Einfach. Sicher. Upat

DECLARATION OF PERFORMANCE

DoP 0271

for Upat concrete screw UCS (Mechanical fastener for use in concrete) EN

1. Unique identification code of the product-type: **DoP 0271**

2. Intended use/es: **Post-installed fastening for use in cracked or uncracked concrete, see appendix, especially annexes B1 - B4.**

3. Manufacturer: **Upat Vertriebs GmbH, Bebelstraße 11, 79108 Freiburg im Breisgau, Germany**

4. Authorised representative: **–**

5. System/s of AVCP: **1**

6. European Assessment Document: **EAD 330232-00-0601**
   European Technical Assessment: **ETA-18/0762; 2018-12-12**
   Technical Assessment Body: **DIBt- Deutsches Institut für Bautechnik**
   Notified body/ies: **2873 TU Darmstadt**

7. Declared performance/s:

Mechanical resistance and stability (BWR 1)

Characteristic resistance to tension load (static and quasi-static loading):

Resistance to steel failure: Annex C1	E_S= 210 000 MPa
Resistance to pull-out failure: Annex C1	
Resistance to concrete cone failure: Annex C1	
Robustness: Annex C1	
Minimum edge distance and spacing: Annex B3	
Edge distance to prevent splitting under load: Annex C1	$N^0_{Rk,sp}$=NPD

Characteristic resistance to shear load (static and quasi-static loading):

Resistance to steel failure (shear load): Annex C1
Resistance to pry-out failure: Annex C1
Resistance to concrete edge failure: Annex C1
Displacements under static and quasi-static loading: Annex C5
Durability: Annexes A2, B1

Characteristic resistance and displacements for seismic performance categories C1 and C2:

Resistance to steel failure: Annexes C2, C3
Resistance to pull-out failure: Annexes C2, C3
Fracture elongation: Annex A2
Factor for annular gap: Annexes C2, C3
Displacements: Annex C5

Safety in case of fire (BWR 2)

Reaction to fire: Class (A1)

Resistance to fire:

Fire resistance to steel failure (tension load): Annex C4
Fire resistance to pull-out failure (tension load): Annex C4
Fire resistance to steel failure (shear load): Annex C4

8. Appropriate Technical Documentation and/or Specific Technical Documentation: **–**

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Dr.-Ing. Oliver Geibig, Managing Director Business Units & Engineering

Jürgen Grün, Managing Director Chemistry & Quality

Tumlingen, 2021-01-19

This DoP has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.

The Appendix includes voluntary and complementary information in English language exceeding the (language-neutrally specified) legal requirements.

Specific Part

1 Technical description of the product

The Upat concrete screw UCS is an anchor of sizes 8, 10, 12 and 14 mm made of hardened carbon steel. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

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 to tension load (static and quasi-static loading)	See Annex C 1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1
Displacements (static and quasi-static loading)	See Annex C 5
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 2, C 3 and C 5

3.2 Safety in case of fire (BWR 2)

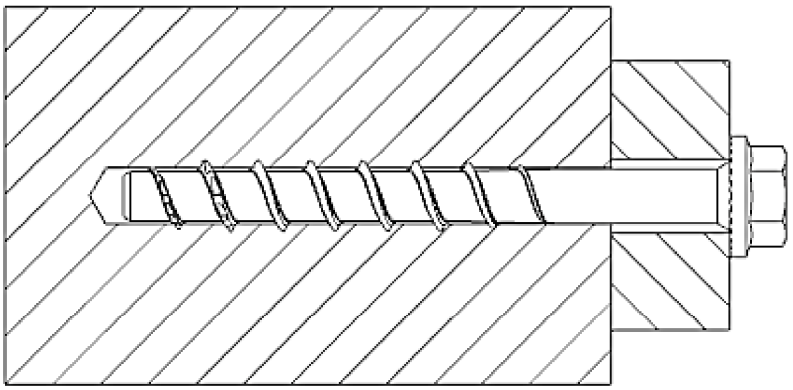
Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 4

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

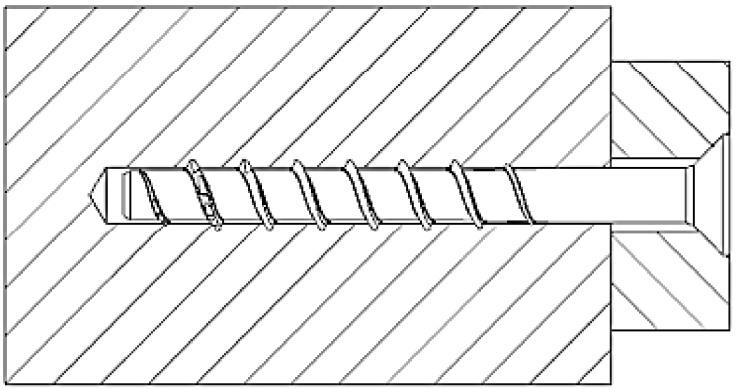
In accordance with European Assessment Document EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

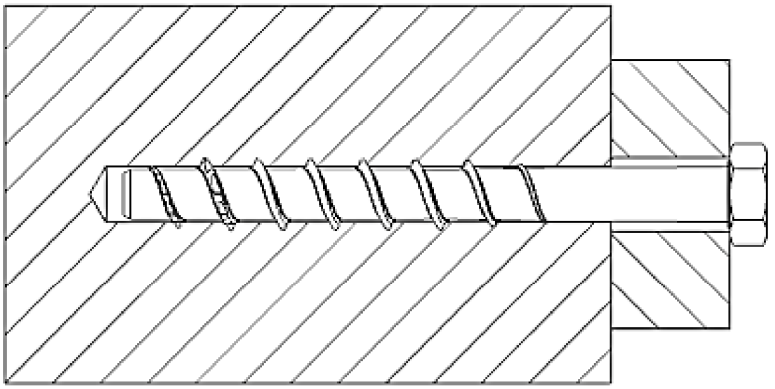
Product in the installed condition



UCS US



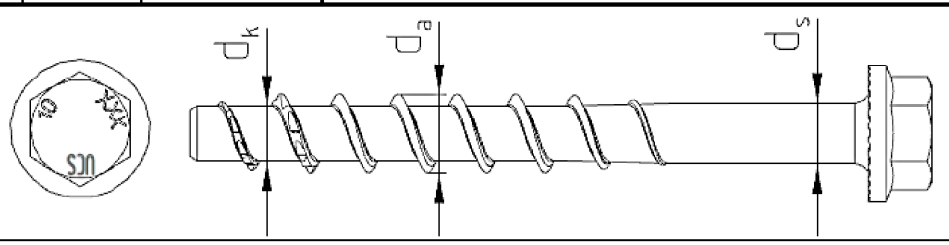
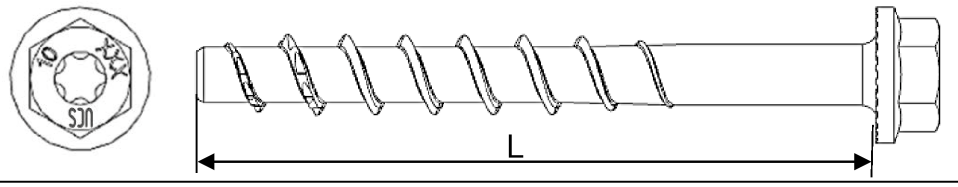
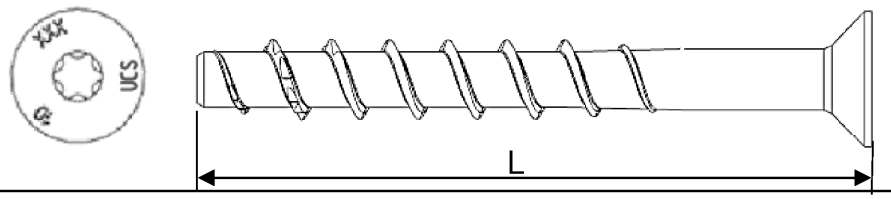
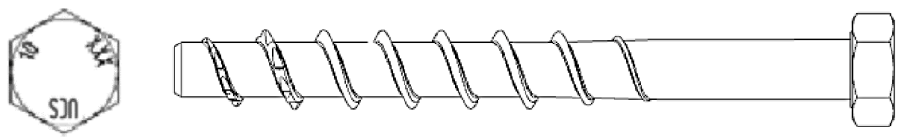
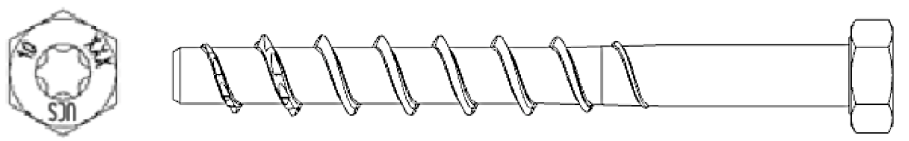
UCS SK



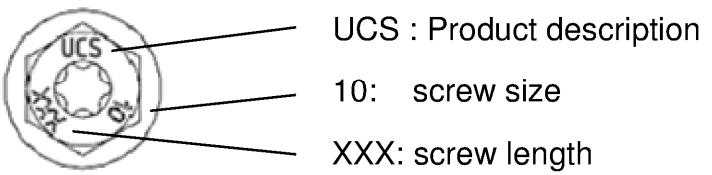
UCS S

Table A1: Material and screw types

Type of screw / size			UCS US / SK / S			
			8	10	12	14
Thread outer diameter	d_a	[mm]	10,3	12,5	14,5	16,6
Core diameter	d_k	[mm]	7,4	9,4	11,3	13,3
Shaft diameter	d_s	[mm]	8,0	9,9	11,7	13,7
Material			Hardened carbon steel; $A_{5\%} \geq 8\%$			
Coating			galvanized			

Hexagon head with formed washer (US)	
Hexagon head with formed washer (US TX)	
Countersunk Head (SK)	
Hexagon Head (S)	
Hexagon Head (S TX)	

Head Marking



UCS : Product description

10: screw size

XXX: screw length

Specifications of intended use

Table B1.1: Anchorages subject to

Size	8		10			12			14		
Nominal embedment depth [mm]	50	65	55	65	85	60	75	100	65	85	115
Static and quasi-static loads in cracked and uncracked concrete	✓										
Fire exposure	✓										
Seismic performance category C1		✓		✓			✓				✓
Seismic performance category C2		✓		✓			✓				✓

Base materials:

- Reinforced and unreinforced normal weight concrete according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013
- Non-cracked or cracked concrete: All sizes and all embedment depths

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.

Design:

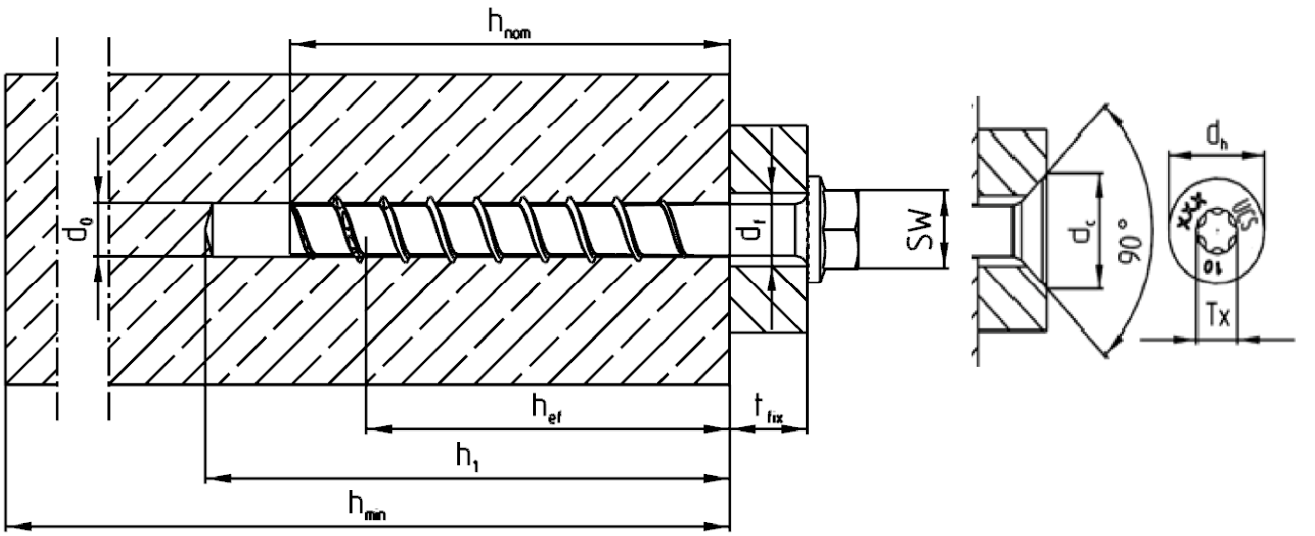
- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the screw is indicated on the design drawings (e.g. position of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

Installation:

- Hammer drilling or diamond drilling or hollow drilling according to Annex B4: All sizes and all embedment depths.
- Screw installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: New hole must be drilled at a minimum distance of twice the depth of the aborted hole or closer, if the hole is filled with a high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- Adjustability according to Annex B3 for: All sizes and all embedment depths.
- Cleaning of drill hole is not necessary when using a hollow drill or:
  - If drilling vertically upwards
  - If drilling vertical downwards and the drill hole depth has been increased. It is recommended to increase the drill depth with additional 3 d_0.
- After correct installation further turning of the screw head should not be possible
- The head of the screw must be fully engaged on the fixture and show no signs of damage.
- For Seismic Performance Category C2 applications: The gap between screw shaft and fixture must be filled with mortar; compressive strength ≥ 50 N/mm² (for example UPM 44 or UPM 55).

Table B2.1: Installation parameters

screw size			UCS 8		UCS 10			UCS 12			UCS 14		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100	65	85	115
Nominal drill hole diameter	d_0	[mm]	8		10			12			14		
Cutting diameter of drill bits	$d_{cut} \leq$	[mm]	8,45		10,45			12,50			14,50		
Cutting diameter of diamond drillers	$d_{cut} \leq$	[mm]	8,10		10,30			12,30			14,30		
Clearance hole diameter	d_f	[mm]	10,6 – 12,0		12,8 – 14,0			14,8 – 16,0			16,9 – 18,0		
Wrench size (US,S)	SW	[mm]	13		15			17			21		
Tx size	Tx	-	40		50			-			-		
Countersunk head diameter	d_h	[mm]	18		21			-			-		
Countersunk diameter in fixture	d_c	[mm]	20		23			-			-		
Drill hole depth	$h_1 \geq$	[mm]	60	75	65	75	95	70	85	110	80	100	130
Drill hole depth (with adjustable setting process)	$h_1 \geq$	[mm]	70	85	75	85	105	80	95	120	90	110	140
Thickness of fixture	$t_{fix} \leq$	[mm]	$L - h_{nom}$										
Length of screw	$L_{min} =$	[mm]	50	65	55	65	85	60	75	100	65	85	115
	$L_{max} =$	[mm]	400	415	405	415	435	410	425	450	415	435	465
Torque impact screw driver	$T_{imp,max}$	[Nm]	600		650								



Upat concrete screw UCS

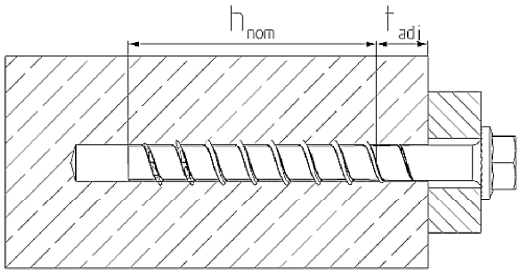
Intended Use
Installation parameters UCS 8 - 14

Annex B 2

Appendix 5 / 12

Adjustment

1)



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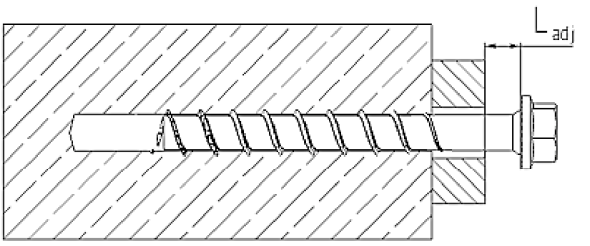

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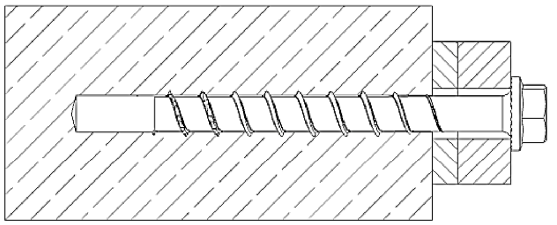
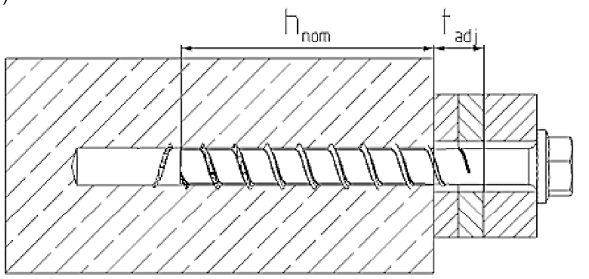


4)

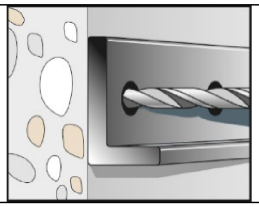


It is permissible to untighten the screw up to two times for adjustment purposes.
Therefor the screw may be untighten to a maximum
of L_{adj} = 20 mm off the surface of the initial fixture.
The total permissible thickness of shims added during the adjustment process is t_{adj} = 10 mm.

Table B3: Minimum thickness of concrete members, minimum spacing and edge distance

Screw size			UCS											
			8		10			12			14			
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100	65	85	115	
Minimum thickness of concrete member	h_{min}	[mm]	100	120	100	120	140	110	130	150	120	140	180	
Minimum spacing	s_{min}	[mm]	35		40			50			60			
Minimum edge distance	c_{min}	[mm]	35		40			50			60			

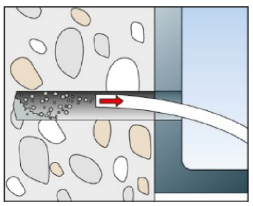
Installation instruction



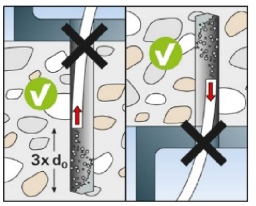
Drill the hole using hammer drill,
hollow drill or diamond core drill.

Drill hole diameter d_0 and
drill hole depth h_1 according to table B2.1

a)



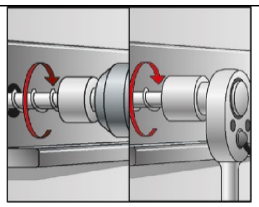
b)



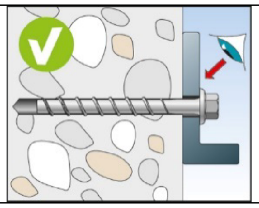
Option a): Clean the drill hole

Option b): Cleaning of drill hole is not necessary when using a hollow drill or a diamond drill or:

- If drilling vertically upwards or
- If drilling vertically downwards and the drill hole depth has been increased. It is recommended to increase the drill hole depth additional 3 times d_0.

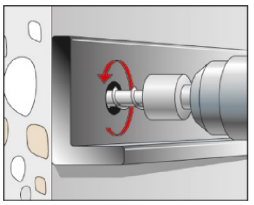


Installation with any torque impact screw driver up to the maximum mentioned torque moment ($T_{imp,max}$ according to table B2.1). Alternatively, all other tools without an indicated torque moment are allowed (e.g. ratchet spanner). The indicated torque moments for impact screw driver are therefore not decisive.

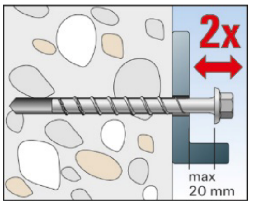


After installation a further turning of the screw must not be possible. The head of the screw must be in contact with the fixture and is not damaged

1.



2.



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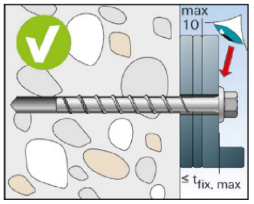
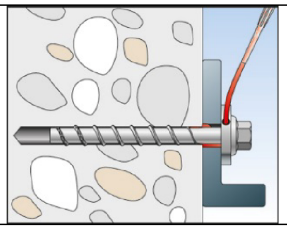


Optional:
It is permissible to adjust the screw twice.
Therefore the screw may be untightened to a maximum of L_{adj} = 20 mm off the surface of the initial fixture. The total permissible thickness of shims added during the adjustment process is t_{adj} = 10 mm.



For seismic performance category C2 applications:
The gap between screw shaft and fixture must be filled with mortar; mortar compressive strength ≥ 50 N/mm² (e. g. UPM 44 or UPM 55). As an aid for filling the gap, the filling disc FFD is recommended.

Table C1: Performance for static and quasi-static action

Screw size				UCS 8		UCS 10			UCS 12				UCS 14		
Nominal embedment depth		h_{nom}	[mm]	50	65	55	65	85	60	75	100		65	85	115
Steel failure for tension load and shear load															
Characteristic resistance		$N_{Rk,s}$	[kN]	35		55			76				103		
Partial factor		γ_{Ms}	[-]	1,4											
Characteristic resistance		$V_{Rk,s}$	[kN]	13,1	19,0	29,4		34,9	31,9		42,7		46,5		61,7
Partial factor		γ_{Ms}	[-]	1,5											
Factor for ductility		k_7	[-]	1,0											
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	51		95			165				269		
Pullout failure															
Charact. resistance in concrete C20/25	cracked	$N_{Rk,p}$	[kN]	6	12	9	12	-[1]	-[1]	-[1]		-[1]	-[1]	-[1]	-[1]
	uncracked	$N_{Rk,p}$	[kN]	-[1]											
Increasing factor concrete	C25/30	ψ_c	[-]	1,12											
	C30/37			1,22											
	C35/45			1,32											
	C40/50			1,41											
	C45/55			1,48											
	C50/60			1,58											
Installation factor		γ_{inst}	[-]	1,0											
Concrete cone failure and splitting failure; Concrete pryout failure															
Effective embedment depth		h_{ef}	[mm]	40	52	43	51	68	47	60	81		50	67	93
Factor for cracked concrete		$k_{cr,N}$	[-]	7,7											
Factor for uncracked concrete		$k_{ucr,N}$	[-]	11,0											
Characteristic edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}											
Characteristic spacing		$s_{cr,N}$	[mm]	3 h_{ef}											
Charact. edge distance for splitting		$c_{cr,sp}$	[mm]	1,5 h_{ef}											
Charact. spacing for splitting		$s_{cr,sp}$	[mm]	3 h_{ef}											
Factor for pryout failure		k_8	[-]	1,0	2,0	1,0	2,0								
Installation factor		γ_{inst}	[-]	1,0											
Concrete edge failure															
Effective length in concrete		l_f	[mm]	50	65	55	65	85	60	75	100		65	85	115
Nominal diameter of screw		d_{nom}	[mm]	8		10			12				14		
Adjustment															
max. thickness of adjustment layers		t_{adj}	[mm]	10											
Max. number of adjustments		n_a	[-]	2											

[1] Pullout failure not decisive.

Table C2: Characteristic values for Seismic Performance Category C1

Screw size				UCS			
				8	10	12	14
Nominal embedment depth		h_{nom}	[mm]	65	85	100	115
Steel failure for tension load and shear load C1							
Characteristic resistance		$N_{Rk,s,eq}$	[kN]	35	55	76	103
		$V_{Rk,s,eq}$	[kN]	11,4	22,3	26,9	38,3
Without filling of the annular gap		α_{gap}	[-]	0,5			
With filling of the annular gap[1)]		α_{gap}	[-]	1,0			
Pullout failure							
Characteristic resistance in cracked concrete		$N_{Rk,p,eq}$	[kN]	12	-[2)]		
Concrete cone failure							
Effective embedment depth		h_{ef}	[mm]	52	68	81	93
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}			
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}			
Installation factor		γ_{inst}	[-]	1,0			
Concrete pryout failure							
Factor for pryout failure		k_8	[-]	2,0			
Concrete edge failure							
Effective length in concrete		l_f	[mm]	65	85	100	115
Nominal diameter of screw		d_{nom}	[mm]	8	10	12	14

1) Filling of the annular gap according to Annex B4
2) Pullout failure not decisive.

Table C3: Characteristic values for Seismic Performance Category C2

Gap between screw shaft and fixture must be filled with mortar

Screw size				UCS			
				8	10	12	14
Nominal embedment depth		h_{nom}	[mm]	65	85	100	115
Steel failure for tension load and shear load C2							
Characteristic resistance		$N_{Rk,s,eq}$	[kN]	35,0	55	76,0	103
		$V_{Rk,s,eq}$	[kN]	13,3	20,4	29,9	35,2
With filling of the annular gap[1)]		α_{gap}	[-]	1,0			
Pullout failure							
Characteristic resistance in cracked concrete		$N_{Rk,p,eq}$	[kN]	2,1	6,0	8,9	17,1
Concrete cone failure							
Effective embedment depth		h_{ef}	[mm]	52	68	81	93
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}			
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}			
Installation factor		γ_{inst}	[-]	1,0			
Concrete pryout failure							
Factor for pryout failure		k_8	[-]	2,0			
Concrete edge failure							
Effective length in concrete		l_f	[mm]	65	85	100	115
Nominal diameter of screw		d_{nom}	[mm]	8	10	12	14

[1)] Filling of the annular gap according to annex B4. Application without filling of the annular gap not allowed

Table C4: Characteristic values for resistance to fire[1)]

Screw size					UCS 8		UCS 10			UCS 12			UCS 14		
Minimum embedment depth			h_{nom}	[mm]	50	65	55	65	85	60	75	100	65	85	115
Steel failure for tension load and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)															
Characteristic resistance for head shape	US, S	R30	$F_{Rk,s,fi}$	[kN]	2,33		3,45			4,62			6,46		
		R60	$F_{Rk,s,fi}$	[kN]	1,82		2,73			3,66			5,11		
		R90	$F_{Rk,s,fi}$	[kN]	1,30		2,00			2,69			3,75		
		R120	$F_{Rk,s,fi}$	[kN]	1,04		1,64			2,20			3,08		
	SK, US TX, S TX	R30	$F_{Rk,s,fi}$	[kN]	2,12		2,96			-			-		
		R60	$F_{Rk,s,fi}$	[kN]	1,67		2,26			-			-		
		R90	$F_{Rk,s,fi}$	[kN]	1,21		1,56			-			-		
		R120	$F_{Rk,s,fi}$	[kN]	0,99		1,21			-			-		
	All head shapes	R30	$M^0_{Rk,s,fi}$	[Nm]	2,62		4,92			7,83			12,89		
		R60	$M^0_{Rk,s,fi}$	[Nm]	2,05		3,89			6,20			10,19		
		R90	$M^0_{Rk,s,fi}$	[Nm]	1,46		2,85			4,56			7,48		
		R120	$M^0_{Rk,s,fi}$	[Nm]	1,17		2,34			3,73			6,14		
Pullout failure															
Characteristic resistance		R30	$N_{Rk,p,fi}$	[kN]	1,5	3,0	2,3	3,0	5,0	2,9	4,2	6,6	3,2	4,9	8,1
		R60	$N_{Rk,p,fi}$	[kN]											
		R90	$N_{Rk,p,fi}$	[kN]											
		R120	$N_{Rk,p,fi}$	[kN]	1,2	2,4	1,8	2,4	4,0	2,3	3,3	5,2	2,5	3,9	6,5
Edge distance															
R30 to R120			$c_{cr,fi}$	[mm]	$2\ h_{ef}$										
In case of fire attack from more than one side, the minimum edge distance shall be ≥ 300 mm															
Spacing															
R30 to R120			$s_{cr,fi}$	[mm]	$2\ c_{cr,fi}$										
Concrete pryout failure															
R30 to R120			k_8	[-]	1,0	2,0	1,0	2,0							

[1)] The embedment depth has to be increased for wet concrete by at least 30 mm compared to the given value.

Table C5: Displacements due to tension loads (static)

Screw size			UCS 8		UCS 10			UCS 12			UCS 14		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100	65	85	115
Tension load in cracked concrete	N	[kN]	2,9	5,7	4,3	5,7	9,6	5,5	8,0	12,5	6,1	9,4	15,3
Displacement	δ_{N0}	[mm]	0,5	0,9	0,7	0,7	0,8	0,7	0,9	0,8	0,8	1,0	0,8
	$\delta_{N\infty}$	[mm]	1,3	1,0	0,7	0,7	0,8	1,3	0,9	0,8	1,1	1,0	1,1
Tension load in non - cracked concrete	N	[kN]	7,9	12,0	6,8	8,8	13,5	7,7	11,0	17,4	8,5	13,2	21,6
Displacement	δ_{N0}	[mm]	0,9	1,4	0,9	0,9	1,4	0,9	1,1	1,4	1,0	1,3	1,1
	$\delta_{N\infty}$	[mm]	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,1	1,3	1,1

Table C6: Displacements due to shear loads (static)

Screw size			UCS 8		UCS 10			UCS 12			UCS 14		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100	65	85	115
Shear load in cracked and non-cracked concrete	V	[kN]	6,2	9,0	14,0	14,0	16,6	15,9	15,9	21,2	23,0	23,0	30,5
Displacement	δ_{V0}	[mm]	1,4	1,4	3,2	3,2	3,2	2,5	2,5	3,4	2,8	2,8	5,4
	$\delta_{V\infty}$	[mm]	2,0	2,1	4,9	4,9	4,9	3,8	3,8	5,1	4,2	4,2	8,1

Table C7: Displacements due to tension loads (Seismic Performance Category C2)

Screw size			UCS 8	UCS 10	UCS 12	UCS 14
Nominal embedment depth	h_{nom}	[mm]	65	85	100	115
Displacement DLS	$\delta_{N,eq(DLS)}$	[mm]	0,5	0,8	0,9	1,3
Displacement ULS	$\delta_{N,eq\ (ULS)}$	[mm]	1,7	2,8	2,7	5,0

Table C8: Displacements due to shear loads (Seismic Performance Category C2)

Screw size			UCS 8	UCS 10	UCS 12	UCS 14
Nominal embedment depth	h_{nom}	[mm]	65	85	100	115
Displacement DLS	$\delta_{V,eqDLS)}$	[mm]	1,6	2,7	3,1	4,1
Displacement ULS	$\delta_{V,eq\ (ULS)}$	[mm]	3,9	7,1	5,3	8,7