Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-09/0077 of 22 November 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	TOX Chemical Capsule Anchor Contact TVA
Product family to which the construction product belongs	Bonded anchor for use in non-cracked concrete
Manufacturer	TOX-Dübel-Technik GmbH Brunnenstraße 31 72505 Krauchenwies-Ablach DEUTSCHLAND
Manufacturing plant	TOX Werk 1, NIEDERLANDE
This European Technical Assessment contains	12 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	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 TOX Chemical Capsule Anchor Contact TVA is a bonded anchor consisting of a glass capsule TOX Contact TVA-M and a threaded anchor rod with hexagon nut and washer. The anchor rod (including nut and washer) is made of zinc-plated steel, hot-dip galvanised steel, stainless steel or made of high corrosion resistant steel.

The glass capsule is placed into the hole and the anchor rod is driven by machine with simultaneous hammering and turning. The anchor rod is anchored via the bond between anchor rod, chemical mortar and concrete.

The product description is given in Annex A.

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

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

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

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi static loads, Displacements	See Annex C 1 and C 2

3.2 Safety in case of fire (BWR 2)

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

3.3 Hygiene, health and the environment (BWR 3)

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

3.4 Safety in use (BWR 4)

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

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC]

The system to be applied is: 1

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

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

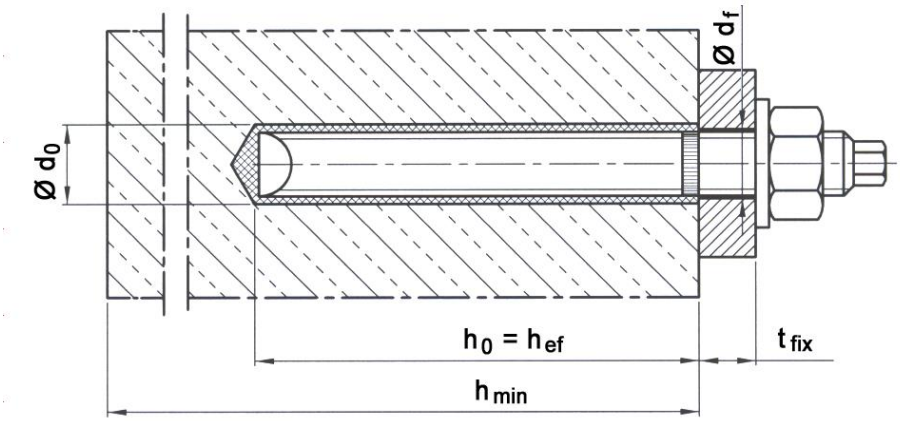
Issued in Berlin on 22 November 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

Installed condition



Product

Glass Capsule TOX Contact TVA-M

TOX Chemical Capsule Anchor Contact TVA	Annex A 1
Product description Installed condition Glass Capsule	

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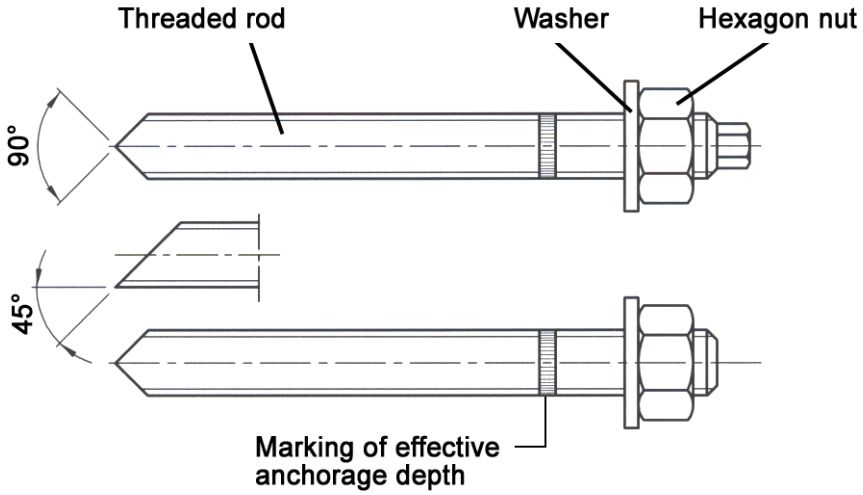
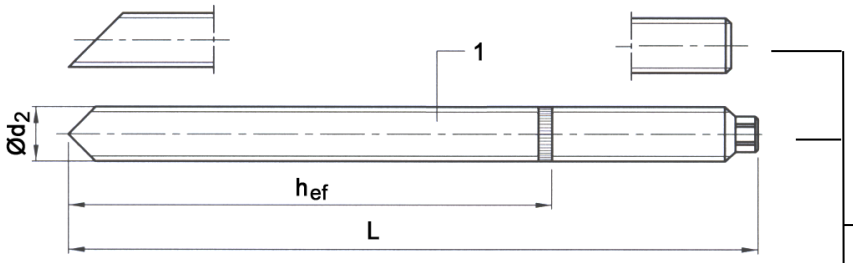
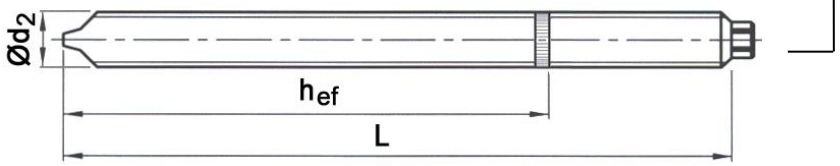
Threaded rod Stix TV-A



Machined steel



Cold formed



Marking: e.g.

- ◇H M12
- ◇ Identifying mark of manufacturing plant
  additional marking of lengths for anchor size M12
- H marking of length
- M12 Size of thread
- ◇ M12-8
- -8 additional marking of steel grade 8.8
- ◇ M12 A4
- A4 additional marking of stainless steel A4
- ◇ M12 HCR
- HCR additional marking of high corrosion resistant steel HCR

Marking of length	E	F	G	H	I	J	K
Length of anchor min ≥	88,9	101,6	114,3	127,0	139,7	152,4	165,1
Length of anchor max <	101,6	114,3	127,0	139,7	152,4	165,1	177,8

Marking of length	L	M	N	O	P	Q	R
Length of anchor min ≥	177,8	190,5	203,2	215,9	228,6	241,3	254,0
Length of anchor max <	190,5	203,2	215,9	228,6	241,3	254,0	279,4

Marking of length	S	T	U	V	W	X	Y	Z
Length of anchor min ≥	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2
Length of anchor max <	304,8	330,2	355,6	381,0	406,4	431,8	457,2	483,0

TOX Chemical Capsule Anchor Contact TVA

Product description
Threaded rod Stix TV-A

Annex A 2

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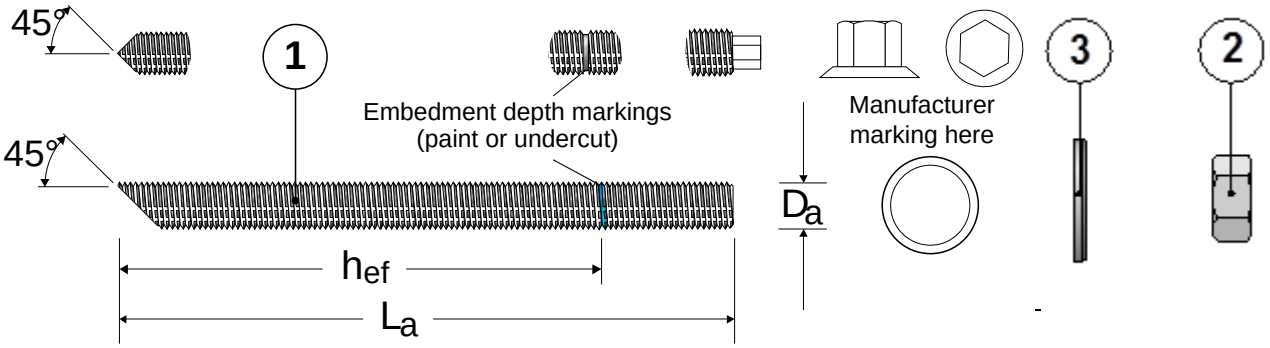
Threaded rod Stix TVA-Z-G



Marking anchor rod Stix TVA-Z-G **z.B. B16A**

Manufacturer	B			
Size	8, 10, 12, 16, 20, 24			
Material				
Galvanised property class 5.8	A	Stainless steel 1.4401, property class 70	C
Galvanised property class 8.8	B	Stainless steel 1.4404, property class 70	K
Hot dipped galvanised property class 5.8	H	Stainless steel 1.4529, property class 70	E
Hot dipped galvanised property class 8.8	I	Stainless steel 1.4565, property class 70	R
		Stainless steel 1.4571, property class 70	D
		Stainless steel 1.4401, property class 80	M
		Stainless steel 1.4404, property class 80	P
		Stainless steel 1.4571, property class 80	O

Table A1: Dimensions

	Anchor size		M8	M10	M12	M16	M20	M24
1	Threaded rod Stix V-A and Stix TVA-Z-G	∅ d_2 / D_a	M8	M10	M12	M16	M20	M24
		L / L_a [1] ≥	90	100	120	140	190	235
		h_{ef}	80	90	110	125	170	210
2	Hexagon nut	SW	13	17	19	24	30	36
4	Glass capsule	D_P	9	11	13	17	22	24
		L_P	80	80	95	95	175	210

[1] Other lengths on demand

Dimensions in mm

Table A2: Materials Glas Capsule

Part	Designation	Material
4	Glaspatrone	Glasampulle, Quarzsand, Harz, Härter

TOX Chemical Capsule Anchor Contact TVA

Product description
Threaded rod Stix TVA-Z-G, Dimensions,
Materials Glass Capsule

Annex A 3

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Table A3: Materials Threaded rod Stix V-A

Part	Designation	Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999	Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 2009
1	Threaded rod	Steel, Property class 5.8, 8.8, acc. to EN ISO 898-1:2013	Steel, Property class 5.8, 8.8, acc. to EN ISO 898-1:2013
2	Hexagon nut according to DIN 934	Property class 8 acc. to EN ISO 898-2:2012, galvanised	Property class 8 acc. to EN ISO 898-2:2012, hot-dip galvanised
3	Washer	Steel, galvanised	Steel, hot-dip galvanised

Part	Designation	Stainless steel A4	High corrosion resistant steel (HCR)
1	Threaded rod	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4578, 1.4362, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009	High corrosion resistant steel, 1.4529, 1.4565, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009
2	Hexagon nut according to DIN 934	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4362, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009	High corrosion resistant steel, 1.4529, 1.4565, EN 10088-1:2014, Property class 70, acc. to EN ISO 3506-1:2009
3	Washer	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4362, EN 10088-1:2014	High corrosion resistant steel, 1.4529, 1.4565, EN 10088-1:2014

Table A4: Materials Threaded rod Stix TVA-Z-G

<table>
<tr><th>Part</th><th>Designation</th><th colspan="4">Material</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Threaded rod</td><td colspan="2">Carbon steel
property class 5.8 or 8.8
EN ISO 898-1:2013</td><td rowspan="2">Stainless steel
1.4401, 1.4404 or 1.4571
property class A4-70 or A4-80
EN ISO 3506-1:2009
A5 > 8% fracture elongation</td><td rowspan="2">High Corrosion resistant steel
1.4529 or 1.4565
property class 70
EN ISO 3506-1:2009
A5 > 8% fracture elongation</td></tr>
<tr><td>Galvanised steel
≥ 5µm acc. to
EN ISO 4042:1999
A5 > 8% fracture elongation</td><td>Hot dip galvanised steel EN ISO 10684:2004+AC:2009
A5 > 8% fracture elongation</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Hexagon nut</td><td colspan="2">Carbon steel
property class 5 to 8
EN ISO 898-2:2012</td><td rowspan="2">Stainless steel
1.4401, 1.4404 or 1.4571
property class A4-70 or A4-80
EN ISO 3506-2:2009</td><td rowspan="2">High Corrosion resistant steel 1.4529 or 1.4565
property class 70
EN ISO 3506-2:2009</td></tr>
<tr><td>Galvanised steel
≥ 5µm acc. to
EN ISO 4042:1999</td><td>Hot dip galvanised steel
10684:2004+AC:2009</td></tr>
<tr><td colspan="4">EN ISO 4032:2012 oder EN ISO 4034:2012</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Washer</td><td colspan="2">Carbon steel</td><td rowspan="2">Stainless steel
1.4401, 1.4404 or 1.4571</td><td rowspan="2">High Corrosion resistant steel
1.4529 or 1.4565</td></tr>
<tr><td>Galvanised steel
≥ 5µm acc. to
EN ISO 4042:1999</td><td>Hot dip galvanised steel
10684:2004+AC:2009</td></tr>
<tr><td colspan="4">EN ISO 887:2006 oder EN ISO 7089:2000 bis EN ISO 7094:2000</td></tr>
</table>

TOX Chemical Capsule Anchor Contact TVA

Product description
Materials Threaded rods

Annex A 4

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: all sizes.

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.

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 +80°C (max long term temperature +50 °C and max short term temperature +80 °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:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- 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 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

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Dry or wet concrete: all sizes.
- Hole drilling by hammer drilling.
- cleaning the drill hole:
  removing possibly existing water in the drill hole completely and cleaning the drill hole by at least one blowing operation, by at least 1 x brushing / 1 x blowing / 1 x brushing operation by using the steel brush supplied by the manufacturer; before brushing cleaning the brush and checking whether the brush diameter according to Annex B 2, Table B1 is still sufficient. The steel brush shall produce natural resistance as it enters the anchor hole. If this is not the case a new brush or a brush with a larger diameter must be used.
- the anchor component installation temperature shall be at least +5 °C; during curing of the chemical mortar the temperature of the concrete must not fall below -5 °C.

TOX Chemical Capsule Anchor Contact TVA	Annex B 1
Intended Use Specifications	

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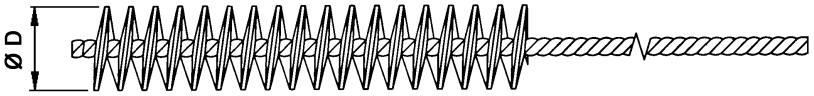
Table B1: Installation parameters, Minimum thickness of concrete, spacing and edge distance

Anchor size			M8	M10	M12	M16	M20	M24
Nominal diameter of drill hole	d_0 =	[mm]	10	12	14	18	25	28
Cutting diameter of drill hole	$d_{cut} \leq$	[mm]	10,5	12,5	14,5	18,5	25,5	28,5
Depth of drill hole	$h_0 \geq$	[mm]	80	90	110	125	170	210
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	22	26
Diameter of steel brush	D ≥	[mm]	11	13	16	20	27	30
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180
Minimum thickness of concrete	$h_{min} \geq$	[mm]	110	120	140	160	220	260
Minimum spacing	$s_{min} \geq$	[mm]	40	45	55	65	85	105
Minimum edge distance	$c_{min} \geq$	[mm]	40	45	55	65	85	105

Steel brush



Installation procedure

drilling | blowing | brushing | blowing | brushing | setting capsule | setting anchor rod | waiting | mounting fixture

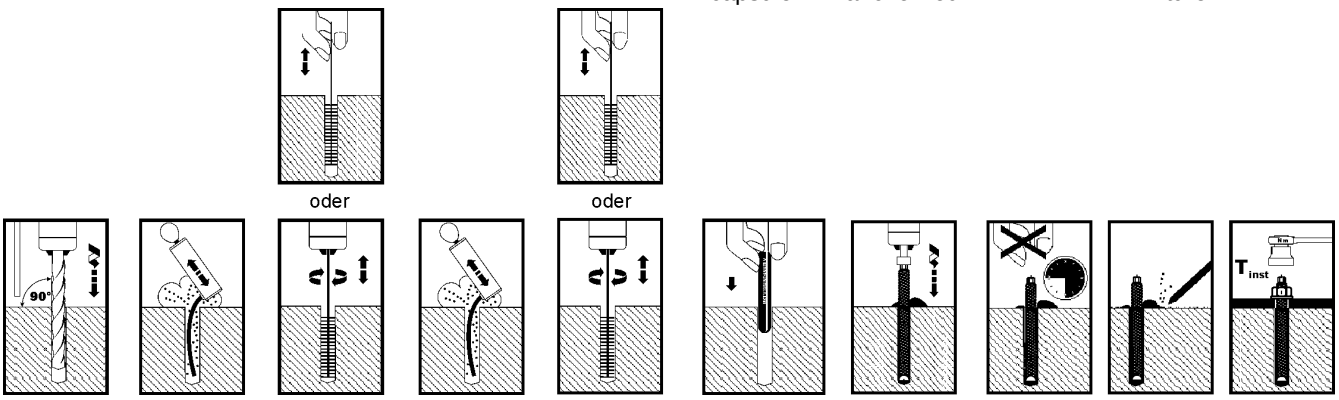


Table B2: Minimum curing time

Temperature [°C] in the drill hole	Minimum curing time dry concrete	dry concrete
≥ + 35 °C	10 min	20 min
≥ + 30 °C	10 min	20 min
≥ + 20 °C	20 min	40 min
≥ + 10 °C	1 h	2 h
≥ + 5 °C	1 h	2 h
≥ 0 °C	5 h	10 h
≥ - 5 °C	5 h	10 h

TOX Chemical Capsule Anchor Contact TVA

Intended Use
Installations parameters, minimum thickness of concrete member, Minimum edge distance and spacing, Minimum curing time

Annex B 2

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Table C1: Design method A Characteristic values for tension loads

Anchor size			M8	M10	M12	M16	M20	M24
Steel failure								
Characteristic resistance Property class **5.8**	$N_{Rk,s}$	[kN]	18	29	42	78	123	177
Characteristic resistance Property class **8.8**	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Characteristic resistance Property class **70**	$N_{Rk,s}$	[kN]	26	40	59	110	172	247
Combined pull-out and concrete failure								
Characteristic resistance in non-cracked concrete C20/25 to C50/60								
Temperature range I	$N^0_{Rk,p}$ [1)]	[kN]	20	30	40	60	90	120
Temperature range II	$N^0_{Rk,p}$ [1)]	[kN]	20	30	40	50	75	90
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					
Effective anchorage depth	h_{ef}	[mm]	80	90	110	125	170	210
Characteristic spacing	$s_{cr,N}$	[mm]	3 h_{ef}					
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}					
Splitting[2)]								
Spacing	$s_{cr,Sp}$	[mm]	3 h_{ef}	2 h_{ef}				
Edge distance	$c_{cr,Sp}$	[mm]	1,5 h_{ef}	1 h_{ef}				
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2					

1) $\tau_{Rk} = N^0_{Rk,p} / (h_{ef} \cdot d_2 \cdot \pi)$, d_2 acc. Table A1

2) For the proof against splitting failure, $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,p}$.

Table C2: Displacements under tension loads

Anchor size			M8	M10	M12	M16	M20	M24
Tension load	N	[kN]	8	12	16	20	30	38
Displacement	δ_{N0}	[mm]	0,1	0,2	0,2	0,2	0,5	0,4
	$\delta_{N\infty}$	[mm]	0,5					

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Table C3: Design method A Characteristic values for shear loads

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Steel failure without lever arm								
Characteristic shear resistance Property class **5.8**	$V_{Rk,s}$	[kN]	9	14	21	39	61	88
Characteristic shear resistance Property class **8.8**	$V_{Rk,s}$	[kN]	15	23	33	63	98	141
Characteristic shear resistance Property class **70**	$V_{Rk,s}$	[kN]	13	20	29	55	86	124
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 Property class **5.8**	$M^0_{Rk,s}$	[Nm]	19	37	65	166	325	561
Characteristic bending moment Property class **8.8**	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898
Characteristic bending moment Property class **70**	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	785
Concrete pryout failure								
Factor k_3 in equation (27) of CEN/TS 1992-4-5 Section 6.3.3 Factor k in equation (5.7) of Technical Report TR 029	$k_{(3)}$	[-]	2,0					
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					
Concrete edge failure								
Effective length of anchor in shear load	l_f	[mm]	80	90	110	125	170	210
Diameter of anchor	d_{nom}	[mm]	10	12	14	18	25	28
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					

Table C4: Displacements under shear loads

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Shear load	V	[kN]	5	8	12	22	35	50
Displacements	δ_{V0}	[mm]	2	3	3	4	5	5
	$\delta_{V\infty}$	[mm]	4	5	5	6	7	7