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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-17/0740 of 2018/10/23

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No. 305/2011: ETA-Danmark A/S	
Trade name of the construction product:	fischer concrete screw ULTRACUT FBS II A4
Product family to which the above construction product belongs:	Mechanical fasteners for use in cracked and un-cracked concrete
Manufacturer:	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 D-72178 Waldachtal
Manufacturing plant:	fischerwerke
This European Technical Assessment contains:	15 pages including 3 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No. 305/2011, on the basis of:	EAD 330232-00-0601; Mechanical fasteners for use in concrete
This version replaces:	The ETA with the same number issued on 2018-05-16

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
fischer concrete screw ULTRACUT FBS II A4 is a concrete screw made of stainless steel. The anchor is installed in a drilled hole and anchored by mechanical interlock.

An illustration of the product is given in Annex A.

The characteristic material values, dimensions and tolerances of the anchors not indicated in Annexes shall correspond to the respective values laid down in the technical documentation of this European Technical Assessment.

The anchors are intended to be used with embedment depth given in Annex B, Table B2.1. The intended use specifications of the product are detailed in the Annex B1.

2 Specification of the intended use in accordance with the applicable EAD

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 provisions made in this European Technical Assessment are based on an assumed intended working life of the anchor of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, 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 Characteristics of product

Mechanical resistance and stability (BWR 1):
The essential characteristics are detailed in the Annex C1, C2 and C4.

Safety in case of fire (BWR 2):
The essential characteristics are detailed in the Annex C3.

Other Basic Requirements are not relevant.

3.2 Methods of assessment

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirement 1 has been made in accordance with EAD 330232-00-0601; Mechanical fasteners for use in concrete.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 1996/582/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No. 305/2011) is 1.

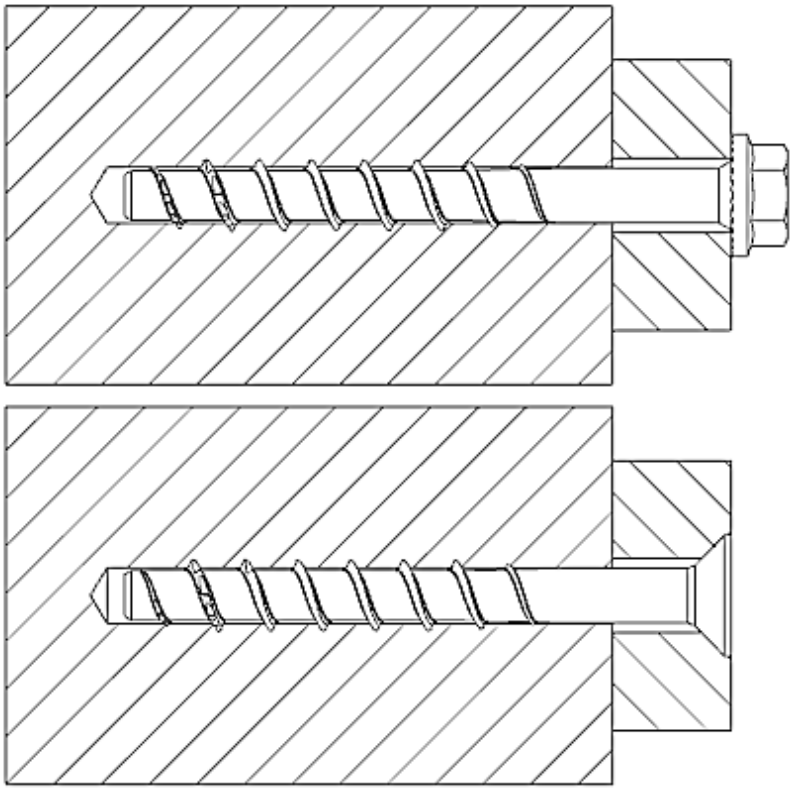
5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2018-10-23 by

Thomas Bruun
Managing Director, ETA-Danmark

Product in the installed condition



FBS II US A4 /
FBS II US TX A4

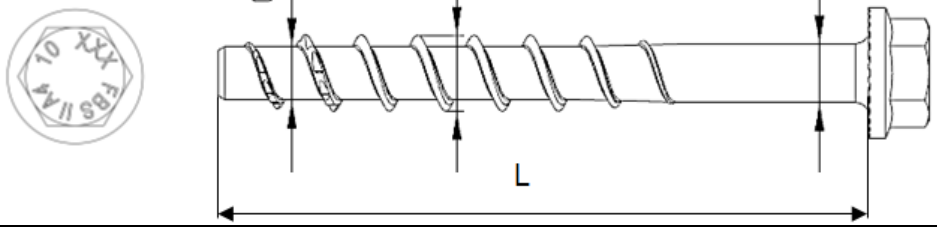
FBS II SK A4

fischer concrete screw ULTRACUT FBS II A4	**Annex A1**
Product description Product in the installed condition	of European Technical Assessment ETA-17/0740

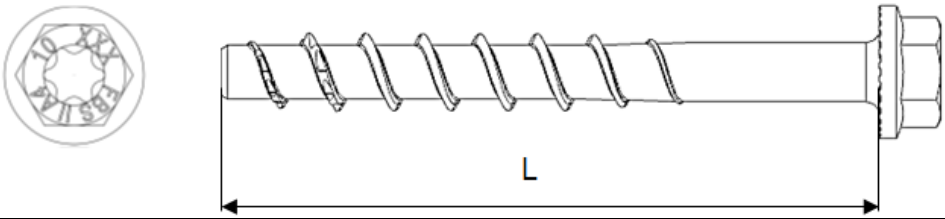
Table A2.1: Geometry and material

Type of screw / size			FBS II A4 US / SK		
			8	**10**	**12**
Thread outer diameter	d_a	[mm]	10,3	12,5	14,6
Core diameter	d_k		7,5	9,4	11,1
Shaft diameter	d_s		8,0	9,9	11,7
Material			Tip: hardened steel; Shaft and head: stainless steel		

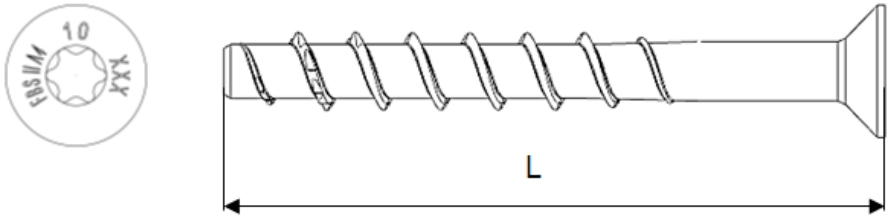
Hexagon head with formed washer **(US)**



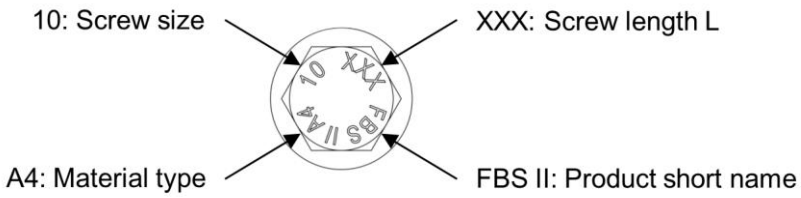
Hexagon head with formed washer and TX-drive **(US TX)**



Countersunk Head **(SK)**



Head Marking



fischer concrete screw ULTRACUT FBS II A4	**Annex A2**
Product description Geometry and material	of European Technical Assessment ETA-17/0740

Specification of intended use:

Size	FBS II A4							
	8		10			12		
Nominal embedment depth [mm]	50	65	55	65	85	60	75	100
Static and quasi-static loads								
Cracked and uncracked concrete				✓				
Fire exposure								
Seismic performance category C1 and C2		✓			✓			✓

Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013
- Uncracked or cracked concrete

Use conditions (Environmental conditions):

- Structures subjected to dry internal conditions
- Structures subjected to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist.

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere or indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where deicing materials are used).

Design:

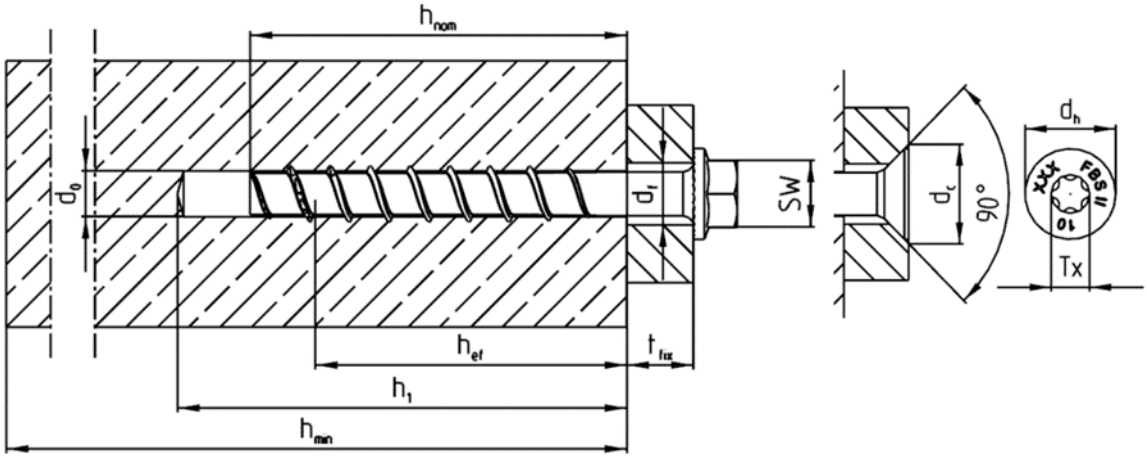
- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the screw is indicated on the design drawings (e.g. position of the screw relative to reinforcement or to supports, etc.).
- Design of fastenings according to FprEN 1992-4: 2016 and EOTA Technical Report TR 055
- Seismic design according EOTA Technical Report TR 049

Installation:

- Hammer drilling or diamond drilling or hollow drilling according to Annex B4
- 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
- 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; mortar compressive strength ≥ 50 N/mm².(e.g. FIS V, FIS HB, FIS SB or FIS EM Plus)

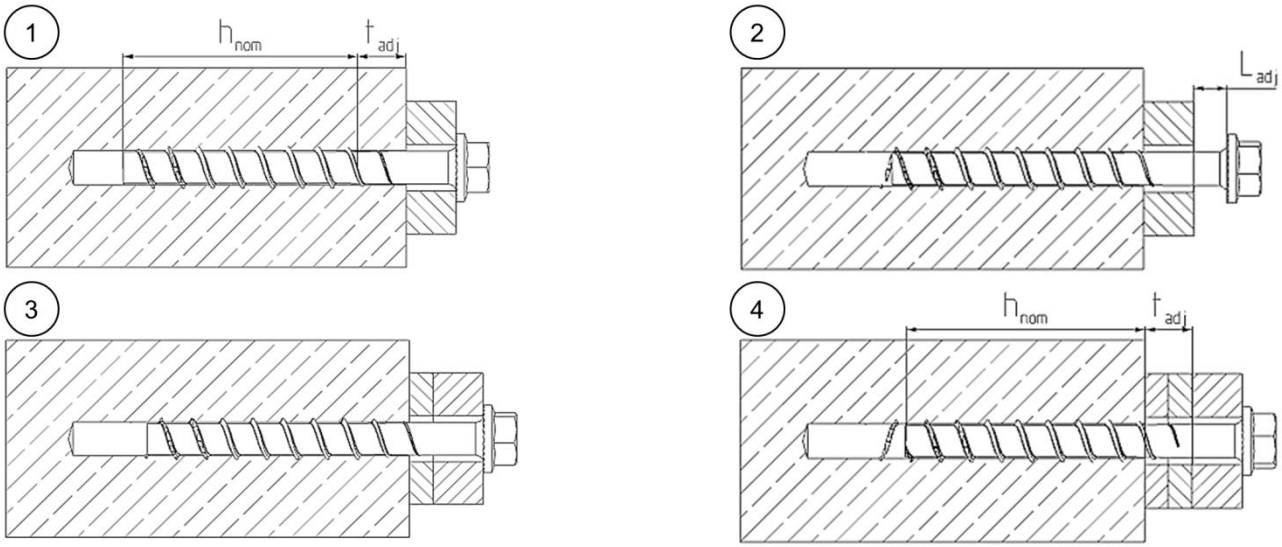
Table B2.1: Installation parameters

FBS II A4			**8**		**10**			**12**		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100
Nominal drill hole diameter	d_0		8		10			12		
Cutting diameter of drill bits	$d_{cut} \leq$		8,45		10,45			12,50		
Cutting diameter for diamond drillers			8,10		10,30			12,30		
Clearance hole diameter	d_f		10,6 – 12,0		12,8 – 14,0			14,8 – 16,0		
Wrench size (US,S)	SW		13		15			17		
Tx-size	Tx	[-]	40		50			-		
Countersunk head diameter	d_h	[mm]	18		21					
Countersunk diameter in fixture	d_c		20		23					
Drill hole depth	$h_1 \geq$		60	75	65	75	95	70	85	110
Drill hole depth (with adjustable setting)			70	85	75	85	105	80	95	120
Thickness of fixture	$t_{fix} \leq$		$L - h_{nom}$							
Length of screw	$L_{min} =$		50	65	55	65	85	60	75	100
	$L_{max} =$		400	415	405	415	435	410	425	450
Torque impact screw driver	$T_{imp,max}$	[Nm]	450					650		
Torque impact screw driver (with adjustable setting process)	$T_{imp,max}$		300					450		



fischer concrete screw ULTRACUT FBS II A4	**Annex B2**
Intended use Installation parameters	of European Technical Assessment ETA-17/0740

Adjustment



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

Table B3.1:Minimum thickness of concrete members, minimum spacing and edge distance

FBS II A4			8		10			12		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100
Minimum thickness of concrete member	h_{min}		100	120	100	120	140	110	130	150
Minimum spacing	s_{min}		35		40			50		
Minimum edge distance	c_{min}		35		40			50		

Installation instruction

Installation of fischer concrete screw ULTRACUT FBS II A4

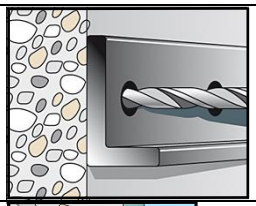
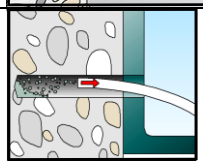
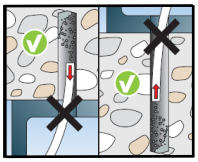
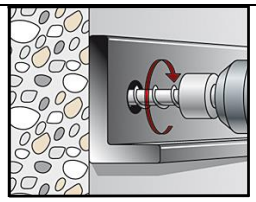
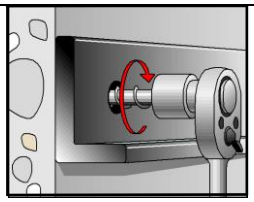
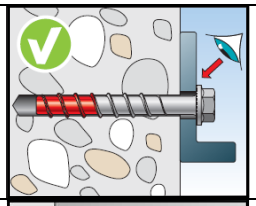
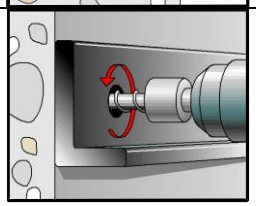
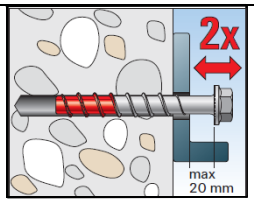
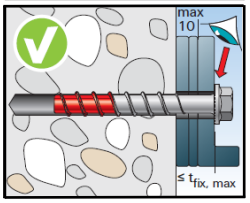
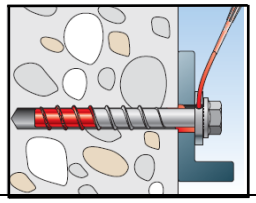
	Drill the hole using hammer drill, hollow drill or diamond core drill. Drill hole diameter d_0 and drill hole depth h_1 according to table B2.1
a)  b) 	Option a) Clean the drill hole Option b) Cleaning of drill hole is not necessary when using a hollow drill or: - If drilling vertically upwards or - 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 ($T_{imp,max}$). 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.  3. 	OPTIONAL: It is permissible to adjust the screw two times. 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. If screw is adjusted, only permissible impact screw driver according to table B2.1 is allowed.
	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. FIS V, FIS HB, FIS SB or FIS EM Plus)

Table C1.1: Characteristic values for static and quasi-static action

FBS II A4				**8**		**10**			**12**		
Nominal embedment depth		h_{nom}	[mm]	50	65	55	65	85	60	75	100
Steel failure for tension load and shear load											
Characteristic resistance		$N_{Rk,s}$	[kN]	27,8		43,8			67,7		
Partial factor		γ_{Ms}	-	1,5							
Characteristic resistance		$V_{Rk,s}$	[kN]	18,0	27,8	13,2	19,3	36,6	20,4	40,1	45,8
Partial factor		γ_{Ms}	[-]	1,25							
Factor for ductility		k_7		1,0							
Characteristic bending resistance		$M^0_{Rk,s}$	[Nm]	31,3		68,5			112,8		
Pullout failure											
Charact. resistance in concrete C20/25	uncracked	$N_{Rk,p}$	[kN]	7,0	14,0	8,5	14,0	-[1)]	10,0	12,0	-[1)]
	cracked	$N_{Rk,p}$	[kN]	4,0	9,0	4,5	6,0	16,0	4,5	11,0	-[1)]
Increasing factors concrete	C25/30	ψ_c	[-]	1,12							
	C30/37			1,22							
	C35/45			1,32							
	C40/50			1,41							
	C45/55			1,50							
	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
Factor for uncracked concrete		$k_{ucr,N}$	[-]	11,0							
Factor for cracked concrete		$k_{cr,N}$		7,7							
Characteristic edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}							
Characteristic spacing		$s_{cr,N}$		3 h_{ef}							
Char. resistance for splitting		$N^0_{Rk,Sp}$	[kN]	12,0	18,4	13,0	17,9	-[1)]	15,8	22,9	-[1)]
Char. edge distance for splitting		$c_{cr,sp}$	[mm]	1,5 h_{ef}							
Char. spacing for splitting		$s_{cr,sp}$		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		$l_f = h_{nom}$	[mm]	50	65	55	65	85	60	75	100
Nominal diameter of screw		d_{nom}		8		10			12		
Adjustment											
Maximum thickness of shims		t_{adj}	[mm]	10							
Max. number of adjustments		n_a		2							

[1)] Pullout failure not decisive.

Table C2.1: Characteristic values for Seismic Performance Category C1

FBS II A4				**8**	**10**	**12**
Nominal embedment depth		h_{nom}	[mm]	65	85	100
Steel failure for tension load and shear load C1						
Characteristic resistance		$N_{Rk,s,eq}$	[kN]	27,8	43,8	67,7
		$V_{Rk,s,eq}$		18,1	29,3	36,6
Pullout failure						
Characteristic resistance in cracked concrete		$N_{Rk,p,eq}$	[kN]	9,0	16,0	-[1)]
Concrete cone failure						
Effective embedment depth		h_{ef}	[mm]	52	68	81
Concrete cone failure	Edge distance	$c_{cr,N}$		1,5 h_{ef}		
	Spacing	$s_{cr,N}$		3 h_{ef}		
Installation factor		γ_{inst}	[-]	1,0		
Concrete pryout failure						
Factor for pryout failure		k_8	[-]	1,0	2,0	
Concrete edge failure						
Effective length in concrete		$l_f = h_{nom}$	[mm]	65	85	100
Nominal diameter of screw		d_{nom}		8	10	12

[1)] Pullout failure not decisive.

Table C2.2: Characteristic values for Seismic Performance Category C2

Gap between screw shaft and fixture must be filled with mortar

FBS II A4				**8**	**10**	**12**
Nominal embedment depth		h_{nom}	[mm]	65	85	100
Steel failure for tension load and shear load C2						
Characteristic resistance		$N_{Rk,s,eq}$	[kN]	27,8	43,8	67,7
		$V_{Rk,s,eq}$		9,7	8,8	19,7
Pullout failure						
Characteristic resistance in cracked concrete		$N_{Rk,p,eq}$	[kN]	2,8	5,0	7,3
Concrete cone failure						
Effective embedment depth		h_{ef}	[mm]	52	68	81
Concrete cone failure	Edge distance	$c_{cr,N}$		1,5 h_{ef}		
	Spacing	$s_{cr,N}$		3 h_{ef}		
Installation factor		γ_{inst}	[-]	1,0		
Concrete pryout failure						
Factor for pryout failure		k_8	[-]	1,0	2,0	
Concrete edge failure						
Effective length in concrete		$l_f = h_{nom}$	[mm]	65	85	100
Nominal diameter of screw		d_{nom}		8	10	12

Table C3.1: Characteristic values for resistance to fire

FBS II A4					8		10			12		
Nominal embedment depth			h_{nom}	[mm]	50	65	55	65	85	60	75	100
Steel failure for tension load and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)												
Characteristic resistance for the head shapes	US, US TX	$F_{Rk,s,fi}$	R30	[kN]	2,3	6,4	3,5		11,0	4,6		15,2
			R60		1,8	4,7	2,7		8,1	3,7		11,2
			R90		1,3	2,9	2,0		5,2	2,7		7,3
			R120		1,0	2,0	1,6		3,8	2,2		5,3
	SK	$F_{Rk,s,fi}$	R30		2,1		3,0			-		
			R60		1,7		2,3					
			R90		1,2		1,6					
			R120		1,0		1,2					
	US, US TX	$M^0_{Rk,s,fi}$	R30	[Nm]	2,6	7,2	7,6		15,4	16,8		25,3
			R60		2,0	5,2	6,0		11,4	13,3		18,7
			R90		1,5	3,3	4,4		7,3	9,8		12,1
			R120		1,2	2,3	3,6		5,3	8,0		8,8
	SK	$M^0_{Rk,s,fi}$	R30		2,4		4,2			-		
			R60		1,9		3,2					
			R90		1,4		2,2					
			R120		1,1		1,7					
Pullout failure												
Characteristic resistance		$N_{Rk,p,fi}$	R30	[kN]	1,7	2,4	2,1	3,5	4,3	2,5	3,0	6,3
			R60									
			R90									
			R120		1,4	1,9	1,7	2,8	3,4	2,0	2,4	5,0
Concrete cone failure												
Characteristic resistance		$N_{Rk,c,fi}$	R30	[kN]	1,6	3,4	2,1	3,2	6,6	2,6	4,8	10,2
			R60									
			R90									
			R120		1,3	2,7	1,7	2,6	5,3	2,1	3,8	8,1
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

The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.

Table C4.1: Displacements due to tension loads (static and quasi-static)

FBS II A4			**8**		**10**			**12**		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100
Tension load in uncracked concrete	N	[kN]	3,5	7,1	4,2	7,0	11,9	5,0	6,0	17,1
Displacement in uncracked concrete	δ_{N0}	[mm]	0,5	0,7	0,4	0,6	0,8	1,0	0,9	1,25
	$\delta_{N\infty}$		0,7	0,7	0,8	0,8	0,8	1,25	1,25	1,25
Tension load in cracked concrete	N	[kN]	3,5	4,5	4,2	7,0	8,1	5,0	6,0	12,0
Displacement in cracked concrete	δ_{N0}	[mm]	0,6	0,4	0,4	0,6	0,7	0,9	0,9	1,4
	$\delta_{N\infty}$		1,5	1,1	1,0	1,8	1,8	1,4	1,7	1,9

Table C4.2: Displacements due to shear loads (static and quasi-static)

FBS II A4			**8**		**10**			**12**		
Nominal embedment depth	h_{nom}	[mm]	50	65	55	65	85	60	75	100
Shear load in cracked and uncracked concrete	V	[kN]	11,0	15,9	10,4	11,9	20,9	12,7	24,9	26,2
Displacement (the gap between fastener and fixture is subtracted)	δ_{V0}	[mm]	4,1	2,7	1,2	1,2	3,5	1,1	2,5	2,9
	$\delta_{V\infty}$		6,2	4,1	1,8	1,8	5,3	1,7	3,8	4,4

Table C4.3: Displacements due to tension loads (Seismic Performance Category C2)

FBS II A4			8	10	12
Nominal embedment depth	h_{nom}	[mm]	65	85	100
Displacement DLS	$\delta_{N,eq\ (DLS)}$		0,9	0,9	1,1
Displacement ULS	$\delta_{N,eq\ (ULS)}$		2,5	2,7	3,2

Table C4.4: Displacements due to shear loads (Seismic Performance Category C2)

FBS II A4			8	10	12
Nominal embedment depth	h_{nom}	[mm]	65	85	100
Displacement DLS	$\delta_{V,eq\ (DLS)}$		1,6	1,7	2,6
Displacement ULS	$\delta_{V,eq\ (ULS)}$		5,0	3,8	6,6