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-20/0321 of 19 June 2020

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	fischer concrete screw ULTRACUT FBS II
Product family to which the construction product belongs	Connector for Strengthening of existing concrete structures by concrete overlay
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischerwerke
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	EAD 332347-00-0601, Edition 12/2019

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Specific Part

1 Technical description of the product

The Shear connector fischer concrete screw UTRACUT FBS II is a concrete screw made of galvanised steel anchored into a predrilled cylindrical drill hole in existing concrete. The special thread of the concrete screw cuts an internal thread into the member while setting. The fischer concrete screw UTRACUT FBS II is connecting two layers of concrete cast at different times (existing concrete and concrete overlay). The side with head of concrete screw is finally embedded in the concrete overlay.

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
Existing concrete: - resistances - edge distance and spacing	 See Annex C 1 See Annex B 3
Concrete overlay: - resistances - edge distance and spacing	 See Annex A 2 and C 2 See Annex B 3
Shear interface parameter under static and quasi-static and fatigue cyclic loading - material and geometric parameters - factor for fatigue cyclic loading	 See Annex C 2 No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

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. 332347-00-0601 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 with Deutsches Institut für Bautechnik.

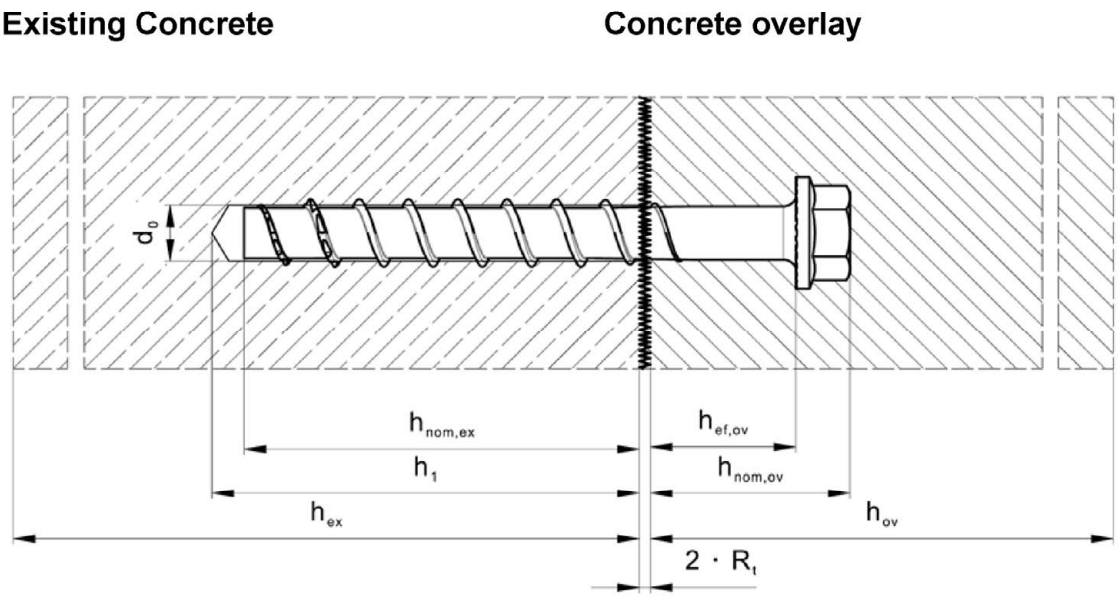
Issued in Berlin on 19 June 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

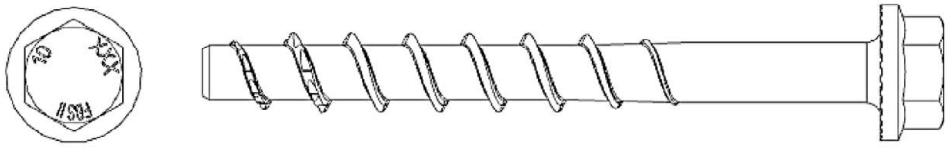
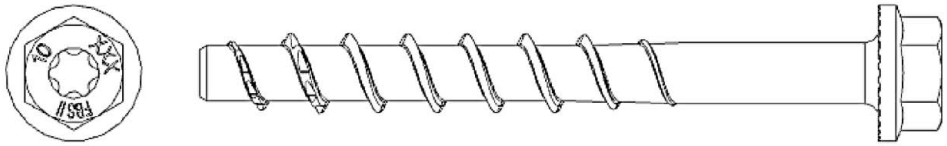
Deutsches Institut für Bautechnik DIBt

Installed condition



$h_{nom,ex}$	Overall embedment depth in existing concrete	$h_{ef,ov}$	Effective embedment depth in concrete overlay
h_1	Drill hole depth	$h_{nom,ov}$	Overall embedment depth in concrete overlay
h_{ex}	Thickness of existing concrete	h_{ov}	Thickness of concrete overlay
R_t	Roughness according to EOTA TR 066:2018-11	d_0	Nominal drill hole diameter

Table A1.1: Screw types FBS II 8 - 14

FBS II 8 - 14	
Hexagon head with formed washer (**US**)	
Hexagon head with formed washer and TX-drive (**US TX**)	

(Fig. not to scale)

fischer concrete screw ULTRACUT FBS II

Product description
Installed condition
Screw types

Annex A 1

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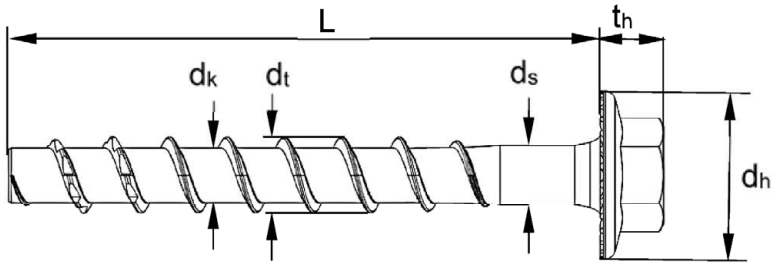
Table A2.1: Dimensions and material

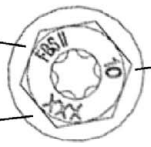
Screw types / size			All head shapes			
			8	**10**	**12**	**14**
Thread outer diameter	d_t	[mm]	10,3	12,5	14,5	16,6
Core diameter	d_k		7,4	9,4	11,3	13,3
Shaft diameter	d_s		8,0	9,9	11,7	13,7
Stressed cross section	A_s	[mm²]	43,0	69,4	100,3	138,9
Minimum length	L_{min}	[mm]	$h_{nom,ex}$ + 40 mm			
Maximum length	L_{max}		415	435	450	465
Diameter of the head	d_h		18	20,5	23	28
Height of the head	t_h		8,4	9,9	10,3	11,5
Material		[-]	Hardened carbon steel; $A_{5\%} \geq 8\%$			
Coating			galvanised			
Nominal characteristic steel yield strength	f_{yk}	[N/mm²]	800	750	750	750
Nominal characteristic steel ultimate tensile strength	f_{uk}		950	900	900	900



Product marking FBS II US (TX)

FBS II: Product marking

XXX: Screw length L



10: Screw size

(Fig. not to scale)

fischer concrete screw ULTRACUT FBS II

Product description
Dimensions, material and marking

Annex A 2

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Specifications of intended use

Anchorages subject to:

- Static or quasi static actions
- Surface roughness “very smooth” to “very rough” of the shear interface according to EOTA Technical Report TR 066:2018-11

Base materials:

- For use to strengthen existing concrete by concrete overlay. Both concrete members are compacted reinforced or unreinforced normal weight (cracked and uncracked) concrete without fibres in the range C20/25 to C50/60 according to EN 206:2013+A1:2016.

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.).
- Post-installed shear connections are designed in accordance with EOTA Technical Report TR 066:2018-11
- For the concrete overlay the following requirements on the mixture according to TR 066:2018-11, chapter 3.2 apply:
    - Concrete compressive strength of the new concrete shall be higher than the concrete compressive strength of the existing concrete.
    - Use of concrete with low shrinkage is recommended.
    - Slump of fresh concrete f ≥ 380 mm, a slump value f ≥ 450 mm is recommended, if applicable.
    - Concrete consolidation with vibratory screed. With thickness of the overlay concrete > 10 cm specific vibratory screed must be checked for its maximum working depth.
    - Very good posttreatment.

Installation:

- The screw installation is executed by trained personal, ensuring that the installation instruction and the specifications by the engineer are observed.
- Hammer drilling, hollow drilling or diamond drilling:
  All sizes and embedment depths
- Screw installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site
- Cleaning of drill hole is not necessary when using a hollow drill with functional suction or:
  - If drilling vertically upwards
  - If drilling vertically downwards and the drill hole depth has been increased. It is recommended to increase the drill hole depth with additional 3 d_0.
- The requirements for construction works given in EOTA Technical Report TR 066:2018-11 have to be observed.

fischer concrete screw ULTRACUT FBS II	**Annex B 1**
Intended use Specifications	

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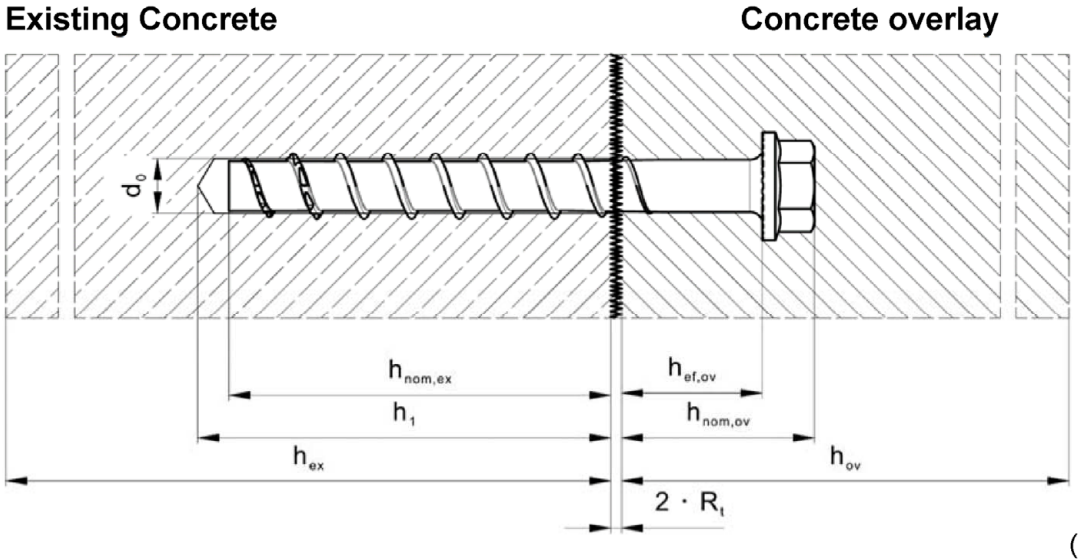
Table B2.1: Installation parameters FBS II 8 – 14 in existing concrete

Size			FBS II											
			8		10			12			14			
Nominal embedment depth	$h_{nom,ex}$	[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 driller	$d_{cut} \leq$	[mm]	8,10		10,30			12,30			14,30			
Wrench size (US, S)	SW	[mm]	13		15			17			21			
TX size	TX	[-]	40		50			-						
Drill hole depth	$h_1 \geq$	[mm]	60	75	65	75	95	70	85	110	80	100	130	
Drill hole depth (for vertical downwards installation without cleaning)	$h_1 \geq$	[mm]	85	100	105	115	135	95	130	155	130	150	180	
Length of screw	L_{min} =	[mm]	90	105	95	105	125	100	115	140	105	125	155	
	L_{max} =	[mm]	400	415	405	415	435	410	425	450	415	435	465	
Torque impact wrench	$T_{imp,max}$	[Nm]	600		650									

Table B2.2: Installation parameters FBS II 8 – 14 in concrete overlay

Size			FBS II			
			8	10	12	14
Minimum effective embedment depth	$h_{ef,ov,min}$	[mm]	40			
Maximum effective embedment depth	$h_{ef,ov,max}$	[mm]	L- $h_{nom,ex}$ – 2 R_t			
Nominal embedment depth	$h_{nom,ov}$	[mm]	$h_{ef,ov}$ + L_h			
Min. thickness of concrete overlay	$h_{min,ov}$	[mm]	$h_{nom,ov}$ + c_{nom} [1]			

[1] Nominal concrete cover according to EN 1992-1-1:2004 + AC:2010



(Fig. not to scale)

fischer concrete screw ULTRACUT FBS II

Intended use
Installation parameters FBS II 8 - 14

Annex B 2

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Table B3.1: Minimum member thickness, minimum spacing and edge distance

Size			FBS II									
			8		10			12			14		
Existing Concrete												
Nominal embedment depth	$h_{nom,ex}$	[mm]	50	65	55	65	85	60	75	100	65	85	115
Minimum thickness of concrete member	$h_{min,ex}$	[mm]	100	120	100	120	140	110	130	150	120	140	180
Minimum spacing	$s_{min,ex}$	[mm]	35		40			50			60		
Minimum edge distance	$c_{min,ex}$	[mm]	35		40			50			60		
Concrete Overlay												
Minimum thickness of concrete member	$h_{min,ov}$	[mm]	$h_{nom,ov} + c_{nom}$ [1)]									
Minimum spacing	$s_{min,ov}$	[mm]	40		40			45			55		
Minimum edge distance	$c_{min,ov}$	[mm]	$10 + c_{nom}$ [1)]		$10 + c_{nom}$ [1)]			$15 + c_{nom}$ [1)]			$15 + c_{nom}$ [1)]		

[1)] Nominal concrete cover according to EN 1992-1-1:2004 + AC:2010

fischer concrete screw ULTRACUT FBS II

Intended use
Minimum member thickness, minimum spacing and edge distance

Annex B 3

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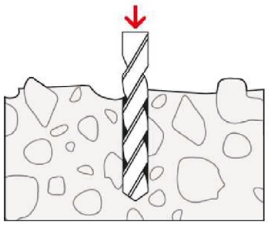
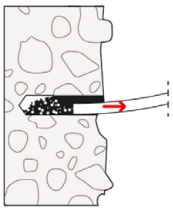
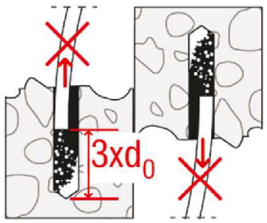
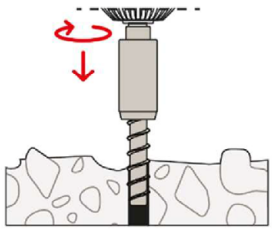
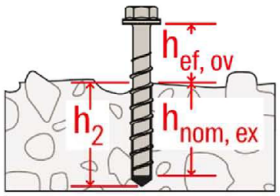
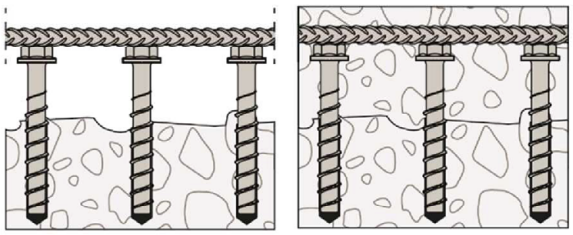
Installation instruction

	**Step 1: Creation of the drill hole:** Drill a hole to the required setting depth using a hammer drill bit, hollow drill bit or a diamond drill bit.
	**Step 2: Cleaning of the drill hole - horizontal:** Clean the drill hole. This step can be omitted in the preparation of the hole by using a hollow drill bit. (recommendation: use the fischer FHD hollow drill bit)
	**Step 2: Cleaning of the drill hole - vertical:** Cleaning of the drill hole can be omitted, if drilling vertically upwards or if drilling vertically downwards and the hole depth has been increased. We recommend increasing the drill hole depth by an additional 3 x drilling ø when drilling vertically downwards.
	**Step 3: Installation via Impact Wrench:** Installation with any impact wrench at a max. mentioned torque moment ($T_{imp, max}$) and with simultaneous axial pressure on the impact wrench. (recommendation: use the fischer FSS 18V 400BL)
	**Step 4: Installation on the right depth:** First, install the concrete screw FBS II in the existing concrete to the defined setting depth $h_{nom,ex}$, while ensuring the desired setting depth $h_{ef,ov}$ is fulfilled in the top concrete layer (for an easy installation it is allowed to use the fischer setting tool SC-ST).
	**Process after the installation of the screw:** After installing the concrete screw, further work can be completed on the reinforcements and using the top concrete layer. ATTENTION: In accordance with TR 066: 2018-11, the requirements for properties of the composite surface and concrete mixture must be observed.

fischer concrete screw ULTRACUT FBS II	**Annex B 4**
Intended use Installation instructions	

Deutsches Institut für Bautechnik DIBt

Table C1.1: Characteristic tension resistance under static and quasi-static action in the existing concrete

Size				FBS II										
				8		10			12			14		
Nominal embedment depth		$h_{nom,ex}$	[mm]	50	65	55	65	85	60	75	100	65	85	115
Steel failure														
Characteristic resistance		$N_{Rk,s,ex}$	[kN]	35		55			76			103		
Partial factor		$\gamma_{Ms,N,ex}$	[-]	1,4										
Pullout failure														
Characteristic resistance in concrete C20/25	uncracked	$N_{Rk,p,ex}$	[kN]	$\geq N^0_{Rk,c,ex}$										
	cracked	$N_{Rk,p,ex}$		6	12	9	12	$\geq N^0_{Rk,c,ex}$						
Increasing factors concrete	C25/30	$\psi_{c,ex}$	[-]	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														
Effective embedment depth		$h_{ef,ex}$	[mm]	40	52	43	51	68	47	60	81	50	67	93
Factor for uncracked concrete		$k_{ucr,N,ex}$	[-]	11,0										
Factor for cracked concrete		$k_{cr,N,ex}$		7,7										
Characteristic edge distance		$c_{cr,N,ex}$	[mm]	$1,5\ h_{ef,ex}$										
Characteristic spacing		$s_{cr,N,ex}$		$3\ h_{ef,ex}$										
Charact. edge distance for splitting		$c_{cr,sp,ex}$		$1,5\ h_{ef,ex}$										
Charact. spacing for splitting		$s_{cr,sp,ex}$		$3\ h_{ef,ex}$										

fischer concrete screw ULTRACUT FBS II

Performances
Characteristic tension resistance in the existing concrete

Annex C 1

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Table C2.1: Characteristic resistance under static and quasi-static action in the concrete overlay

Size			FBS II			
			8	**10**	**12**	**14**
Steel failure						
Characteristic resistance	$N_{Rk,s,ov}$	[kN]	35,0	55,0	76,0	103,0
Partial factor	$\gamma_{Ms,N,ov}$	[-]	1,4			
Pullout failure						
Projected area of the head	A_h	[mm²]	205	255	308	472
Concrete cone failure and splitting failure						
Effective embedment depth min	$h_{ef,ov}$	[mm²]	40			
Effective embedment depth max	$h_{ef,ov}$		L-$h_{nom,ex}$ – 2 R_t			
Factor for uncracked concrete	$k_{ucr,N,ov}$	[-]	12,7			
Factor for cracked concrete	$k_{cr,N,ov}$		8,9			
Characteristic edge distance	$c_{cr,N,oc}$	[mm]	1,5 $h_{ef,ov}$			
Characteristic spacing	$s_{cr,N,ov}$		3 $h_{ef,ov}$			
Charact. edge distance for splitting	$c_{cr,sp,ov}$		3 $h_{ef,ov}$			
Charakt. spacing for splitting	$s_{cr,sp,ov}$		6 $h_{ef,ov}$			
Blowout failure						
Projected area of the head	A_h	[mm²]	205	255	308	472

Table C2.2: Characteristic shear resistance in the interface under static and quasi-static action

Size			FBS II			
			8	**10**	**12**	**14**
Characteristic yield strength	f_{yk}	[N/mm²]	800	750	750	750
Product specific factor for ductility	α_{k1}	[-]	0,8			
Stressed cross section	A_s	[mm²]	43,0	69,4	100,3	138,9
Product specific factor for geometry	α_{k2}	[-]	1,0			

fischer concrete screw ULTRACUT FBS II

Performances
Characteristic tension resistance in the concrete overlay
Characteristic shear resistance in the interface

Annex C 2