



## PROHLÁŠENÍ O VLASTNOSTECH



DoP: 0134

pro fischer šroub do betonu ULTRACUT FBS II A4 (Kovové kotvy do betonu (pro vysoké zátěže)) – CS

1. Jedinečný identifikační kód typu výrobku: **DoP: 0134**
2. Zamýšlené/zamýšlená použití: **Dodatečné upevnění v tažené a tlačené zóně betonu, viz. doplněk, obzvláště Přílohy B 1 - B 4**
3. Výrobce: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Straße 1, 72178 Waldachtal, Německo**
4. Zplnomocněný zástupce: --
5. Systém/systémy POSV: **1**
6. Evropský dokument pro posuzování: **EAD 330232-00-0601**  
Evropské technické posouzení: **ETA-17/0740; 2018-05-16**  
Subjekt pro technické posuzování: **ETA-Danmark A/S**  
Oznámený subjekt/oznámené subjekty: **1343 – MPA Darmstadt**
7. Deklarovaná vlastnost/Deklarované vlastnosti:

### Mechanická odolnost a stabilita (BWR 1)

- Charakteristická odolnost pro statické a kvazi-statické zatížení: Viz. dodatek, obzvláště Příloha C 1
- Charakteristická únosnost pro seismické kategorie C1 a C2: Viz. dodatek, obzvláště Příloha C 2
- Posuny při statickém a kvazi-statickém zatížení: Viz. dodatek, obzvláště Příloha C 4
- Posuny při seismickém zatížení: Viz. dodatek, obzvláště Příloha C 4

### Bezpečnost v případě požáru (BWR 2)

- Odolnost proti ohni: Kotvení splňuje požadavky Třídy A 1
- Charakteristická únosnost v případě požáru: Viz. dodatek, obzvláště Příloha C 3

8. Příslušná technická dokumentace a/nebo specifická technická dokumentace: ---

Vlastnosti výše uvedeného výrobku jsou ve shodě se souborem deklarovaných vlastností. Toto prohlášení o vlastnostech se v souladu s nařízením (EU) č. 305/2011 vydává na výhradní odpovědnost výrobce uvedeného výše.

Podepsáno za výrobce a jeho jménem:

Andreas Bucher, Dipl.-Ing.

Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

Tumlingen, 2018-05-23

- Toto PoV bylo připraveno v různých jazykových mutacích.. V případě rozporu vždy rozhoduje interpretace verze v anglickém jazyce.
- Příloha obsahuje nepovinné a doplňkové informace v anglickém jazyce na rámec zákonných požadavků.



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## Appendix 1 / 15

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

MEMBER OF EOTA



# European Technical Assessment ETA-17/0740 of 2018/05/16

## 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:**

-

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## **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.

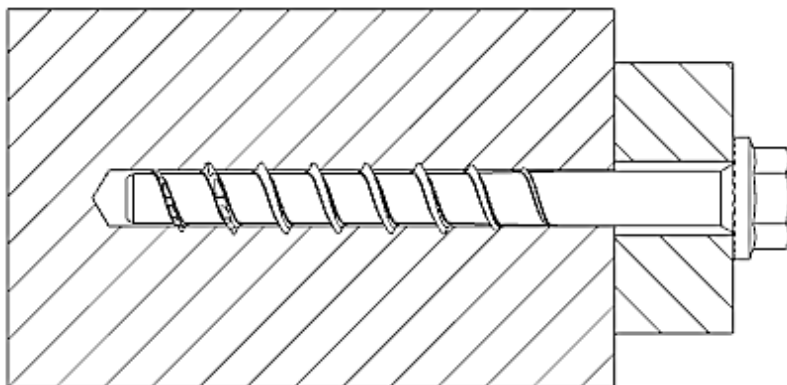
#### **5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD**

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.

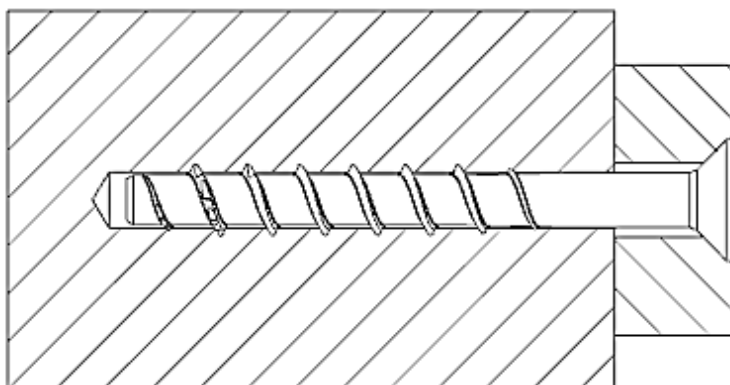
Issued in Copenhagen on 2018-05-16 by



Thomas Bruun  
Managing Director, ETA-Danmark

**Product in the installed condition**

FBS II US A4 /  
FBS II US TX A4



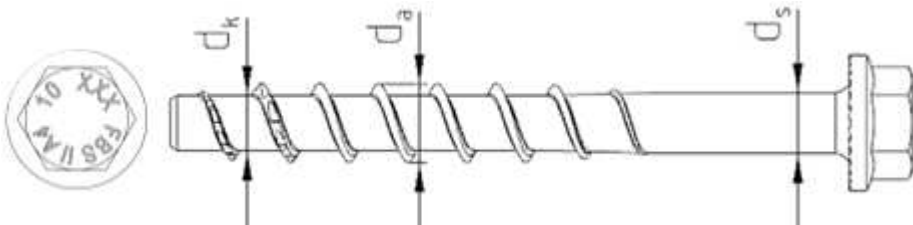
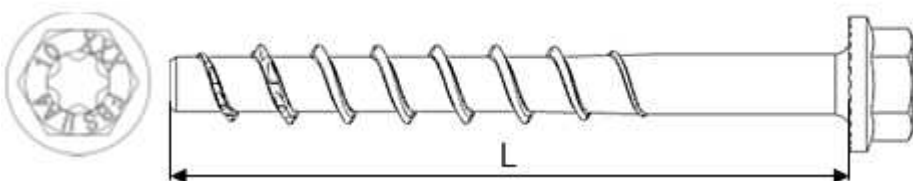
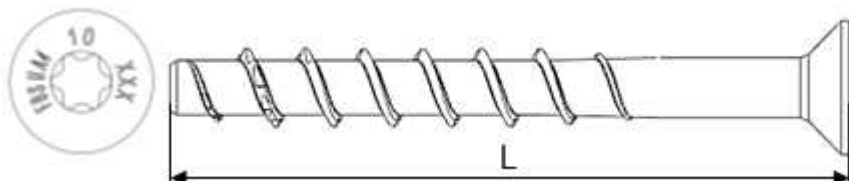
FBS II SK A4

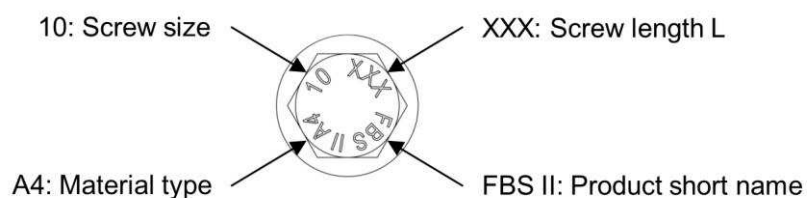
**fischer concrete screw ULTRACUT FBS II A4**

Product description  
Product in the installed condition

**Annex A1**  
of European  
Technical Assessment  
ETA-17/0740

**Table A2.1: Material and screw types**

| FBS II US A4 and FBS II SK A4                                 |                                                                                     |      | 8                                                       | 10   | 12   |
|---------------------------------------------------------------|-------------------------------------------------------------------------------------|------|---------------------------------------------------------|------|------|
| Thread outer diameter                                         | d <sub>a</sub>                                                                      | [mm] | 10,3                                                    | 12,5 | 14,6 |
| Core diameter                                                 | d <sub>k</sub>                                                                      |      | 7,5                                                     | 9,4  | 11,1 |
| Shaft diameter                                                | d <sub>s</sub>                                                                      |      | 8,0                                                     | 9,9  | 11,7 |
| Material                                                      |                                                                                     |      | Tip: hardened steel;<br>Shaft and Head: stainless steel |      |      |
| Hexagon head<br>with formed washer<br>(US)                    |   |      |                                                         |      |      |
| Hexagon head<br>with formed washer<br>and TX-drive<br>(US TX) |   |      |                                                         |      |      |
| Countersunk Head<br>(SK)                                      |  |      |                                                         |      |      |

**Head Marking****fischer concrete screw ULTRACUT FBS II A4**

Product description  
Material and screw types

**Annex A2**  
of European  
Technical Assessment  
ETA-17/0740



**Specification of intended use:**

| Size                                   | FBS II A4 |    |    |
|----------------------------------------|-----------|----|----|
|                                        | 8         | 10 | 12 |
| Static and quasi-static loads          | ✓         | ✓  | ✓  |
| Cracked and uncracked concrete         |           |    |    |
| Fire exposure                          |           |    |    |
| Seismic performance category C1 and C2 |           |    |    |

**Base materials:**

- Reinforced and unreinforced normal weight concrete according to EN 206:2000
- Strength classes C20/25 to C50/60 according to EN 206:2000
- 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 with functional suction 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 with functional suction or:
  - If drilling vertically upwards
  - If drilling vertical downwards and the drill hole depth has been increased. We recommend to increase the drill depth with additional 3 d<sub>o</sub>.
- 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  $\geq 50 \text{ N/mm}^2$ .

|                                                  |                                                                       |
|--------------------------------------------------|-----------------------------------------------------------------------|
| <b>fischer concrete screw ULTRACUT FBS II A4</b> | <b>Annex B1</b><br>of European<br>Technical Assessment<br>ETA-17/0740 |
| Intended use<br>Specification                    |                                                                       |

**Table B2.1: Installation parameters**

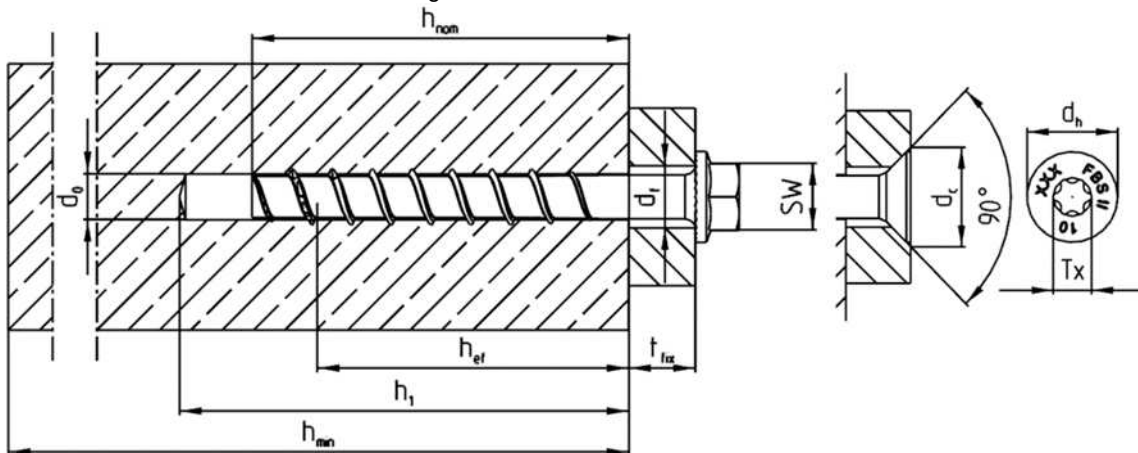
| <b>FBS II A4</b>                                                           |                     |      | <b>8</b>      | <b>10</b>   | <b>12</b>   |
|----------------------------------------------------------------------------|---------------------|------|---------------|-------------|-------------|
| Nominal embedment depth                                                    | $h_{nom}$           | [mm] | 65            | 85          | 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                                      | $d_{cut} \leq$      |      | 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                  | [mm] | 13            | 15          | 17          |
| TX-size                                                                    | TX                  |      | 40            | 50          | -           |
| Countersunk head diameter                                                  | $d_h$               |      | 18            | 21          | -           |
| Countersunk diameter in fixture                                            | $d_c$               |      | 20            | 23          | -           |
| Drill hole depth <sup>1)</sup>                                             | $h_1 \geq$          |      | 75            | 95          | 110         |
| Drill hole depth <sup>1)</sup><br>(with adjustable setting)                | $h_1 \geq$          |      | 85            | 105         | 120         |
| Thickness of fixture                                                       | $t_{fix}^{3)} \geq$ | [mm] | 0             |             |             |
|                                                                            | $t_{fix} \leq$      |      | $L - h_{nom}$ |             |             |
| Length of screw                                                            | $L_{min}^{3)} =$    | [mm] | 65            | 85          | 100         |
|                                                                            | $L_{max} =$         |      | 415           | 435         | 450         |
| Torque impact screw driver <sup>2)</sup>                                   | $T_{imp,max}$       | [Nm] | 450           |             | 650         |
| Torque impact screw driver (with adjustable setting process) <sup>2)</sup> | $T_{imp,max}$       | [Nm] | 300           |             | 450         |

1) Cleaning of drill hole is not necessary when using a hollow drill with functional suction or:  
if drilling vertical upwards

If drilling vertical downwards and the drill hole depth has been increased. We recommend to increase the drill depth with additional  $3 \times d_0$ .

2) Installation with any torque impact screw driver up to the maximum mentioned torque moment ( $T_{imp,max}$ ). Alternatively, all other tools without a mentioned torque moment are allowed (e.g. ratchet spanner). In any case it must be secured, that after installation the head of the screw must be tight down on the fixture. An easy further turning of the screw must not be possible and the head of the screw is not damaged. The torque moments  $T_{imp,max}$  are not valid for manual installation (e.g. torque wrench).

3) For countersunk screws the height of the head must be added to  $t_{fix}$  and  $L_{min}$  and  $L_{max}$

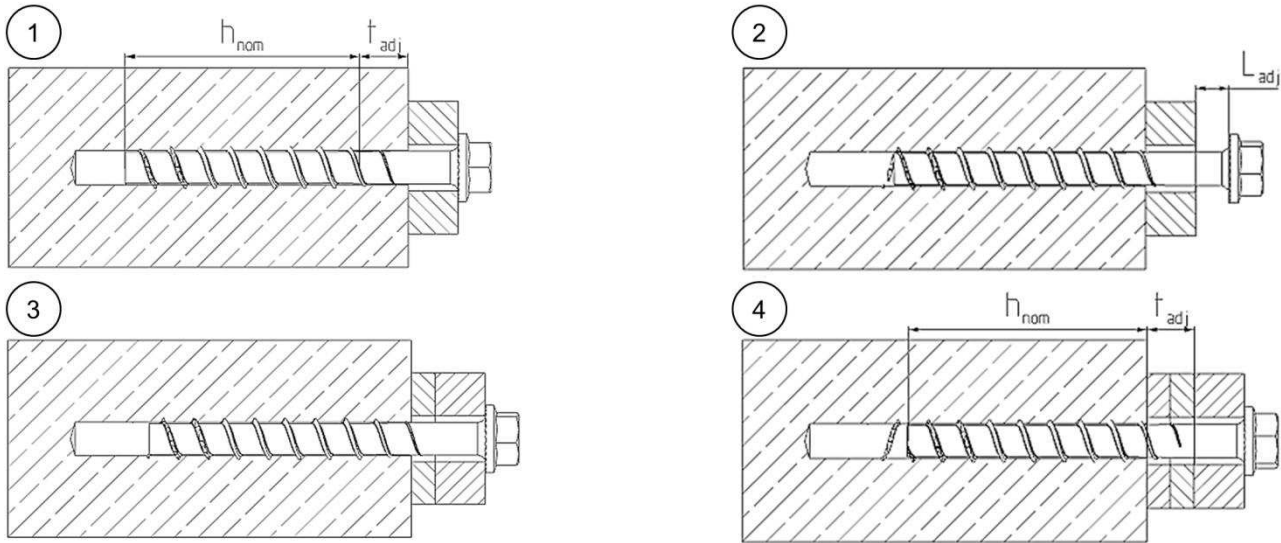


**fischer concrete screw ULTRACUT FBS II A4**

Intended use  
Installation parameters

**Annex B2**  
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] | 65  | 85  | 100 |
| Minimum thickness of concrete member | $h_{min}$ |      | 120 | 140 | 150 |
| Minimum spacing                      | $s_{min}$ |      | 35  | 40  | 50  |
| Minimum edge distance                | $c_{min}$ |      | 35  | 40  | 50  |

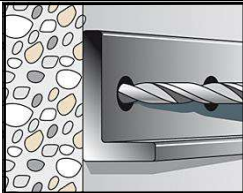
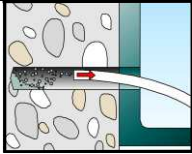
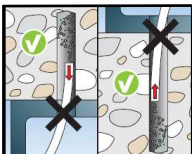
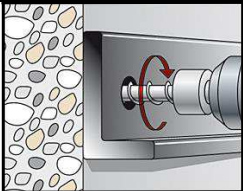
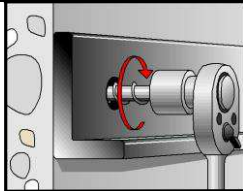
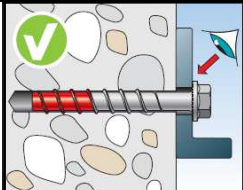
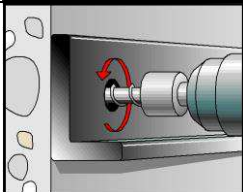
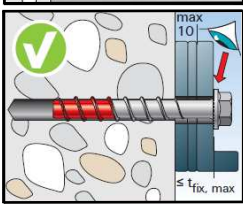
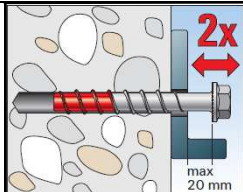
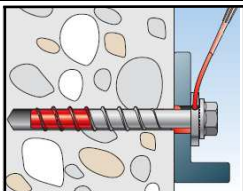
**fischer concrete screw ULTRACUT FBS II A4**

Intended use – Adjustment  
Minimum thickness of members, minimum spacing and edge distance

**Annex B3**  
of European  
Technical Assessment  
ETA-17/0740

## Installation instruction

### Installation of fischer concrete screw ULTRACUT FBS II A4

|                                                                                                                                                                                                     |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                    |                                                                                                   | Drill the hole using hammer drill, hollow drill or diamond core drill.<br><br>Drill hole diameter $d_0$ and drill hole depth $h_1$ according to table B2.1                                                                                                                                                                                           |
| <div>a) </div> <div>b) </div>     |                                                                                                   | Option a) Clean the drill hole<br><br>Option b) Cleaning of drill hole is not necessary when using a hollow drill with functional suction or:<br><br>- If drilling vertically upwards or<br>- If drilling vertically downwards and the drill hole depth has been increased. We recommend 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.                                                                                                                                                                                                |
| <div>1. </div> <div>3. </div> | <div>2. </div> | OPTIONAL:<br>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                                                                    |
|                                                                                                                  |                                                                                                   | For seismic performance category C2 applications:<br>The gap between screw shaft and fixture must be filled with mortar;<br>mortar compressive strength $\geq 50$ N/mm <sup>2</sup>                                                                                                                                                                  |
| fischer concrete screw ULTRACUT FBS II A4                                                                                                                                                           |                                                                                                   | Annex B4<br>of European<br>Technical Assessment<br>ETA-17/0740                                                                                                                                                                                                                                                                                       |
| Installation Instructions                                                                                                                                                                           |                                                                                                   |                                                                                                                                                                                                                                                                                                                                                      |

| FBS II A4                                                            |                       |                  | 8        | 10           | 12   |       |
|----------------------------------------------------------------------|-----------------------|------------------|----------|--------------|------|-------|
| Nominal embedment depth                                              |                       | $h_{nom}$        | [mm]     | 65           | 85   | 100   |
| Steel failure for tension load and shear load                        |                       |                  |          |              |      |       |
| Characteristic resistance                                            |                       | $N_{Rk,S}$       | [kN]     | 27,8         | 43,8 | 67,7  |
|                                                                      |                       | $\gamma_{M,S,N}$ | -        | 1,5          |      |       |
|                                                                      |                       | $V^0_{Rk,S}$     | [kN]     | 27,8         | 36,6 | 45,8  |
|                                                                      |                       | $\gamma_{M,S,V}$ | [-]      | 1,25         |      |       |
|                                                                      |                       | $k_7$            |          | 1,0          |      |       |
|                                                                      |                       | $M^0_{Rk,S}$     | [Nm]     | 31,3         | 68,5 | 112,8 |
| Pullout failure                                                      |                       |                  |          |              |      |       |
| Charact. resistance in concrete C20/25                               | Cracked               | $N_{Rk,P}$       | [kN]     | 9,0          | 16,0 | ..1)  |
|                                                                      | Uncracked             | $N_{Rk,P}$       | [kN]     | 14,0         | ..1) | ..1)  |
| Increasing factor concrete                                           | $C25/30$              |                  | $\Psi_c$ | [-]          | 1,12 |       |
|                                                                      | $C30/37$              |                  |          |              | 1,22 |       |
|                                                                      | $C35/45$              |                  |          |              | 1,32 |       |
|                                                                      | $C40/50$              |                  |          |              | 1,41 |       |
|                                                                      | $C45/55$              |                  |          |              | 1,50 |       |
|                                                                      | $C50/60$              |                  |          |              | 1,58 |       |
| Robustness factor                                                    |                       | $\gamma_{inst}$  | [-]      | 1,0          |      |       |
| Concrete cone failure and splitting failure; concrete pryout failure |                       |                  |          |              |      |       |
| Effective embedment depth                                            |                       | $h_{ef}$         | [mm]     | 52           | 68   | 81    |
| Factor for                                                           | Cracked               | $k_{cr,N}$       | [-]      | 7,7          |      |       |
|                                                                      | Uncracked             | $k_{ucr,N}$      |          | 11,0         |      |       |
| Concrete cone failure                                                | Edge distance         | $C_{cr,N}$       | [mm]     | 1,5 $h_{ef}$ |      |       |
|                                                                      | Spacing               | $S_{cr,N}$       |          | 3 $h_{ef}$   |      |       |
| Splitting failure                                                    | Cracked and Uncracked | $N^0_{Rk,Sp}$    | [kN]     | 18,4         | ..1) | ..1)  |
|                                                                      | Edge distance         | $C_{cr,sp}$      | [mm]     | 1,5 $h_{ef}$ |      |       |
|                                                                      | Spacing               | $S_{cr,sp}$      |          | 3 $h_{ef}$   |      |       |
| k-factor for pryout failure                                          |                       | $k_8$            | [-]      | 1,0          | 2,0  |       |
| Robustness safety factor                                             |                       | $\gamma_{inst}$  |          | 1,0          |      |       |
| Concrete edge failure                                                |                       |                  |          |              |      |       |
| Effective length in concrete                                         |                       | $l_f = h_{nom}$  | [mm]     | 65           | 85   | 100   |
| Nominal diameter of screw                                            |                       | $d_{nom}$        | [mm]     | 8            | 10   | 12    |

1) Pullout failure not decisive.

**fischer concrete screw ULTRACUT FBS II A4**

### Characteristic values for static and quasi-static action

**Annex C1**  
of European  
Technical Assessment  
ETA-17/0740

**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                        | $N_{Rk,s,C1}$   | [kN] | 27,8       | 43,8         | 67,7 |  |
|                                                  | $V_{Rk,s,C1}$   |      | 18,1       | 29,3         | 36,6 |  |
| Pullout failure                                  |                 |      |            |              |      |  |
| Characteristic resistance in cracked concrete    | $N_{Rk,p,C1}$   | [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 safety factor                       | $\gamma_{inst}$ | [-]  | 1,0        |              |      |  |
| Concrete pryout failure                          |                 |      |            |              |      |  |
| k-factor                                         | $k_8$           | [-]  | 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                        | $N_{Rk,s,C2}$               | [kN] | 27,8         | 43,8 | 67,7 |
|                                                  | $V_{Rk,s,C2}$               |      | 9,7          | 8,8  | 19,7 |
| Pullout failure                                  |                             |      |              |      |      |
| Characteristic resistance in cracked concrete    | $N_{Rk,p,C2}$               | [kN] | 2,8          | 5,0  | 7,3  |
| Concrete cone failure                            |                             |      |              |      |      |
| Effective embedment depth                        | $h_{ef}$                    | [mm] | 52           | 68   | 81   |
| Concrete cone failure                            | Edge distance<br>$C_{cr,N}$ |      | $1,5 h_{ef}$ |      |      |
|                                                  | Spacing<br>$S_{cr,N}$       |      | $3 h_{ef}$   |      |      |
| Robustness safety factor                         | $\gamma_{inst}$             | [-]  | 1,0          |      |      |
| Concrete pryout failure                          |                             |      |              |      |      |
| k-factor                                         | $k_8$                       | [-]  | 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   |

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Characteristic values for Seismic Performance Category C1 and C2

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**Table C3.1: Characteristic values for resistance to fire**

| FBS II A4                                                                                              |               |                 |      | 8             | 10                                                             | 12   |      |
|--------------------------------------------------------------------------------------------------------|---------------|-----------------|------|---------------|----------------------------------------------------------------|------|------|
| Nominal embedment depth                                                                                |               | $h_{nom}$       | [mm] | 65            | 85                                                             | 100  |      |
| 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, US TX     | $F_{Rk,s,fi}$   | R30  | [kN]          | 6,4                                                            | 11,0 | 15,2 |
|                                                                                                        |               |                 | R60  |               | 4,7                                                            | 8,1  | 11,2 |
|                                                                                                        |               |                 | R90  |               | 2,9                                                            | 5,2  | 7,3  |
|                                                                                                        |               |                 | R120 |               | 2,0                                                            | 3,8  | 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]          | 7,2                                                            | 15,4 | 25,3 |
|                                                                                                        |               |                 | R60  |               | 5,2                                                            | 11,4 | 18,7 |
|                                                                                                        |               |                 | R90  |               | 3,3                                                            | 7,3  | 12,1 |
|                                                                                                        |               |                 | R120 |               | 2,3                                                            | 5,3  | 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                                                                              | $N_{Rk,s,fi}$ | R30             | [kN] | 2,4           | 4,3                                                            | 6,3  |      |
|                                                                                                        |               | R60             |      |               |                                                                |      |      |
|                                                                                                        |               | R90             |      |               |                                                                |      |      |
|                                                                                                        |               | R120            |      |               |                                                                |      | 1,9  |
| Concrete cone failure                                                                                  |               |                 |      |               |                                                                |      |      |
| Characteristic resistance                                                                              | $N_{Rk,s,fi}$ | R30             | [kN] | 3,4           | 6,6                                                            | 10,2 |      |
|                                                                                                        |               | R60             |      |               |                                                                |      |      |
|                                                                                                        |               | R90             |      |               |                                                                |      |      |
|                                                                                                        |               | R120            |      |               |                                                                |      | 2,7  |
| 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 $\geq 300$ mm       |               |                 |      |               |                                                                |      |      |
| Spacing                                                                                                |               |                 |      |               |                                                                |      |      |
| R30 to R120                                                                                            |               | $s_{cr,fi}$     | [mm] | 2 $c_{cr,fi}$ |                                                                |      |      |
| Concrete pryout failure                                                                                |               |                 |      |               |                                                                |      |      |
| R30 to R120                                                                                            |               | k               | [-]  | 1,0           | 2,0                                                            |      |      |
| The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value |               |                 |      |               |                                                                |      |      |
|                                                                                                        |               |                 |      |               |                                                                |      |      |
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| Characteristic values for resistance to fire                                                           |               |                 |      |               |                                                                |      |      |

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

| FBS II A4                          |                    |      | 8   | 10   | 12   |
|------------------------------------|--------------------|------|-----|------|------|
| Nominal embedment depth            | $h_{nom}$          | [mm] | 65  | 85   | 100  |
| Tension load in cracked concrete   | N                  | [kN] | 4,5 | 8,1  | 12,0 |
| Displacement in cracked concrete   | $\delta_{N0}$      | [mm] | 0,4 | 0,7  | 1,4  |
|                                    | $\delta_{N\infty}$ |      | 1,1 | 1,8  | 1,9  |
| Tension load in uncracked concrete | N                  | [kN] | 7,1 | 11,9 | 17,1 |
| Displacement in uncracked concrete | $\delta_{N0}$      | [mm] | 0,7 | 0,8  | 1,25 |
|                                    | $\delta_{N\infty}$ |      | 0,7 | 0,8  | 1,25 |

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

| FBS II A4                                                         |                    |      | 8    | 10   | 12   |
|-------------------------------------------------------------------|--------------------|------|------|------|------|
| Nominal embedment depth                                           | $h_{nom}$          | [mm] | 65   | 85   | 100  |
| Shear load in cracked and uncracked concrete                      | V                  | [kN] | 15,9 | 20,9 | 26,2 |
| Displacement (the gap between fastener and fixture is subtracted) | $\delta_{V0}$      | [mm] | 2,7  | 3,5  | 2,9  |
|                                                                   | $\delta_{V\infty}$ |      | 4,1  | 5,3  | 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        | $\delta_{N,C2(DLS)}$ |      | 0,9 | 0,9 | 1,1 |
| Displacement ULS        | $\delta_{N,C2(ULS)}$ |      | 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        | $\delta_{V,C2(DLS)}$ |      | 1,6 | 1,7 | 2,6 |
| Displacement ULS        | $\delta_{V,C2(ULS)}$ |      | 5,0 | 3,8 | 6,6 |

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Displacements due to tension and shear loads

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