cr}	[N/mm ²]	4,5	4,0	3,5	3,5	3,5	3,5
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	4,3	3,8	3,4	3,5	3,5	3,5
		$\tau^0_{Rk,seis,C2}$	[N/mm ²]	1,4	1,4	No Perf	ormance I	Determine	d (NP
		τ _{Rk,cr}	[N/mm ²]	4,0	3,5	3,0	3,0	3,0	3,
	dry and wet concrete	τ ⁰ _{Rk,seis,C1}	[N/mm ²]	3.9	3,4	3.0	3.0	3.0	3.0
Temperature range III:	,	τ ⁰ _{Rk,seis,C2}	[N/mm ²]	1,3	1,2	No Perf	· · ·	Determine	<i>,</i>
72°C/43°C		τ _{Rk,cr}	[N/mm ²]	4,0	3,5	3,0	3,0	3,0	3,0
	flooded bore hole	$\tau^0_{\text{Rk,seis,C1}}$	[N/mm ²]	3,9	3,4	3.0	3.0	3.0	3.0
		τ ⁰ _{Rk,seis,C2}	[N/mm ²]	1,3	1,2	,	· ·	Determine	· · ·
noragoing factors for cons	roto	C30/37	[]	.,.	-,		04		- (
ncreasing factors for conci only static or quasi-static a		C40/50					08		
Ψc	,	C50/60					10		
Factor according to CEN/TS 1992-4-5 Section	6 3 3 3	k ₈	[-]			,	,2		
Concrete cone failure	0.2.2.0								
Factor according to				1					
CEN/TS 1992-4-5 Section	6.2.3.1	k _{cr}	[-]			7	,2		
Edge distance		C _{cr,N}	[mm]				5 h _{ef}		
Axial distance		S _{cr,N}	[mm]			3,0) h _{ef}		
Splitting failure		- 1		1					
Edge distance		C _{cr,sp}	[mm]		1,0 · h _{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 (dr		γ ₂		1	,2		1	,4	
Installation safety factor (flo	ooded bore hole)	γ2				1	,4		
SORMAT Chemica	al Injection System	n ITH-EPOXe fo	or concre	te			_	_	
Performances Characteristic values or (Design according to C	f resistance for threaded		n loads in cr	acked co	ncrete		An	nex C	8



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 Perfe	ormance	14	27	42	56	72	88
	$V^0_{\ Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	13	25	No Per	rformance	Determined	d (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]	No Perfe		18	34	53	70	91	11
	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	17	31	No Per	rformance	Determined	d (NPD
Obevertavistis ab sev vesistavas	V _{Rk,s}	[kN]	15	23	34	63	98	141	184	224
Characteristic shear resistance, Steel, property class 8.8	$V^0_{Rk,s,seis,C1}$	[kN]	No Perfe		30	55	85	111	145	17
	$V^0_{Rk,s,seis,C2}$	[kN]	Determin	ed (NPD)	27	50	No Per	rformance	Determined	d (NPD
Characteristic shear resistance,	V _{Rk,s}	[kN]	13	20	30	55	86	124	115	14
Stainless steel A4 and HCR, property class 50 (>M24) and 70 (\leq M24)	V ⁰ _{Rk,s,seis,C1}	[kN]		ormance	26	48	75	98	91	11
	V ⁰ _{Rk,s,seis,C2}	[kN]	Determin	ed (NPD)	24	44	No Per	formance	Determined	d (NPD
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k ₂					0	,8			
Steel failure with lever arm										
	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	Dotormino			
	M ⁰ _{Rk,s,seis,C2}	[Nm]			NO F EI		Jetenninet	u (INF D)		
	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]								
Characteristic bending moment,	M ⁰ _{Rk,s}	[Nm]	30	60	105	266	519	896	1333	179
Steel, property class 8.8	M ⁰ _{Rk,s,seis,C1}	[Nm]			No Per	formance I	Determined	d (NPD)		
	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 I	Determined	d (NPD)		
	$M^0_{\rm Rk,s,seis,C2}$	[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]				l _t = min(h	_{ef} ; 8 d _{nom})			
Outside diameter of anchor	d _{nom}	[mm]	8	10	12	16	20	24	27	30
Installation safety factor	γ ₂	1		II		1	,0			1
SORMAT Chemical Injection	n System	ITH-I	EPOXe	for con	crete					
								_	nnex C	-

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 reinforc	ing bar				Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure					•	•			•	•	•	•	
Characteristic tension	resistar	nce	N _{Rk,s}	[kN]					$A_{s}\boldsymbol{\cdot}f_{uk}$				
Combined pull-out a	nd con	crete failure	•										
Characteristic bond re	esistance	e in non-cracked concre	te C20/25	5									
Temperature range I:		dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm ²]	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	l:	dry and wet concrete	τ _{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	$\tau_{Rk,ucr}$	[N/mm ²]	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 ψ_{c}	concrete	9	C40/50						1,08				
			C50/60						1,10				
Factor according to CEN/TS 1992-4-5 Sec	ction 6.2	2.2.3	k ₈	[-]					10,1				
Concrete cone failur	e												
Factor according to CEN/TS 1992-4-5 Sec	ction 6.2	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 _{ef}				
Splitting failure													
Edge distance			C _{cr,sp}	[mm]			1,0 · h _€	_{ef} ≤2·h _e	ef (2,5	<u>h</u> h _{ef})≤2	,4 ⋅ h _{ef}		
Axial distance			S _{cr,sp}	[mm]					2 c _{cr,sp}				
Installation safety facto	or (dry a	and wet concrete)	γ2				1,2				1	,4	
Installation safety facto	or (flood	led bore hole)	γ2						1,4				
Performances	ies of re	Injection Syster esistance for rebar ur						te			Anne	x C 1(D



	aracteristic valu ncrete (Design a							ds in (cracke	∍d
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	d concrete failure									
Characteristic bond resis	stance in cracked concre	te 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
		τ _{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°Ċ/43°C		$\tau_{\rm Rk,cr}$	[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
		$\tau_{\rm Rk,cr}$	[N/mm ²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
Temperature range III:	dry and wet concrete	$\tau^0_{Rk,seis,C1}$	[N/mm ²]	3,7	3,2	3,3	2,9	3,0	3,0	3,0
72°C/43°C		$\tau_{\rm Rk,cr}$	[N/mm ²]	4,0	3,5	3,5	3,0	3,0	3,0	3,0
	flooded bore hole	$\tau^0_{Rk,seis,C1}$	[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-station Ψ_{c}	ic actions)	C40/50					1,08			
Factor according to		C50/60					1,10			
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 _{or}	[-]				7,2			
Edge distance		C _{cr,N}	[mm]				1,5 h _{et}			
Axial distance		S _{cr,N}	[mm]				3,0 h _{et}			
Splitting failure										
Edge distance		C _{cr,sp}	[mm]		1,0 ·	h _{ef} ≤2 ⋅ h	$h_{ef}\left(2,5-\frac{1}{h}\right)$	<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)	γ ₂					1,4			
Performances Characteristic values	ical Injection Sys	ar under tension la						Ann	ex C 1	1



Table C12: Characteristic value 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			1	1	1	I	1	I	1		
	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	44 ∙ 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 ⁰ _{Rk,s}	[Nm]				1.:	2 ∙ W _{el} ∙	f _{uk}			
Characteristic bending moment	$M^0_{Rk,s,seis,C1}$	[Nm]			No Pe	erformar	nce 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	γ ₂						1,0				
Concrete edge failure											
Effective length of anchor	It	[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				

SORMAT	Chemical	Injection	System	ITH-EPOXe	for concrete
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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) Annex C 12



Anchor size threa	ded rod		M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked cond	rete C20/25	under static and o	quasi-statio	c action			1	I	•	•
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]	0,011	0,013	0,015	0,020	0,024	0,029	0,032	0,035
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	0,140
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/mm²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Temperature range III:	δ_{N0} -factor	[mm/(N/mm ²)]	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/mm²)]	0,050	0,060	0,070	0,091	0,111	0,131	0,146	0,16
Cracked concrete	C20/25 und	er static, quasi-sta	atic and sei	ismic C	l 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	$\delta_{N_\infty}\text{-factor}$	[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	$\delta_{N\infty}$ -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	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm²)]			0,24	0,24	0,24	0,24	0,24	0,24
Cracked concrete	C20/25 und	er seismic C2 acti	on							
Temperature range I:	$\delta_{N,seis(DLS)}$	[mm/(N/mm ²)]			0,03	0,05				
40°C/24°C	$\delta_{\text{N,seis}(\text{ULS})}$	[mm/(N/mm ²)]			0,06	0,09				
Temperature range II:	$\delta_{\text{N,seis}(\text{DLS})}$	[mm/(N/mm ²)]		ormance mined	0,03	0,05	No Porf	ormance l	Dotormino	
60°C/43°C	$\delta_{N,seis(ULS)}$	[mm/(N/mm ²)]		PD)	0,06	0,09		onnunoe i	Jotominio	
			(/						
Temperature range III:	$\delta_{N,seis(\text{DLS})}$	[mm/(N/mm ²)]		- /	0,03	0,05				
Temperature range III: 72°C/43°C ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	$\begin{array}{ c c c c }\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displacement \\ \cdot \ \tau; \\\hline \end{array}$	[mm/(N/mm ²)]			0,03 0,06	0,05 0,09				
¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	$\begin{array}{ c c c c }\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displacement \\ \cdot \ \tau; \\ \cdot \ \tau; \\\hline \end{array}$	[mm/(N/mm ²)]			0,06	0,09				
$72^{\circ}C/43^{\circ}C$ 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 c }\hline \delta_{N,seis(DLS)} \\\hline \delta_{N,seis(ULS)} \\\hline e \ displacement \\ \cdot \ \tau; \\\hline \cdot \ \tau; \\\hline splacement \\\hline \end{array} $	[mm/(N/mm ²)]			0,06	0,09	M 20	M24	M 27	M 30
$72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size threa	$\begin{array}{ c c c c c }\hline\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displacement \\ \cdot \ \tau; \\\hline \cdot \ \tau; \\\hline e \ splacement \\\hline ded \ rod \\\hline \end{array}$	[mm/(N/mm ²)]	nr load ¹⁾ (1	thread M 10	0,06 ed rod M 12	0,09) M 16			M 27	M 30
$72^{\circ}C/43^{\circ}C^{\circ}$ 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 a	$\begin{array}{ c c c c c }\hline\hline & \delta_{N,seis(DLS)} \\\hline & \delta_{N,seis(ULS)} \\\hline e \ displacement \\ \cdot \ \tau; \\\hline \cdot \ \tau; \\\hline e \ splacement \\\hline ded \ rod \\\hline \end{array}$	[mm/(N/mm ²)] nt	nr load ¹⁾ (1	thread M 10	0,06 ed rod M 12	0,09) M 16			M 27	M 30
$72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C14: Di Anchor size threa Non-cracked and All temperature		[mm/(N/mm²)] nt ents under shea hcrete C20/25 under [mm/(kN)]	nr Ioad ¹⁾ (1 M 8 er static, qu	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s	0,09) M 16 seismic	C1 act	ion		0,03
$72^{\circ}C/43^{\circ}C$ 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 All temperature ranges	$\begin{tabular}{ c c c c }\hline\hline &\delta_{N,seis(DLS)} \\\hline &\delta_{N,seis(ULS)} \\\hline &e displacement \\\hline &\cdot \tau; \\\hline &\cdot \tau; \\\hline &\cdot \tau; \\\hline &splacement \\\hline &splacement \\\hline &ded rod \\\hline &cracked corr \\\hline &\delta_{Vo}\mbox{-}factor \\\hline &\delta_{Vo}\mbox{-}factor \\\hline &\delta_{Vo}\mbox{-}factor \\\hline \end{tabular}$	[mm/(N/mm ²)] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)]	ar load¹⁾ (1 M 8 er static, qu 0,06 0,09	thread M 10 Jasi-stat	0,06 ed rod M 12 ic and s 0,05	0,09) M 16 seismic 0,04	C1 act	i on 0,03	0,03	0,03
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 All temperature ranges Cracked concrete	$ \begin{array}{c c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \hline e \ displacement \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \\ \hline splacement \\ \hline ded \ rod \\ \hline \\ cracked \ cor \\ \hline \\ \delta_{Vo} \mbox{-}factor \\ \hline \\ \hline \\ C20/25 \ und \\ \hline \\ \hline \\ \hline \end{array} $	[mm/(N/mm ²)] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)] er seismic C2 acti	er static, qu 0,06 0,09 0n	thread M 10 Jasi-stat	0,06 ed rod M 12 tic and s 0,05 0,08	0,09) M 16 seismic 0,04 0,06	C1 act	i on 0,03	0,03	
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 All temperature ranges Cracked concrete All temperature	$\begin{tabular}{ c c c c }\hline\hline &\delta_{N,seis(DLS)} \\\hline &\delta_{N,seis(ULS)} \\\hline &e displacement \\\hline &\cdot \tau; \\\hline &\cdot \tau; \\\hline &\cdot \tau; \\\hline &splacement \\\hline &splacement \\\hline &ded rod \\\hline &cracked corr \\\hline &\delta_{Vo}\mbox{-}factor \\\hline &\delta_{Vo}\mbox{-}factor \\\hline &\delta_{Vo}\mbox{-}factor \\\hline \end{tabular}$	[mm/(N/mm ²)] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)]	Ir load ¹⁾ (1 M 8 er static, qu 0,06 0,09 on No Perfi Deter	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 ic and s 0,05	0,09) M 16 seismic 0,04	C1 act 0,04 0,06	i on 0,03	0,03	0,03
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 ¹⁾ Calculation of th $\delta_{V0} = \delta_{V\infty}$ -factor $\delta_{V\infty} = \delta_{V\infty}$ -factor	$ \begin{array}{c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \end{array} \\ e \ displacemen \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \end{array} \\ \hline \begin{array}{c} \sigma_{T} \\ \hline \sigma_{T} \hline \hline \sigma_{T} \\ \hline \sigma_{T} \\ \hline \sigma_{T} \\ \hline \sigma_{T} \hline \hline \sigma_{T} \\ \hline \sigma_{T} \hline$	[mm/(N/mm²)] nt ents under shea ncrete C20/25 unde [mm/(kN)] [mm/(kN)] er seismic C2 acti [mm/kN] [mm/kN] nt	nr Ioad ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perf Deter (Ni	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 iic and s 0,05 0,08	0,09) M 16 seismic 0,04 0,06	C1 act 0,04 0,06	ion 0,03 0,05	0,03	0,03
$72^{\circ}C/43^{\circ}C$ ¹⁾ Calculation of th $\delta_{N0} = \delta_{N0}$ -factor Table C14: Di Anchor size thread Non-cracked and d Anchor size thread Non-cracked and d All temperature ranges Cracked concrete All temperature ranges ¹⁾ Calculation of th $\delta_{V0} = \delta_{V0}$ -factor $\delta_{V\infty} = \delta_{V\infty}$ -factor	$ \begin{array}{c} \delta_{N,seis(DLS)} \\ \hline \delta_{N,seis(ULS)} \\ \end{array} \\ e \ displacemen \\ \cdot \ \tau; \\ \cdot \ \tau; \\ \hline \end{array} \\ \hline \begin{array}{c} \sigma_{T} \\ \hline \sigma_{T} \hline \hline \sigma_{T} \\ \hline \sigma_{T} \\ \hline \sigma_{T} \\ \hline \sigma_{T} \hline \hline \sigma_{T} \\ \hline \sigma_{T} \hline$	imm/(N/mm²)] int	nr Ioad ¹⁾ (1 M 8 Pr static, qu 0,06 0,09 on No Perf Deter (Ni	thread M 10 Jasi-stat 0,06 0,08	0,06 ed rod M 12 iic and s 0,05 0,08	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



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 cond	crete C20/	25 under static	and qua	asi-stati	ic actior	้า	1	1			
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	0,037
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	0,149
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,020	0,023	0,028	0,034	0,038	0,043
60°C/43°C	$\delta_{N_{\infty}}$ -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:	δ_{N0} -factor	[mm/(N/mm²)]	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	asi-statio	c and se	eismic C	1 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°C	$\delta_{N_{\infty}}$ -factor	[mm/(N/mm ²)]		-	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	0,070
60°C/43°C	$\delta_{\text{N}_{\infty}}\text{-factor}$	[mm/(N/mm ²)]		-	0,24	0,24	0,24	0,24	0,24	0,24	0,24
Temperature range III:	δ_{N0} -factor	[mm/(N/mm²)]			0,037	0,040	0,043	0,049	0,056	0,063	0,070
72°C/43°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]		-	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 i	· τ; · τ;		hear lo	ad ¹⁾ (r	ebar)						
$\begin{split} \delta_{\text{N0}} &= \delta_{\text{N0}}\text{-factor}\\ \delta_{\text{N\infty}} &= \delta_{\text{N\infty}}\text{-factor} \end{split}$ Table C16: Di	τ; τ; isplacen	nent under s	hear lo Ø 8	øad ¹⁾ (re Ø 10	ebar) Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$\begin{array}{l} \delta_{N0} = \delta_{N0} \text{-factor} \\ \delta_{N\infty} = \delta_{N\infty} \text{-factor} \end{array}$	τ; τ; isplacen prcing bar	nent under s	Ø 8	Ø 10	Ø 12	~ · ·	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$ Table C16: Di Anchor size reinfo For concrete C20/2	τ; τ; prcing bar 25 under s δ _{vo} -factor	nent under s static, quasi-st [mm/(kN)]	Ø 8	Ø 10	Ø 12	~ · ·	Ø 16	Ø 20 0,04	Ø 25 0,03	Ø 28 0,03	Ø 32 0,03
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$	τ; τ; isplacen prcing bar 25 under s $δ_{V0}$ -factor $δ_{V\infty}$ -factor	nent under s static, quasi-st [mm/(kN)] [mm/(kN)]	Ø 8 atic and	Ø 10 seismid	Ø 12 c C1 act	ion			<u> </u>	1	
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$ Table C16: Di Anchor size reinfo For concrete C20/2	τ; τ; isplacen prcing bar 25 under s δ_{Vo} -factor $\delta_{V\infty}$ -factor le displacen V;	nent under s static, quasi-st [mm/(kN)] [mm/(kN)]	Ø 8 atic and 0,06	Ø 10 seismic 0,05	Ø 12 c C1 act 0,05	i on 0,04	0,04	0,04	0,03	0,03	0,03