

## ΔΗΛΩΣΗ ΕΠΙΔΟΣΕΩΝ

### DoP 0414

για fischer Strong Undercut Anchor FSU (Εκτομούμενα αγκύρια για χρήση σε μπετόν)

EL

1. Μοναδικός κωδικός ταυτοποίησης του τύπου του προϊόντος: **DoP 0414**
2. Προβλεπόμενη(-ες) χρήση(-εις): **Μεταγενέστερη αγκύρωση σε ρηγματωμένο ή μη ρηγματωμένο σκυρόδεμα, δείτε το παράρτημα, ειδικά τα παραρτήματα B1 - B6.**
3. Κατασκευαστής: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Γερμανία**
4. Εξουσιοδοτημένος αντιπρόσωπος: **—**
5. Σύστημα/συστήματα AVCP (αξιολόγηση και επαλήθευση της σταθερότητας της επίδοσης): **1**
6. Ευρωπαϊκό έγγραφο αξιολόγησης: **EAD 330232-02-0601**  
 Ευρωπαϊκή τεχνική αξιολόγηση: **ETA-22/0674; 2026-03-25**  
 Οργανισμός τεχνικής αξιολόγησης: **DIBt- Deutsches Institut für Bautechnik**  
 Κοινοποιημένος(-οι) οργανισμός(-οι): **2873 TU Darmstadt**
7. Δηλωθείσα(-ες) επίδοση(-εις):  
**Μηχανική αντίσταση και σταθερότητα (BWR1)**  
**Χαρακτηριστική αντίσταση σε εφελκυστικό φορτίο (στατικό και σχεδόν στατικό) μέθοδος A:**  
 1 Αντίσταση σε αστοχία χάλυβα: δείτε το παράρτημα, ειδικά τα Παράρτημα C1  
 2 Αντίσταση σε αστοχία από εξόλκευση: δείτε το παράρτημα, ειδικά τα Παράρτημα C1  
 3 Αντίσταση σε αστοχία από κώνο σκυροδέματος: δείτε το παράρτημα, ειδικά τα Παράρτημα C1  
 4 Ανθεκτικότητα: δείτε το παράρτημα, ειδικά τα Παράρτημα C1  
 5 Ελάχιστη απόσταση από ακμή και μεταξύ αγκυρίων: δείτε το παράρτημα, ειδικά τα Παράρτημα C4  
 6 Απόσταση από ακμή για αποφυγή θραύσης από φορτίο: δείτε το παράρτημα, ειδικά τα Παράρτημα C1  
**Χαρακτηριστική αντίσταση σε διατμητικό φορτίο (στατικό και σχεδόν στατικό) μέθοδος A:**  
 7 Αντίσταση σε αστοχία χάλυβα (διατμητικό φορτίο): δείτε το παράρτημα, ειδικά τα Παραρτήματα C2, C3  
 8 Αντίσταση σε ολίσθηση: δείτε το παράρτημα, ειδικά τα Παραρτήματα C2, C3  
**Χαρακτηριστική αντίσταση για απλοποιημένο σχεδιασμό:**  
 9 Μέθοδος B: NPD  
 10 Μέθοδος C: NPD  
**Μετατόπιση:**  
 11 Μετατοπίσεις υπό στατικό και σχεδόν στατικό φορτίο: δείτε το παράρτημα, ειδικά τα Παράρτημα C9  
**Ακαμψία:**  
 12 Ακαμψία στην ελαστική περιοχή υπό φορτίο εφελκυσμού: δείτε το παράρτημα, ειδικά τα Παράρτημα C11  
 13 Χαρακτηριστικά ακαμψίας για φόρτιση σε εφελκυσμό για μη γραμμικά μοντέλα ελατηρίων: δείτε το παράρτημα, ειδικά τα Παράρτημα C11  
**Χαρακτηριστική αντοχή για την κατηγορία σεισμικής απόδοσης C1:**  
 14 Αντίσταση σε εφελκυσμό: δείτε το παράρτημα, ειδικά τα Παράρτημα C7  
 15 Αντίσταση σε διάτμηση, Παράμετρος περιμετρικού κενού: δείτε το παράρτημα, ειδικά τα Παράρτημα C7  
**Χαρακτηριστική αντίσταση και μετακινήσεις για τις σεισμικές κατηγορίες C2 (προαιρετικά):**  
 16 Αντίσταση σε εφελκυσμό, μετατόπιση: δείτε το παράρτημα, ειδικά τα Παραρτήματα C8, C10  
 17 Αντίσταση σε διάτμηση, μετατόπιση, Παράμετρος περιμετρικού κενού: δείτε το παράρτημα, ειδικά τα Παραρτήματα C8, C10  
**Ασφάλεια σε περίπτωση φωτιάς (BWR 2)**  
 18 Αντίδραση σε φωτιά: Κατηγορία (A1)  
**Αντίσταση στη φωτιά:**  
 19 Αντίσταση σε φωτιά για αστοχία χάλυβα (εφελκυστικό φορτίο): δείτε το παράρτημα, ειδικά τα Παράρτημα C5  
 20 Αντίσταση σε φωτιά για εξόλκευση (εφελκυστικό φορτίο): δείτε το παράρτημα, ειδικά τα Παράρτημα C5  
 21 Αντίσταση σε φωτιά για αστοχία χάλυβα (διατμητικό φορτίο): δείτε το παράρτημα, ειδικά τα Παραρτήματα C5, C6  
**Διάρκεια:**  
 22 Διάρκεια: δείτε το παράρτημα, ειδικά τα Παραρτήματα A3, B1
8. Κατάλληλη τεχνική τεκμηρίωση και/ή ειδική τεχνική τεκμηρίωση: **—**

Η επίδοση του προϊόντος που ταυτοποιείται ανωτέρω είναι σύμφωνη με τη (τις) δηλωθείσα(-ες) επίδοση(-εις). Αυτή η δήλωση επιδόσεων εκδίδεται σύμφωνα με τον Κανονισμό (ΕΕ) Αρ. 305/2011 με αποκλειστική ευθύνη του κατασκευαστή που προσδιορίζεται παραπάνω.

Υπογραφή για λογαριασμό και εξ ονόματος του κατασκευαστή από:



Dr. Christian Weber, Διευθυντής Ανάπτυξης  
Tumlingen, 2026-07-01



Dieter Pfaff, Επικεφαλής της Διεθνούς Ομοσπονδίας Παραγωγής και Διαχείρισης Ποιότητας

Αυτή η Δήλωση Επιδόσεων μεταφράστηκε σε διάφορες γλώσσες. Σε περίπτωση που υπάρχει αμφιβολία για τη μετάφραση, υπερισχύει πάντα η αγγλική έκδοση. Το παράρτημα περιλαμβάνει προαιρετικές και συμπληρωματικές πληροφορίες στα αγγλικά, που ξεπερνούν τις (οριζόμενες σε άλλες γλώσσες) νόμιμες απαιτήσεις.

Translation guidance Essential Characteristics and Performance Parameters for Annexes

**Οδηγίες Μετάφρασης των βασικών χαρακτηριστικών και απόδοσης για τα παραρτήματα**

**Μηχανική αντίσταση και σταθερότητα (BWR 1)**

**Μηχανική αντίσταση και σταθερότητα (BWR1)**

Characteristic resistance under static and quasi-static loading, Method A

**Χαρακτηριστική αντίσταση σε εφελκυστικό φορτίο (στατικό και σχεδόν στατικό) μέθοδος Α:**

|   |                                                                                                            |                                                          |
|---|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| 1 | Resistance to steel failure:<br><b>Αντίσταση σε αστοχία χάλυβα:</b>                                        | $N_{Rk,s}$ [kN], $E_s$ [N/mm <sup>2</sup> ]              |
| 2 | Resistance to pull-out failure:<br><b>Αντίσταση σε αστοχία από εξόλκευση:</b>                              | $N_{Rk,p}$ [kN], $\psi_c$                                |
| 3 | Resistance to concrete cone failure:<br><b>Αντίσταση σε αστοχία από κώνο σκυροδέματος:</b>                 | $k_{cr,N}$ , $k_{ucr,N}$ [-], $h_{ef}$ , $c_{cr,N}$ [mm] |
| 4 | Robustness:<br><b>Ανθεκτικότητα:</b>                                                                       | $\gamma_{inst}$ [-]                                      |
| 5 | Minimum edge distance and spacing:<br><b>Ελάχιστη απόσταση από ακμή και μεταξύ αγκυρίων:</b>               | $c_{min}$ , $s_{min}$ , $h_{min}$ [mm]                   |
| 6 | Edge distance to prevent splitting under load:<br><b>Απόσταση από ακμή για αποφυγή θραύσης από φορτίο:</b> | $N^0_{Rk,sp}$ [kN], $c_{cr,sp}$ [mm]                     |

Characteristic resistance to shear load (static and quasi-static loading), Method A

**Χαρακτηριστική αντίσταση σε διατμητικό φορτίο (στατικό και σχεδόν στατικό) μέθοδος Α:**

|   |                                                                                                          |                                                 |
|---|----------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 7 | Resistance to steel failure under shear load:<br><b>Αντίσταση σε αστοχία χάλυβα (διατμητικό φορτίο):</b> | $V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], $k_7$ [-] |
| 8 | Resistance to pry-out failure:<br><b>Αντίσταση σε ολίσθηση:</b>                                          | $k_8$ [-]                                       |

Characteristic Resistance for simplified design:

**Χαρακτηριστική αντίσταση για απλοποιημένο σχεδιασμό:**

|    |                                |                                                                                                               |
|----|--------------------------------|---------------------------------------------------------------------------------------------------------------|
| 9  | Method B:<br><b>Μέθοδος Β:</b> | $F^0_{Rk}$ [kN], $M^0_{Rk,s}$ [Nm] $\psi_c$ [-], $c_{cr}$ , $s_{cr}$ , $c_{min}$ , $s_{min}$ , $h_{min}$ [mm] |
| 10 | Method C:<br><b>Μέθοδος C:</b> | $F_{Rk}$ [kN], $M^0_{Rk,s}$ [Nm], $c_{cr}$ , $s_{cr}$ , $h_{min}$ [mm]                                        |

Displacements

**Μετατόπιση:**

|    |                                                                                                                    |                                                                                                      |
|----|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| 11 | Displacements under static and quasi-static loading:<br><b>Μετατοπίσεις υπό στατικό και σχεδόν στατικό φορτίο:</b> | $\delta_{N0}$ , $\delta_{N50years}$ , $\delta_{N100years}$ , $\delta_{V0}$ , $\delta_{V\infty}$ [mm] |
| 12 | Stiffness characteristics for tension loading for non-linear spring models:<br><b>Ακαμψία:</b>                     | $k_{1,ucr}$ , $k_{2,ucr}$ , $k_{3,ucr}$ , $k_{4,ucr}$                                                |

|    |                                                                                                                                                               |                                                                                                                          |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 12 | Stiffness in the elastic range under tension loading<br><b>Ακαμψία στην ελαστική περιοχή υπό φορτίο εφελκυσμού:</b>                                           | $k_{A,ucr}$ , $k_{A,cr}$ [N/mm]                                                                                          |
| 13 | Stiffness characteristics for tension loading for non-linear spring models<br><b>Χαρακτηριστικά ακαμψίας για φόρτιση σε εφελκυσμό για μη γραμμικά μοντέλα</b> | $k_{A,ucr}$ , $k_{B,ucr}$ , $k_{C,ucr}$ , $k_{D,ucr}$ [N/mm]<br>$k_{A,cr}$ , $k_{B,cr}$ , $k_{C,cr}$ , $k_{D,cr}$ [N/mm] |

Characteristic resistance for seismic performance category C1:

**Χαρακτηριστική αντοχή για την κατηγορία σεισμικής απόδοσης C1:**

|    |                                                                                                               |                                        |
|----|---------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 14 | Resistance to tension load:<br><b>Αντίσταση σε εφελκυσμό:</b>                                                 | $N_{Rk,s,C1}$ [kN], $N_{Rk,p,C1}$ [kN] |
| 15 | Resistance to shear load, Factor annular gap:<br><b>Αντίσταση σε διάτμηση, Παράμετρος περιμετρικού κενού:</b> | $V_{Rk,s,C1}$ [kN]                     |

Characteristic resistance and displacements for seismic performance categorie C2:

**Χαρακτηριστική αντίσταση και μετακινήσεις για τις σεισμικές κατηγορίες C2 (προαιρετικά):**

|    |                                                                                                                                             |                                                                                            |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 16 | Resistance to tension load, displacements:<br><b>Αντίσταση σε εφελκυσμό, μετατόπιση:</b>                                                    | $N_{Rk,s,C2}$ [kN], $N_{Rk,p,C2}$ [kN]<br>$\delta_{N,C2(0,5)}$ , $\delta_{N,C2(0,8)}$ [mm] |
| 17 | Resistance to shear load and displacements, factor annular gap:<br><b>Αντίσταση σε διάτμηση, μετατόπιση, Παράμετρος περιμετρικού κενού:</b> | $V_{Rk,s,C2}$ [kN],<br>$\delta_{V,C2(0,5)}$ , $\delta_{V,C2(0,8)}$ [mm]                    |

Safety in case of fire (BWR 2)

**Ασφάλεια σε περίπτωση φωτιάς (BWR 2)**

|    |                                                 |       |
|----|-------------------------------------------------|-------|
| 18 | Reaction to fire:<br><b>Αντίδραση σε φωτιά:</b> | Class |
|----|-------------------------------------------------|-------|

Resistance to fire:

|    |                                                                                                                        |                                          |
|----|------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 19 | Fire resistance to steel failure (tension load):<br><b>Αντίσταση σε φωτιά για αστοχία χάλυβα (εφελκυστικό φορτίο):</b> | $N_{Rk,s,fi}$ [kN]                       |
| 20 | Fire resistance to pull-out failure (tension load):<br><b>Αντίσταση σε φωτιά για εξόλκευση (εφελκυστικό φορτίο):</b>   | $N_{Rk,p,fi}$ [kN]                       |
| 21 | Fire resistance to steel failure (shear load):<br><b>Αντίσταση σε φωτιά για αστοχία χάλυβα (διατμητικό φορτίο):</b>    | $V_{Rk,s,fi}$ [kN], $M^0_{Rk,s,fi}$ [Nm] |

Aspects of durability

**Διάρκεια:**

|    |                                 |       |
|----|---------------------------------|-------|
| 22 | Durability:<br><b>Διάρκεια:</b> | Class |
|----|---------------------------------|-------|

## Specific part

### 1 Technical description of the product

The fischer Strong Undercut Anchor is an anchor made of galvanised steel or of stainless steel which is placed in a cylindrical hole and anchored by displacement-controlled, self-undercutted mechanical interlock.

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 and 100 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), Method A    | See Annex C1 and C4      |
| Characteristic resistance to shear load (static and quasi-static loading)                | See Annex C2 and C3      |
| Displacements                                                                            | See Annex C9             |
| Stiffness                                                                                | See Annex C11            |
| Characteristic resistance and displacements for seismic performance categories C1 and C2 | See Annex C7, C8 and C10 |

#### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance         |
|--------------------------|---------------------|
| Reaction to fire         | Class A1            |
| Resistance to fire       | See Annex C5 and C6 |

#### 3.3 Aspects of Durability

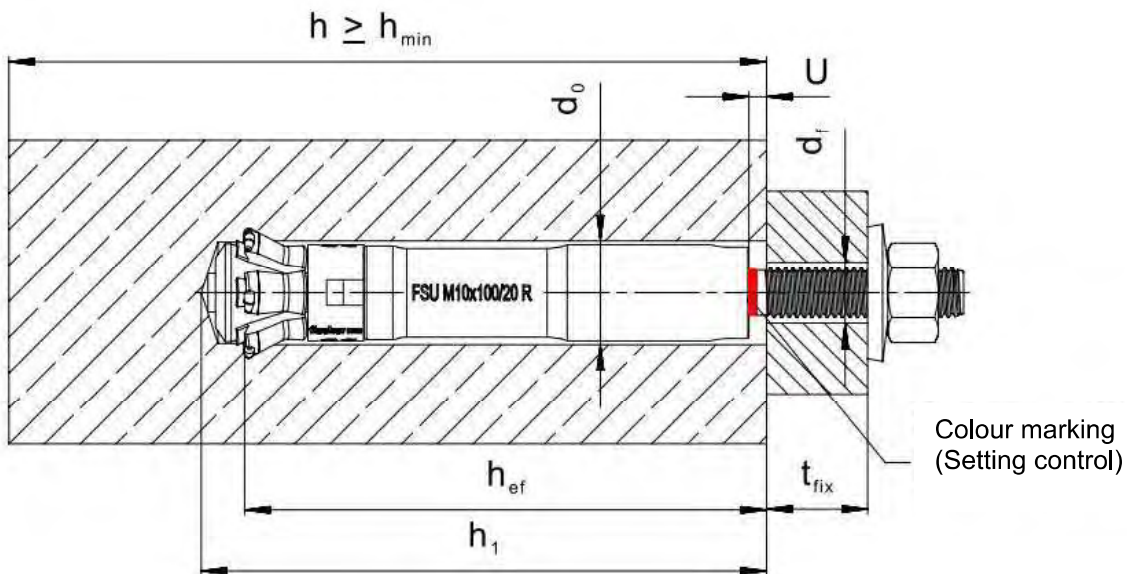
| Essential characteristic | Performance  |
|--------------------------|--------------|
| Durability               | See Annex B1 |

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

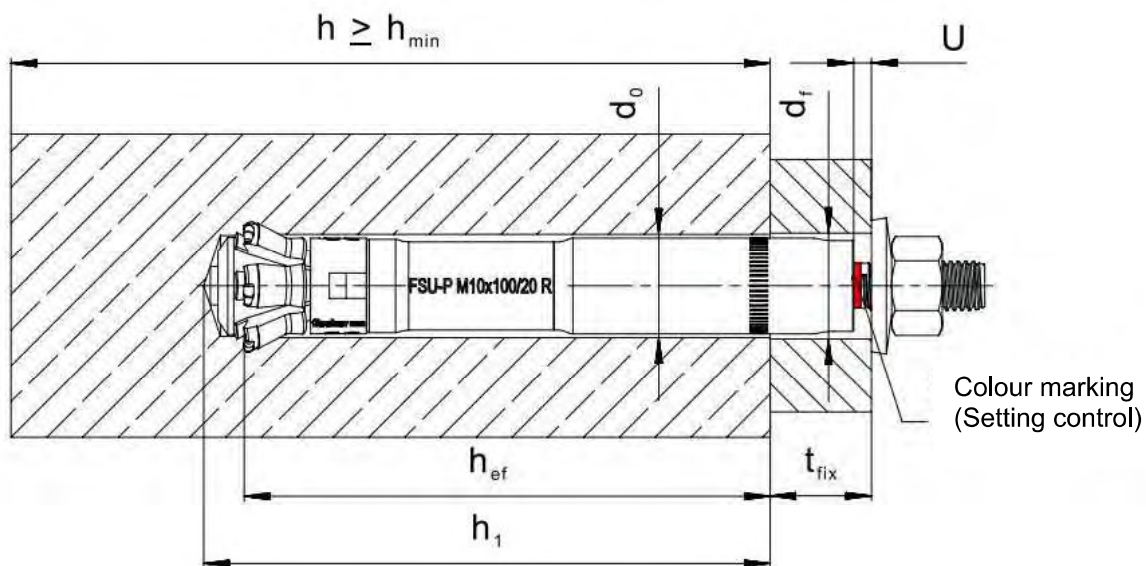
In accordance with the European Assessment Document EAD 330232-02-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

## Pre-setting anchor FSU / FSU R



## Push-through anchor FSU-P / FSU-P R



### Legend

- $d_0$  = Nominal drill hole diameter
- $d_f$  = Diameter of clearance hole in the fixture
- $h_{ef}$  = Effective embedment depth
- $h_1$  = Depth of drill hole to deepest point
- $h$  = Thickness of member
- $t_{fix}$  = Thickness of fixture
- $U$  = Gap after setting

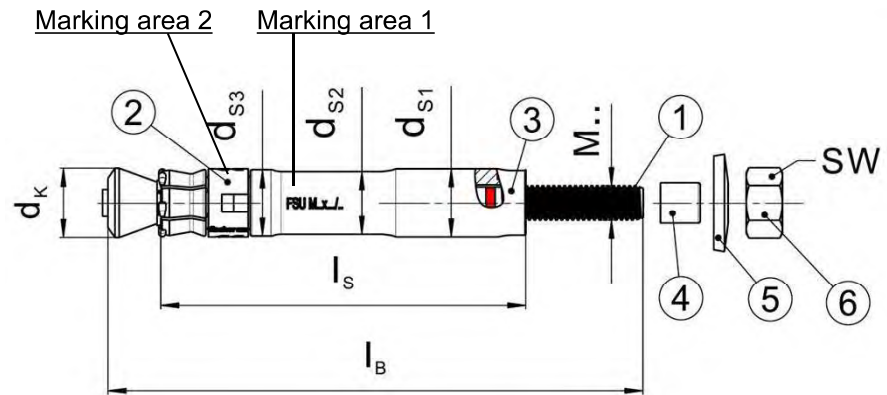
(Figures not to scale)

### fischer Strong Undercut Anchor FSU

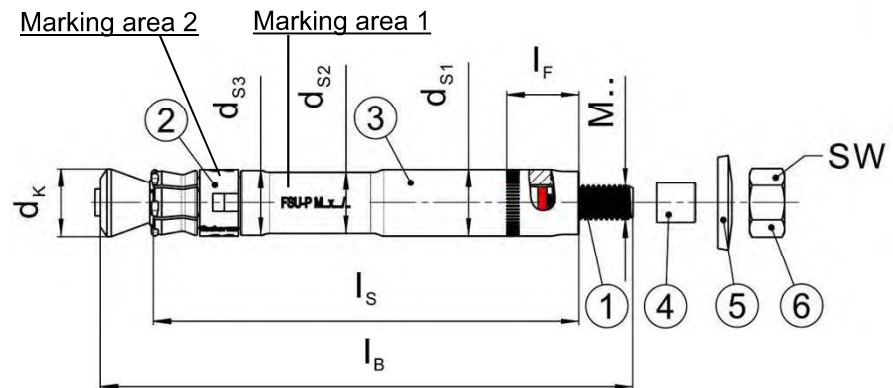
Product description  
Installed condition

### Annex A1

## Pre-setting anchor FSU / FSU R



## Push-through anchor FSU-P / FSU-P R



Product marking, example: FSU-P M10x100/20 R      optional: Brand

Type of fastener      Identification R (stainless steel version)

Thread size x effective embedment depth ( $h_{ef}$ ) / Maximum thickness of the fixture ( $t_{fix}$ )

**Table A6.1: Dimensions [mm]**

| Type of anchor       | $t_{fix}$         | $d_k$ | $d_{s1}$ | $d_{s2}$ | $d_{s3}$ | M  | $l_s$ | $l_B$ | $l_F$ | SW |
|----------------------|-------------------|-------|----------|----------|----------|----|-------|-------|-------|----|
| FSU M10x100/20 (R)   | $\leq 20$         | 19,3  | 19,0     | 17,5     | 18,5     | 10 | 100   | 148   | -     | 17 |
| FSU M12x125/30 (R)   | $\leq 30$         | 21,5  | 21,0     | 19,3     | 20,5     | 12 | 125   | 188   | -     | 19 |
| FSU M12x125/50 (R)   | $\leq 50$         | 21,5  | 21,0     | 19,3     | 20,5     | 12 | 125   | 208   | -     | 19 |
| FSU M16x190/40 (R)   | $\leq 40$         | 29,0  | 29,0     | 26,5     | 28,5     | 16 | 191   | 273   | -     | 24 |
| FSU M16x190/60 (R)   | $\leq 60$         | 29,0  | 29,0     | 26,5     | 28,5     | 16 | 191   | 293   | -     | 24 |
| FSU-P M10x100/20 (R) | $\geq 10 \leq 20$ | 19,3  | 19,0     | 17,5     | 18,5     | 10 | 120   | 148   | 20    | 17 |
| FSU-P M12x125/30 (R) | $\geq 12 \leq 30$ | 21,5  | 21,0     | 19,3     | 20,5     | 12 | 155   | 188   | 30    | 19 |
| FSU-P M12x125/50 (R) | $\geq 12 \leq 50$ | 21,5  | 21,0     | 19,3     | 20,5     | 12 | 175   | 208   | 50    | 19 |
| FSU-P M16x190/40 (R) | $\geq 15 \leq 40$ | 29,0  | 29,0     | 26,5     | 28,5     | 16 | 231   | 273   | 40    | 24 |
| FSU-P M16x190/60 (R) | $\geq 15 \leq 60$ | 29,0  | 29,0     | 26,5     | 28,5     | 16 | 251   | 293   | 60    | 24 |

(Figures not to scale)

**fischer Strong Undercut Anchor FSU**

**Product description**

Product description and dimensions

**Annex A2**

Appendix 4 / 23

Table A3.1: Materials FSU

| Part | Designation    | Material                                                          |                                            |
|------|----------------|-------------------------------------------------------------------|--------------------------------------------|
|      |                | FSU, FSU-P                                                        | FSU R, FSU-P R                             |
| 1    | Cone bolt      | Steel, zinc plated $\geq 5\text{ }\mu\text{m}$ , EN ISO 4042:2022 | Stainless steel according to EN 10088:2023 |
| 2    | Plastic sleeve | Plastic                                                           |                                            |
| 3    | Sleeve         | Steel, zinc plated $\geq 5\text{ }\mu\text{m}$ , EN ISO 4042:2022 | Stainless steel according to EN 10088:2023 |
| 4    | Protective cap | Plastic                                                           |                                            |
| 5    | Washer         | Steel, zinc plated $\geq 5\text{ }\mu\text{m}$ , EN ISO 4042:2022 | Stainless steel according to EN 10088:2023 |
| 6    | Hexagon nut    | Steel, zinc plated $\geq 5\text{ }\mu\text{m}$ , EN ISO 4042:2022 | Stainless steel A4-80                      |

Stop drill bit FSU-SD

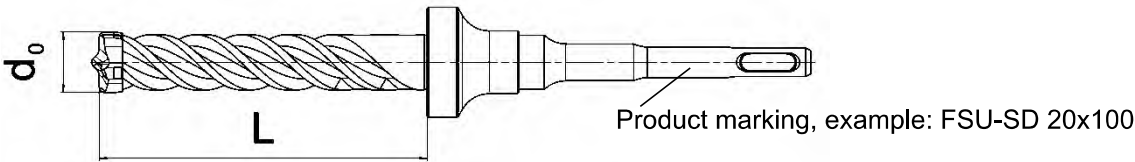


Table A3.2: Required stop drill bits for FSU

| Type of anchor       | Type of stop drill bit | d <sub>0</sub> [mm] | L [mm] |
|----------------------|------------------------|---------------------|--------|
| FSU M10x100/20 (R)   | FSU-SD 20x100          | 20                  | 107    |
| FSU M12x125/30 (R)   | FSU-SD 22x125          | 22                  | 132    |
| FSU M12x125/50 (R)   |                        |                     |        |
| FSU M16x190/40 (R)   | FSU-SD 30x190          | 30                  | 200    |
| FSU M16x190/60 (R)   |                        |                     |        |
| FSU-P M10x100/20 (R) | FSU-SD 20x120          | 20                  | 127    |
| FSU-P M12x125/30 (R) | FSU-SD 22x155          | 22                  | 162    |
| FSU-P M12x125/50 (R) | FSU-SD 22x175          | 22                  | 182    |
| FSU-P M16x190/40 (R) | FSU-SD 30x230          | 30                  | 240    |
| FSU-P M16x190/60 (R) | FSU-SD 30x250          | 30                  | 260    |

(Figure not to scale)

fischer Strong Undercut Anchor FSU

Product description  
Materials and stop drill bits

Annex A3

Machine setting tool FSU-ST

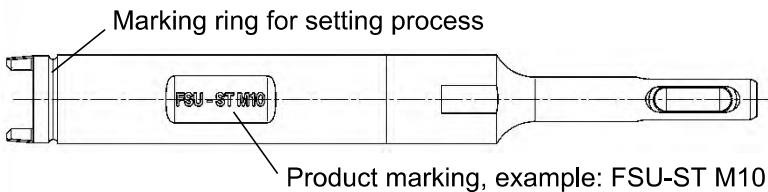


Table A4.1: Required machine setting tools for FSU

| Type of anchor       | Type of machine setting tool |
|----------------------|------------------------------|
| FSU M10x100/20 (R)   | FSU-ST M10                   |
| FSU M12x125/30 (R)   |                              |
| FSU M12x125/50 (R)   |                              |
| FSU M16x190/40 (R)   | FSU-ST M16                   |
| FSU M16x190/60 (R)   |                              |
| FSU-P M10x100/20 (R) | FSU-ST M10                   |
| FSU-P M12x125/30 (R) | FSU-ST M12                   |
| FSU-P M12x125/50 (R) |                              |
| FSU-P M16x190/40 (R) | FSU-ST M16                   |
| FSU-P M16x190/60 (R) |                              |

Table A4.2: Recommendations for hammer drills used with FSU-ST

| Technical feature    |         | Recommendation<br>FSU, FSU-P, FSU R, FSU-P R |         |           |
|----------------------|---------|----------------------------------------------|---------|-----------|
|                      |         | M10x100                                      | M12x125 | M16x190   |
| Drill chuck          | [-]     | SDS plus                                     |         | SDS Max   |
| Hammer drilling RPM  | [U/min] | 600 - 1800                                   |         | 200 - 700 |
| Hammer impact energy | [J]     | 2,5 - 6                                      |         | 8 - 13    |

(Figure not to scale)

|                                      |                                 |
|--------------------------------------|---------------------------------|
| fischer Strong Undercut Anchor FSU   | Annex A4<br><br>Appendix 6 / 23 |
| Product description<br>Setting tools |                                 |

## Specifications of intended use with working life 50 and 100 years

### Fastenings subject to:

| Size                           | FSU, FSU R, FSU-P, FSU-P R |            |            |            |            |
|--------------------------------|----------------------------|------------|------------|------------|------------|
|                                | M10x100/20                 | M12x125/30 | M12x125/50 | M16x190/40 | M16x190/60 |
| Static and quasi-static loads  | ✓                          |            |            |            |            |
| Cracked and uncracked concrete |                            |            |            |            |            |
| Seismic loads                  |                            |            |            |            |            |
| performance category           |                            |            |            |            |            |
| Fire exposure                  |                            |            |            |            |            |

### Base materials:

- Compacted reinforced and unreinforced normal weight concrete without fibres (cracked and uncracked) according to EN 206:2013+A2:2021.
- Strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021.

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (FSU, FSU-P, FSU R, FSU-P R).
- For all other conditions according to EN 1993-1-4:2006 + A1:2015 corresponding to corrosion resistance class CRC III: FSU R, FSU-P R.

### Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with EN 1992-4:2018.
- For requirements to resistance to fire local spalling of the concrete cover must be avoided.
- The stiffness characteristics  $k_A$ - $k_D$  (Annex C11) are intended to be used in finite element calculations, such as linear- and non-linear spring models, for the design of the fastener as a function of fastener displacements and the anchor plate stiffness.

**fischer Strong Undercut Anchor FSU**

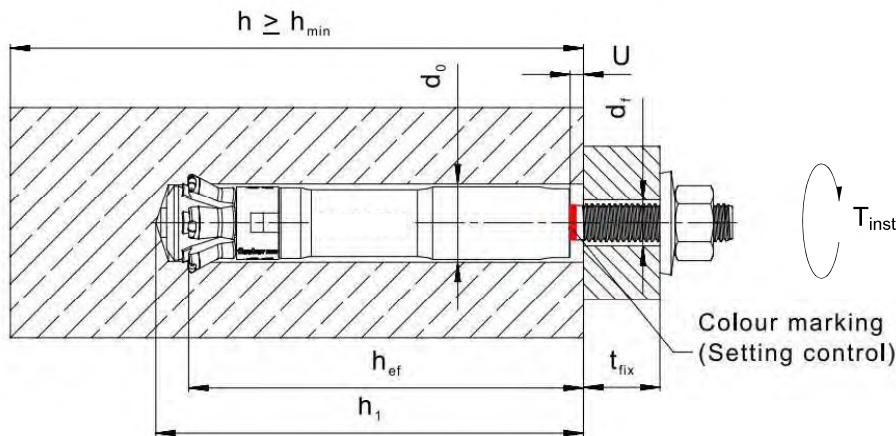
**Intended Use**  
Specifications

**Annex B1**

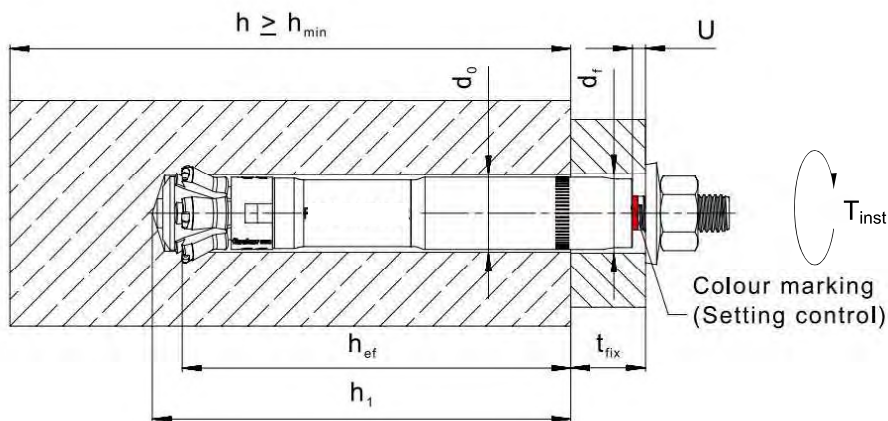
Appendix 7 / 23

**Table B2.1: Installation parameters**

| Size                                      |                 | FSU, FSU R     |                |                | FSU-P, FSU-P R    |                   |                   |
|-------------------------------------------|-----------------|----------------|----------------|----------------|-------------------|-------------------|-------------------|
|                                           |                 | M10x100<br>/20 | M12x125<br>/30 | M12x125<br>/50 | M10x100<br>/20    | M12x125<br>/30    | M12x125<br>/50    |
| Nominal drill hole diameter               | $d_0$           | 20             | 22             | 22             | 20                | 22                | 22                |
| Cutting diameter of drill bits            | $d_{cut} \leq$  | 20,5           | 22,5           | 22,5           | 20,5              | 22,5              | 22,5              |
| Depth of drill hole to deepest point      | $h_1 \geq$      | 107            | 132            | 132            | $127-t_{fix}$     | $162-t_{fix}$     | $182-t_{fix}$     |
| Effective embedment depth                 | $h_{ef} \geq$   | 100            | 125            | 125            | 100               | 125               | 125               |
| Diameter of clearance hole in the fixture | $d_f \leq$      | 12             | 14             | 14             | 21                | 23                | 23                |
| Thickness of the fixture                  | $t_{fix}$       | $\leq 20$      | $\leq 30$      | $\leq 50$      | $\geq 10 \leq 20$ | $\geq 12 \leq 30$ | $\geq 12 \leq 50$ |
| Gap after setting                         | U               | 2 - 5          | 3 - 6          | 3 - 6          | 2 - 5             | 3 - 6             | 3 - 6             |
| Required setting torque                   | $T_{inst}$ [Nm] | 40             | 80             | 80             | 40                | 80                | 80                |



**FSU (R)**



**FSU-P (R)**

(Figures not to scale)

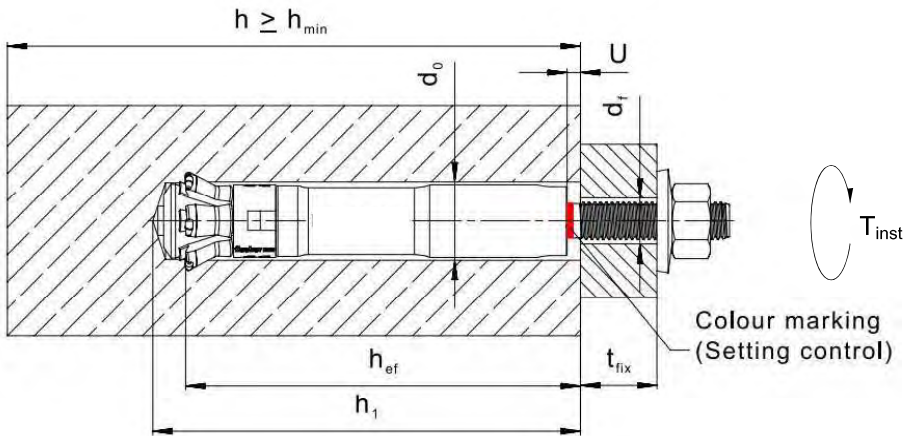
**fischer Strong Undercut Anchor FSU**

**Intended Use**  
Installation parameters

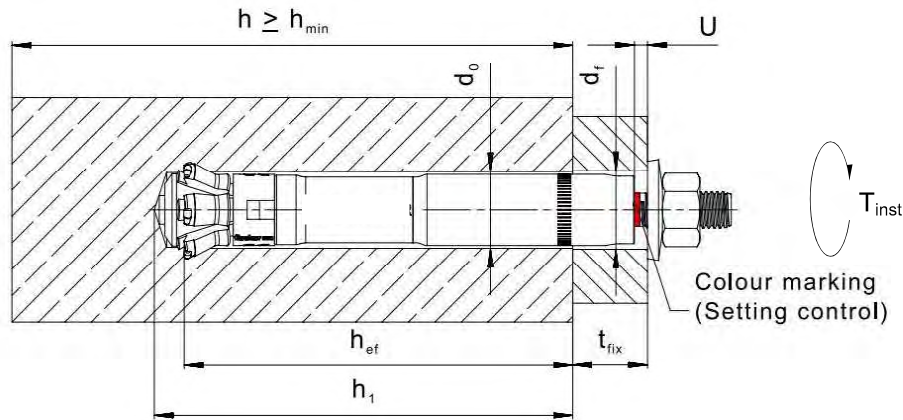
**Annex B2**

**Table B3.1: Installation parameters**

| Size                                      |                 | FSU, FSU R     |                | FSU-P, FSU-P R    |                   |
|-------------------------------------------|-----------------|----------------|----------------|-------------------|-------------------|
|                                           |                 | M16x190<br>/40 | M16x190<br>/60 | M16x190<br>/40    | M16x190<br>/60    |
| Nominal drill hole diameter               | $d_0$           | 30             | 30             | 30                | 30                |
| Cutting diameter of drill bits            | $d_{cut} \leq$  | 30,55          | 30,55          | 30,55             | 30,55             |
| Depth of drill hole to deepest point      | $h_1 \geq$      | 200            | 200            | $240-t_{fix}$     | $260-t_{fix}$     |
| Effective embedment depth                 | $h_{ef} \geq$   | 190            | 190            | 190               | 190               |
| Diameter of clearance hole in the fixture | $d_f \leq$      | 18             | 18             | 32                | 32                |
| Thickness of the fixture                  | $t_{fix}$       | $\leq 40$      | $\leq 60$      | $\geq 15 \leq 40$ | $\geq 15 \leq 60$ |
| Gap after setting                         | U               | 3 - 8          | 3 - 8          | 3 - 8             | 3 - 8             |
| Required setting torque                   | $T_{inst}$ [Nm] | 120            | 120            | 120               | 120               |



FSU (R)



FSU-P (R)

(Figures not to scale)

**fischer Strong Undercut Anchor FSU**

**Intended Use**  
Installation parameters

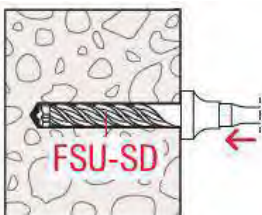
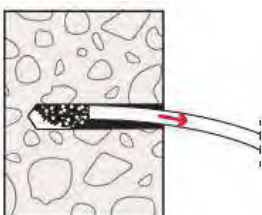
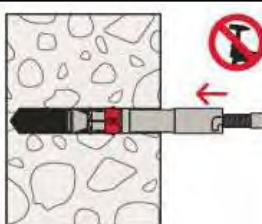
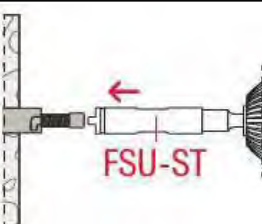
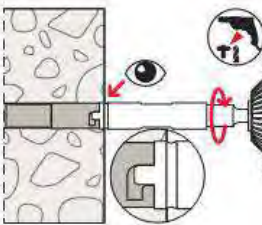
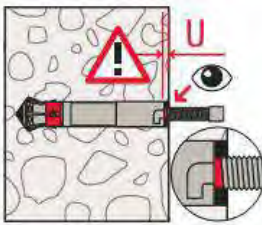
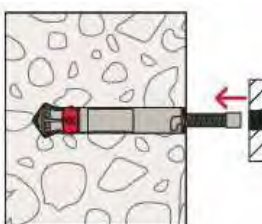
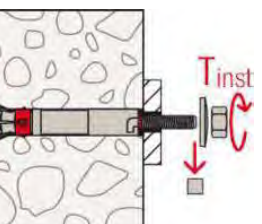
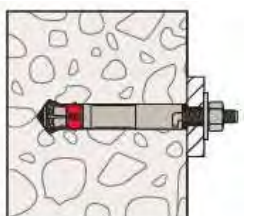
**Annex B3**

**Installation instructions**

- Fastener installation carried out by appropriately qualified personnel according to the design drawings and under the supervision of the person responsible for technical matters on the site.
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener.
- Fastener installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools (machine setting tool FSU-ST, stop drill bit FSU-SD).
- Drill hole created perpendicular (tolerance +/- 5°) to concrete surface.
- Cleaning the hole of drilling dust.
- Fastener installation ensuring complete expansion of the sleeve with checking that the coloured ring marking on the bolt is visible above the top edge of the anchor sleeve, therefore it is required using the setting tool FSU-ST, that is the appropriate depth ring marking of the setting tool at least flush with the concrete surface (pre-setting) respecting with the fixture surface (Push-through-setting).
- Fastener installation ensuring complete shear load capacity, after setting the gap between the top edge of the sleeve and the concrete surface (pre-setting) or with surface of the fixture (Push-through-setting) has to be in the specified range according to Annex B2 Table B2.1 or Annex B3 Table B3.1, respectively.
- Positioning of the drill holes and the undercut without damaging the reinforcement.
- In case of aborted hole: new drilling at a minimum distance twice the depth of the aborted drill hole or smaller distance, if the aborted drill hole is filled with high strength mortar and, if under shear or oblique tension load, it is not in the direction of load application.
- Application of the torque moment given in Annex B2 Table B2.1 or Annex B3 Table B3.1, respectively, using a calibrated torque wrench.

|                                    |                           |                  |
|------------------------------------|---------------------------|------------------|
| fischer Strong Undercut Anchor FSU |                           | Annex B4         |
| Intended Use                       | Installation instructions |                  |
|                                    |                           | Appendix 10 / 23 |

## Installation instructions for pre-setting anchor FSU, FSU R

|                                                                                               |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1)</p>    | <p>2)</p>   | <p>1) Drill the hole with the designated stop drill bit FSU-SD (see Table A3.2).<br/>2) Clean the hole.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>3)</p>    | <p>4)</p>   | <p>3) Place the anchor in the hole by hand. Do not use any hammering tools.<br/>4) Use the designated setting tool FSU-ST (see Table A4.1) and follow the recommendations for the hammer drill (see Table A4.2).</p>                                                                                                                                                                                                                                                                                                                                                 |
| <p>5)</p>    | <p>6)</p>   | <p>5) Place the setting tool in the grooves provided on the anchor. Carry out the setting process with the rotary-impact mode of the hammer drill. The setting process is completed when the marking ring of the setting tool is flush with the concrete surface.<br/>6) After removing the setting tool, the red coloured ring marking on the bolt must be visible above the top edge of the anchor sleeve. The gap U between the top edge of the sleeve and the concrete surface must be in the specified range according to Table B2.1 or B3.1, respectively.</p> |
| <p>7)</p>   | <p>8)</p>  | <p>7) Place the fixture.<br/>8) Remove the protective cap. Place the spring washer and the hexagon nut on the bolt. Take care of the right orientation of the spring washer, in the way, that the outer diameter of the washer in uncompressed condition is in touch with the fixture, only. Apply the installation torque.</p>                                                                                                                                                                                                                                      |
| <p>9)</p>  |                                                                                              | <p>9) Correctly installed fastener.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

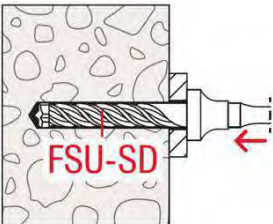
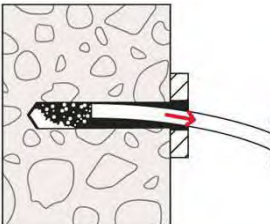
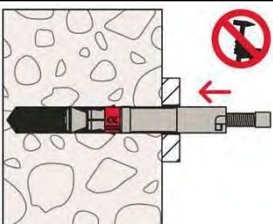
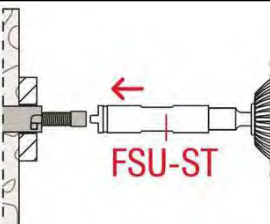
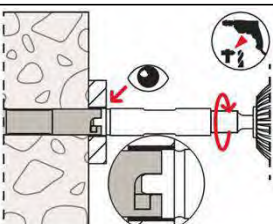
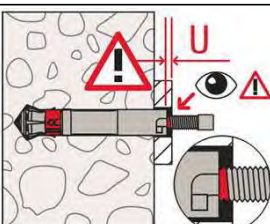
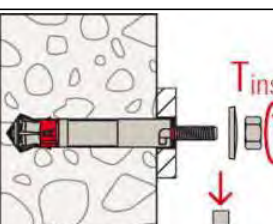
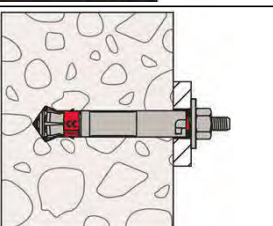
fischer Strong Undercut Anchor FSU

**Intended Use**  
Installation instructions

**Annex B5**

Appendix 11 / 23

## Installation instructions for push-through anchor FSU-P, FSU-P R

|    |                                                                                     |    |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----|-------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) |    | 2) |  | 1) Drill the hole with the designated stop drill bit FSU-SD (see table A3.2) in compliance with the specified range of fixture thicknesses (see Table B2.1 or B3.1, respectively).<br>2) Clean the hole.                                                                                                                                                                                                                                                                                                                                                         |
| 3) |    | 4) |  | 3) Place the anchor in the hole by hand. Do not use any hammering tools.<br>4) Use the designated setting tool FSU-ST (see Table A4.1) and follow the recommendations for the hammer drill (see Table A4.2).                                                                                                                                                                                                                                                                                                                                                     |
| 5) |    | 6) |  | 5) Place the setting tool in the grooves provided on the anchor. Carry out the setting process with the rotary-impact mode of the hammer drill. The setting process is completed when the marking ring of the setting tool is flush with the fixture surface.<br>6) After removing the setting tool, the red coloured ring marking on the bolt must be visible above the top edge of the anchor sleeve. The gap U between the top edge of the sleeve and the fixture surface must be in the specified range according to Table B2.1 or Table B3.1, respectively. |
| 7) |   |    |                                                                                   | 7) Remove the protective cap. Place the spring washer and the hexagon nut on the bolt. Take care of the right orientation of the spring washer, in the way, that the outer diameter of the washer in uncompressed condition is in touch with the fixture, only. Apply the installation torque.                                                                                                                                                                                                                                                                   |
| 8) |  |    |                                                                                   | 8) Correctly installed fastener.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

fischer Strong Undercut Anchor FSU

**Intended Use**  
Installation instructions

**Annex B6**

Appendix 12 / 23

**Table C1.1: Characteristic tension resistance under static and quasi-static action for a working life of 50 and 100 years**

| Size                                                                                                                                                                                                             |                    |                                                   | FSU, FSU-P, FSU R, FSU-P R |                       |                                                                         |       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------|----------------------------|-----------------------|-------------------------------------------------------------------------|-------|
|                                                                                                                                                                                                                  |                    |                                                   | M10x100                    | M12x125               | M16x190                                                                 |       |
| Steel failure                                                                                                                                                                                                    |                    |                                                   |                            |                       |                                                                         |       |
| Characteristic resistance                                                                                                                                                                                        |                    | N <sub>Rk,s</sub>                                 | [kN]                       | 46,4                  | 67,4                                                                    | 125,6 |
| Partial factor for steel failure                                                                                                                                                                                 |                    | γ <sub>Ms</sub>                                   | [-]                        | 1,5                   |                                                                         |       |
| Pullout failure                                                                                                                                                                                                  |                    |                                                   |                            |                       |                                                                         |       |
| Characteristic resistance in C20/25                                                                                                                                                                              | cracked concrete   | N <sub>Rk,p,cr</sub> = N <sub>Rk,p,cr,50</sub>    |                            | 46,4                  | 67,4                                                                    | 125,6 |
|                                                                                                                                                                                                                  |                    | N <sub>Rk,p,cr</sub> = N <sub>Rk,p,cr,100</sub>   |                            |                       | 63,4                                                                    |       |
|                                                                                                                                                                                                                  | uncracked concrete | N <sub>Rk,p,ucr</sub> = N <sub>Rk,p,ucr,100</sub> |                            |                       | 67,4                                                                    |       |
| Increasing factor for N <sub>Rk,p</sub> ;<br>N <sub>Rk,p,100</sub><br>N <sub>Rk,p</sub> = ψ <sub>c</sub> * N <sub>Rk,p</sub> (C20/25)<br>N <sub>Rk,p,100</sub> = ψ <sub>c</sub> * N <sub>Rk,p,100</sub> (C20/25) |                    |                                                   | C25/30                     | 1,12                  |                                                                         |       |
|                                                                                                                                                                                                                  |                    |                                                   | C30/37                     | 1,22                  |                                                                         |       |
|                                                                                                                                                                                                                  |                    |                                                   | C35/45                     | 1,32                  |                                                                         |       |
|                                                                                                                                                                                                                  |                    |                                                   | C40/50                     | 1,41                  |                                                                         |       |
|                                                                                                                                                                                                                  |                    |                                                   | C45/55                     | 1,50                  |                                                                         |       |
|                                                                                                                                                                                                                  |                    |                                                   | C50/60                     | 1,58                  |                                                                         |       |
| Installation sensitivity factor                                                                                                                                                                                  |                    | γ <sub>inst</sub>                                 | [-]                        | 1,0                   |                                                                         |       |
| Concrete cone and splitting failure                                                                                                                                                                              |                    |                                                   |                            |                       |                                                                         |       |
| Effective embedment depth                                                                                                                                                                                        |                    | h <sub>ef</sub>                                   | [mm]                       | 100                   | 125                                                                     | 190   |
| Factor for cracked concrete                                                                                                                                                                                      |                    | k <sub>cr,N</sub>                                 | [-]                        | 8,9                   |                                                                         |       |
| Factor for uncracked concrete                                                                                                                                                                                    |                    | k <sub>ucr,N</sub>                                |                            | 12,7                  |                                                                         |       |
| Characteristic spacing                                                                                                                                                                                           |                    | s <sub>cr,N</sub>                                 | [mm]                       | 3 x h <sub>ef</sub>   |                                                                         |       |
| Characteristic edge distance                                                                                                                                                                                     |                    | c <sub>cr,N</sub>                                 |                            | 1,5 x h <sub>ef</sub> |                                                                         |       |
| Characteristic spacing for splitting failure                                                                                                                                                                     |                    | s <sub>cr,sp</sub>                                |                            | 3 x h <sub>ef</sub>   |                                                                         |       |
| Characteristic edge distance for splitting failure                                                                                                                                                               |                    | c <sub>cr,sp</sub>                                |                            | 1,5 x h <sub>ef</sub> |                                                                         |       |
| Characteristic resistance for splitting failure                                                                                                                                                                  |                    | N <sup>0</sup> <sub>Rk,sp</sub>                   |                            | [kN]                  | min {N <sup>0</sup> <sub>Rk,c</sub> ; N <sub>Rk,p</sub> } <sup>1)</sup> |       |

1)  $N^0_{Rk,c}$  according to EN 1992-4:2018.

**fischer Strong Undercut Anchor FSU**

**Performances**

Characteristic tension resistance under static and quasi-static action for a working life of 50 and 100 years

**Annex C1**

Appendix 13 / 23

**Table C2.1: Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years**

| Size                              |                    |      | FSU, FSU R |         |
|-----------------------------------|--------------------|------|------------|---------|
|                                   |                    |      | M10x100    | M12x125 |
| Steel failure without lever arm   |                    |      |            |         |
| Characteristic resistance         | $V_{Rk,s}^0$ FSU   | [kN] | 26,8       | 38,2    |
|                                   | $V_{Rk,s}^0$ FSU R |      | 32,9       | 49,9    |
| Partial factor for steel failure  | $\gamma_{Ms}$      | [-]  | 1,25       |         |
| Factor for ductility              | $k_7$              |      | 1,0        |         |
| Steel failure with lever arm      |                    |      |            |         |
| Characteristic bending resistance | $M_{Rk,s}^0$       | [Nm] | 59,8       | 104,8   |
| Partial factor for steel failure  | $\gamma_{Ms}$      | [-]  | 1,25       |         |
| Concrete pryout failure           |                    |      |            |         |
| Factor for pryout failure         | $k_8$              | [-]  | 2,5        |         |
| Concrete edge failure             |                    |      |            |         |
| Effective length in concrete      | $l_f$              | [mm] | 100        | 125     |
| Effective diameter of fastener    | $d_{nom}$          |      | 19         | 21      |

**Table C2.2: Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years**

| Size                              |                    |      | FSU, FSU R<br>M16x190 |
|-----------------------------------|--------------------|------|-----------------------|
| Steel failure without lever arm   |                    |      |                       |
| Characteristic resistance         | $V_{Rk,s}^0$ FSU   | [kN] | 69,1                  |
|                                   | $V_{Rk,s}^0$ FSU R |      | 87,9                  |
| Partial factor for steel failure  | $\gamma_{Ms}$      | [-]  | 1,25                  |
| Factor for ductility              | $k_7$              |      | 1,0                   |
| Steel failure with lever arm      |                    |      |                       |
| Characteristic bending resistance | $M_{Rk,s}^0$       | [Nm] | 266,4                 |
| Partial factor for steel failure  | $\gamma_{Ms}$      | [-]  | 1,25                  |
| Concrete pryout failure           |                    |      |                       |
| Factor for pryout failure         | $k_8$              | [-]  | 2,5                   |
| Concrete edge failure             |                    |      |                       |
| Effective length in concrete      | $l_f$              | [mm] | 190                   |
| Effective diameter of fastener    | $d_{nom}$          |      | 29                    |

**fischer Strong Undercut Anchor FSU**

**Performances**

Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years

**Annex C2**

**Table C3.1: Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years**

| Size                              |                                        |      | FSU-P, FSU-P R             |                            |                            |                            |
|-----------------------------------|----------------------------------------|------|----------------------------|----------------------------|----------------------------|----------------------------|
|                                   |                                        |      | M10x100                    |                            | M12x125                    |                            |
| Steel failure without lever arm   |                                        |      |                            |                            |                            |                            |
| Characteristic resistance         | for t <sub>fix</sub>                   | [mm] | 10 ≤ t <sub>fix</sub> < 15 | 15 ≤ t <sub>fix</sub> ≤ 20 | 12 ≤ t <sub>fix</sub> < 20 | 20 ≤ t <sub>fix</sub> ≤ 50 |
|                                   | V <sup>0</sup> <sub>Rk,s</sub> FSU-P   | [kN] | 66,1                       | 69,6                       | 86,4                       | 96,7                       |
|                                   | V <sup>0</sup> <sub>Rk,s</sub> FSU-P R |      | 74,6                       | 80,6                       | 102,9                      | 103,6                      |
| Partial factor for steel failure  | γ <sub>Ms</sub>                        | [-]  | 1,25                       |                            |                            |                            |
| Factor for ductility              | k <sub>7</sub>                         |      | 1,0                        |                            |                            |                            |
| Steel failure with lever arm      |                                        |      |                            |                            |                            |                            |
| Characteristic bending resistance | M <sup>0</sup> <sub>Rk,s</sub>         | [Nm] | 59,8                       |                            | 104,8                      |                            |
| Partial factor for steel failure  | γ <sub>Ms</sub>                        | [-]  | 1,25                       |                            |                            |                            |
| Concrete pryout failure           |                                        |      |                            |                            |                            |                            |
| Factor for pryout failure         | k <sub>8</sub>                         | [-]  | 2,5                        |                            |                            |                            |
| Concrete edge failure             |                                        |      |                            |                            |                            |                            |
| Effective length in concrete      | l <sub>f</sub>                         | [mm] | 100                        |                            | 125                        |                            |
| Effective diameter of fastener    | d <sub>nom</sub>                       |      | 19                         |                            | 21                         |                            |

**Table C3.2: Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years**

| Size                              |                                        |      | FSU-P, FSU-P R<br>M16x190  |                            |
|-----------------------------------|----------------------------------------|------|----------------------------|----------------------------|
| Steel failure without lever arm   |                                        |      |                            |                            |
| Characteristic resistance         | for t <sub>fix</sub>                   | [mm] | 15 ≤ t <sub>fix</sub> < 40 | 40 ≤ t <sub>fix</sub> ≤ 60 |
|                                   | V <sup>0</sup> <sub>Rk,s</sub> FSU-P   | [kN] | 178,8                      | 226,7                      |
|                                   | V <sup>0</sup> <sub>Rk,s</sub> FSU-P R |      | 214,7                      | 286,7                      |
| Partial factor for steel failure  | γ <sub>Ms</sub>                        | [-]  | 1,25                       |                            |
| Factor for ductility              | k <sub>7</sub>                         |      | 1,0                        |                            |
| Steel failure with lever arm      |                                        |      |                            |                            |
| Characteristic bending resistance | M <sup>0</sup> <sub>Rk,s</sub>         | [Nm] | 266,4                      |                            |
| Partial factor for steel failure  | γ <sub>Ms</sub>                        | [-]  | 1,25                       |                            |
| Concrete pryout failure           |                                        |      |                            |                            |
| Factor for pryout failure         | k <sub>8</sub>                         | [-]  | 2,5                        |                            |
| Concrete edge failure             |                                        |      |                            |                            |
| Effective length in concrete      | l <sub>f</sub>                         | [mm] | 190                        |                            |
| Effective diameter of fastener    | d <sub>nom</sub>                       |      | 29                         |                            |

**fischer Strong Undercut Anchor FSU**

**Performances**

Characteristic shear resistance under static and quasi-static action for a working life of 50 and 100 years

**Annex C3**

Appendix 15 / 23

**Table C4.1: Minimum thickness of concrete members**

| Size                                                | FSU, FSU R |            |            |            |            |
|-----------------------------------------------------|------------|------------|------------|------------|------------|
|                                                     | M10x100/20 | M12x125/30 | M12x125/50 | M16x190/40 | M16x190/60 |
| Minimum thickness of concrete member $h_{min}$ [mm] | 170        | 215        |            | 270        |            |

**Table C4.2: Minimum thickness of concrete members**

| Size                                                | FSU-P, FSU-P R     |                    |                    |                    |                    |
|-----------------------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                                                     | M10x100/20         | M12x125/30         | M12x125/50         | M16x190/40         | M16x190/60         |
| Maximum thickness of the fixture $t_{fix,max}$ [mm] | 20                 | 30                 | 50                 | 40                 | 60                 |
| Minimum thickness of concrete member $h_{min}$      | $190-t_{fix}^{1)}$ | $245-t_{fix}^{1)}$ | $265-t_{fix}^{1)}$ | $310-t_{fix}^{1)}$ | $330-t_{fix}^{1)}$ |

<sup>1)</sup>  $t_{fix}$  = actual thickness of the fixture.

**Table C4.3: Minimum spacings and edge distances**

| Size                            | FSU, FSU-P, FSU R, FSU-P R |            |            |            |            |
|---------------------------------|----------------------------|------------|------------|------------|------------|
|                                 | M10x100/20                 | M12x125/30 | M12x125/50 | M16x190/40 | M16x190/60 |
| Minimum spacing $s_{min}$ [mm]  | 80                         | 90         |            | 100        |            |
| Minimum edge distance $c_{min}$ | 80                         | 90         |            | 100        |            |

**fischer Strong Undercut Anchor FSU**

**Performances**

Minimum thickness of concrete member, minimum spacings and edge distances

**Annex C4**

**Table C5.1: Characteristic tension resistance under fire exposure for a working life of 50 and 100 years**

| Size                                                      |                   |         | FSU, FSU-P |         | FSU R, FSU-P R |         |
|-----------------------------------------------------------|-------------------|---------|------------|---------|----------------|---------|
|                                                           |                   |         | M10x100    | M12x125 | M10x100        | M12x125 |
| Characteristic resistance<br><b>steel failure</b>         | $N_{Rk,s,fi}$     | R30     | 3,7        | 4,5     | 7,2            | 10,4    |
|                                                           |                   | R60     | 2,2        | 3,2     | 5,3            | 7,7     |
|                                                           |                   | R90     | 1,7        | 2,8     | 4,7            | 6,9     |
|                                                           |                   | R120    | 1,5        | 2,6     | 4,4            | 6,4     |
| Characteristic resistance<br><b>Concrete cone failure</b> | $N_{Rk,c,fi}$     | R30-R90 | 19,9       | 34,8    | 19,9           | 34,8    |
|                                                           |                   | R120    | 15,9       | 27,8    | 15,9           | 27,8    |
| Characteristic resistance<br><b>pullout failure</b>       | $N_{Rk,p,fi,50}$  | R30-R90 | 11,6       | 16,9    | 11,6           | 16,9    |
|                                                           |                   | R120    | 9,3        | 13,5    | 9,3            | 13,5    |
|                                                           | $N_{Rk,p,fi,100}$ | R30-R90 | 11,6       | 15,9    | 11,6           | 15,9    |
|                                                           |                   | R120    | 9,3        | 12,7    | 9,3            | 12,7    |

**Table C5.2: Characteristic tension resistance under fire exposure for a working life of 50 and 100 years**

| Size                                                      |               | FSU, FSU-P |         | FSU R, FSU-P R |         |
|-----------------------------------------------------------|---------------|------------|---------|----------------|---------|
|                                                           |               | M16x190    | M16x190 | M16x190        | M16x190 |
| Characteristic resistance<br><b>steel failure</b>         | $N_{Rk,s,fi}$ | R30        | 7,9     | 19,4           |         |
|                                                           |               | R60        | 5,6     | 14,4           |         |
|                                                           |               | R90        | 4,9     | 12,8           |         |
|                                                           |               | R120       | 4,5     | 11,9           |         |
| Characteristic resistance<br><b>Concrete cone failure</b> | $N_{Rk,c,fi}$ | R30-R90    | 99,0    | 99,0           |         |
|                                                           |               | R120       | 79,2    | 79,2           |         |
| Characteristic resistance<br><b>pullout failure</b>       | $N_{Rk,p,fi}$ | R30-R90    | 31,4    | 31,4           |         |
|                                                           |               | R120       | 25,1    | 25,1           |         |

**Table C5.3: Characteristic shear resistance under fire exposure for a working life of 50 and 100 years**

| Size                                                                         |      | FSU, FSU-P                             |                             | FSU R, FSU-P R |         |      |
|------------------------------------------------------------------------------|------|----------------------------------------|-----------------------------|----------------|---------|------|
|                                                                              |      | M10x100                                | M12x125                     | M10x100        | M12x125 |      |
| Characteristic resistance<br>steel failure without<br>lever arm              | R30  | V <sub>Rk,s,fi</sub> [kN]              | 3,7                         | 4,5            | 7,2     | 10,4 |
|                                                                              | R60  |                                        | 2,2                         | 3,2            | 5,3     | 7,7  |
|                                                                              | R90  |                                        | 1,7                         | 2,8            | 4,7     | 6,9  |
|                                                                              | R120 |                                        | 1,5                         | 2,6            | 4,4     | 6,4  |
| Characteristic bending<br>resistance steel failure<br>with lever arm         | R30  | M <sup>0</sup> <sub>Rk,s,fi</sub> [Nm] | 4,8                         | 6,9            | 9,2     | 16,2 |
|                                                                              | R60  |                                        | 2,9                         | 5,0            | 6,9     | 12,0 |
|                                                                              | R90  |                                        | 2,2                         | 4,4            | 6,1     | 10,6 |
|                                                                              | R120 |                                        | 1,9                         | 4,0            | 5,7     | 10,0 |
| Concrete failure V <sup>0</sup> <sub>Rk,c,fi</sub> and V <sub>Rk,cp,fi</sub> |      |                                        | According to EN 1992-4:2018 |                |         |      |

**fischer Strong Undercut Anchor FSU**

#### Performances

Characteristic resistance under fire exposure for a working life of 50 and 100 years

**Annex C5**

**Table C6.1: Characteristic shear resistance under fire exposure for a working life of 50 and 100 years**

| Size                                                                         |                     | FSU, FSU-P<br>M16x190       | FSU R, FSU-P R<br>M16x190 |
|------------------------------------------------------------------------------|---------------------|-----------------------------|---------------------------|
| Characteristic resistance<br><b>steel failure without<br/>lever arm</b>      | $V_{Rk,s,fi}$ R30   | 7,9                         | 19,4                      |
|                                                                              | R60                 | 5,6                         | 14,4                      |
|                                                                              | R90                 | 4,9                         | 12,8                      |
|                                                                              | R120                | 4,5                         | 11,9                      |
| Characteristic bending<br>resistance <b>steel failure<br/>with lever arm</b> | $M^0_{Rk,s,fi}$ R30 | 16,7                        | 41,2                      |
|                                                                              | R60                 | 11,9                        | 30,6                      |
|                                                                              | R90                 | 10,3                        | 27,1                      |
|                                                                              | R120                | 9,5                         | 25,3                      |
| Concrete failure $V^0_{Rk,c,fi}$ and $V_{Rk,cp,fi}$                          |                     | According to EN 1992-4:2018 |                           |

**Table C6.2: Minimum spacings and minimum edge distances under fire exposure for tension and shear load**

| Size                  |              | FSU, FSU-P, FSU R, FSU-P R<br>All sizes                                                          |
|-----------------------|--------------|--------------------------------------------------------------------------------------------------|
| Minimum spacing       | $s_{min,fi}$ | $4 \cdot h_{ef}$                                                                                 |
| Minimum edge distance | $c_{min,fi}$ | $2 \cdot h_{ef}$ ,<br>for fire exposure from more than one side $c_{min,fi} \geq 300 \text{ mm}$ |

fischer Strong Undercut Anchor FSU

**Performances**  
Characteristic resistance under fire exposure for a working life of 50 and 100 years  
Minimum spacing and edge distance under fire exposure for tension and shear load

**Table C7.1: Characteristic values of tension and shear resistance under seismic performance category C1 for a working life of 50 and 100 years**

| Size                                                                                       |                                |                                               |      | FSU, FSU-P, FSU R, FSU-P R    |                                  |                               |                                  |
|--------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------|------|-------------------------------|----------------------------------|-------------------------------|----------------------------------|
|                                                                                            |                                |                                               |      | M10x100                       |                                  | M12x125                       |                                  |
| Factor for annular gap                                                                     | without filling of annular gap | $\alpha_{\text{gap}}$                         | [-]  | 0,5                           |                                  |                               |                                  |
| Steel failure                                                                              |                                |                                               |      |                               |                                  |                               |                                  |
| Characteristic resistance tension load seismic performance category C1                     |                                | $N_{\text{Rk,s,C1}}$                          | [kN] | 46,4                          |                                  | 67,4                          |                                  |
| Pullout failure                                                                            |                                |                                               |      |                               |                                  |                               |                                  |
| Characteristic resistance tension load in cracked concrete seismic performance category C1 |                                | $N_{\text{Rk,p,C1}} = N_{\text{Rk,p,C1,50}}$  | [kN] | 46,4                          |                                  | 67,4                          |                                  |
|                                                                                            |                                | $N_{\text{Rk,p,C1}} = N_{\text{Rk,p,C1,100}}$ |      |                               |                                  | 63,4                          |                                  |
| Steel failure without lever arm                                                            |                                |                                               |      |                               |                                  |                               |                                  |
| Characteristic resistance shear load seismic performance category C1                       | for $t_{\text{fix}}$           | [mm]                                          |      | $10 \leq t_{\text{fix}} < 15$ | $15 \leq t_{\text{fix}} \leq 20$ | $12 \leq t_{\text{fix}} < 20$ | $20 \leq t_{\text{fix}} \leq 50$ |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU       | [kN]                                          |      | 18,8                          |                                  | 26,8                          |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU R     |                                               |      | 23,0                          |                                  | 34,9                          |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU-P     |                                               | 46,3 | 48,7                          | 60,5                             | 67,7                          |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU-P R   |                                               | 52,2 | 56,4                          | 72,0                             | 72,5                          |                                  |

**Table C7.2: Characteristic values of tension and shear resistance under seismic performance category C1 for a working life of 50 and 100 years**

| Size                                                                                       |                                |                       |       | FSU, FSU-P, FSU R, FSU-P R<br>M16x190 |                                  |
|--------------------------------------------------------------------------------------------|--------------------------------|-----------------------|-------|---------------------------------------|----------------------------------|
| Factor for annular gap                                                                     | without filling of annular gap | $\alpha_{\text{gap}}$ | [-]   | 0,5                                   |                                  |
| Steel failure                                                                              |                                |                       |       |                                       |                                  |
| Characteristic resistance tension load seismic performance category C1                     |                                | $N_{\text{Rk,s,C1}}$  | [kN]  | 125,6                                 |                                  |
| Pullout failure                                                                            |                                |                       |       |                                       |                                  |
| Characteristic resistance tension load in cracked concrete seismic performance category C1 |                                | $N_{\text{Rk,p,C1}}$  | [kN]  | 125,6                                 |                                  |
| Steel failure without lever arm                                                            |                                |                       |       |                                       |                                  |
| Characteristic resistance shear load seismic performance category C1                       | for $t_{\text{fix}}$           | [mm]                  |       | $15 \leq t_{\text{fix}} < 40$         | $40 \leq t_{\text{fix}} \leq 60$ |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU       | [kN]                  |       | 62,2                                  |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU R     |                       | 70,3  |                                       |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU-P     |                       | 89,4  | 120,2                                 |                                  |
|                                                                                            | $V_{\text{Rk,s,C1}}$ FSU-P R   |                       | 107,4 | 152,0                                 |                                  |

**fischer Strong Undercut Anchor FSU**

**Performances**

Characteristic tension and shear resistance under seismic performance category C1 for a working life of 50 and 100 years

**Annex C7**

Appendix 19 / 23

**Table C8.1: Characteristic values of tension and shear resistance under seismic performance category C2 for a working life of 50 and 100 years**

| Size                                                                                       |                                |                                               |      | FSU, FSU-P, FSU R, FSU-P R    |                                  |                               |                                  |
|--------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------|------|-------------------------------|----------------------------------|-------------------------------|----------------------------------|
|                                                                                            |                                |                                               |      | M10x100                       |                                  | M12x125                       |                                  |
| Factor for annular gap                                                                     | without filling of annular gap | $\alpha_{\text{gap}}$                         | [-]  | 0,5                           |                                  |                               |                                  |
| Steel failure                                                                              |                                |                                               |      |                               |                                  |                               |                                  |
| Characteristic resistance tension load seismic performance category C2                     |                                | $N_{\text{Rk,s,C2}}$                          | [kN] | 46,4                          |                                  | 67,4                          |                                  |
| Pullout failure                                                                            |                                |                                               |      |                               |                                  |                               |                                  |
| Characteristic resistance tension load in cracked concrete seismic performance category C2 |                                | $N_{\text{Rk,p,C2}} = N_{\text{Rk,p,C2,50}}$  | [kN] | 46,4                          |                                  | 67,4                          |                                  |
|                                                                                            |                                | $N_{\text{Rk,p,C2}} = N_{\text{Rk,p,C2,100}}$ |      |                               |                                  | 63,4                          |                                  |
| Steel failure without lever arm                                                            |                                |                                               |      |                               |                                  |                               |                                  |
|                                                                                            |                                | for $t_{\text{fix}}$                          | [mm] | $10 \leq t_{\text{fix}} < 15$ | $15 \leq t_{\text{fix}} \leq 20$ | $12 \leq t_{\text{fix}} < 20$ | $20 \leq t_{\text{fix}} \leq 50$ |
| Characteristic resistance shear load seismic performance category C2                       |                                | $V_{\text{Rk,s,C2}}$ FSU                      | [kN] | 20,1                          |                                  | 24,5                          |                                  |
|                                                                                            |                                | $V_{\text{Rk,s,C2}}$ FSU R                    |      | 22,8                          |                                  | 31,9                          |                                  |
|                                                                                            |                                | $V_{\text{Rk,s,C2}}$ FSU-P                    |      | 39,6                          | 41,8                             | 51,8                          | 62,9                             |
|                                                                                            |                                | $V_{\text{Rk,s,C2}}$ FSU-P R                  |      | 37,2                          |                                  | 56,6                          | 67,3                             |

**Table C8.2: Characteristic values of tension and shear resistance under seismic performance category C2 for a working life of 50 and 100 years**

| Size                                                                                       |                                |                       |      | FSU, FSU-P, FSU R, FSU-P R<br>M16x190 |                                  |
|--------------------------------------------------------------------------------------------|--------------------------------|-----------------------|------|---------------------------------------|----------------------------------|
| Factor for annular gap                                                                     | without filling of annular gap | $\alpha_{\text{gap}}$ | [-]  | 0,5                                   |                                  |
| Steel failure                                                                              |                                |                       |      |                                       |                                  |
| Characteristic resistance tension load seismic performance category C2                     |                                | $N_{\text{Rk,s,C2}}$  | [kN] | 125,6                                 |                                  |
| Pullout failure                                                                            |                                |                       |      |                                       |                                  |
| Characteristic resistance tension load in cracked concrete seismic performance category C2 |                                | $N_{\text{Rk,p,C2}}$  | [kN] | 125,6                                 |                                  |
| Steel failure without lever arm                                                            |                                |                       |      |                                       |                                  |
| Characteristic resistance shear load seismic performance category C2                       | for $t_{\text{fix}}$           | [mm]                  |      | $15 \leq t_{\text{fix}} < 40$         | $40 \leq t_{\text{fix}} \leq 60$ |
|                                                                                            | $V_{\text{Rk,s,C2}}$ FSU       |                       | [kN] | 62,2                                  |                                  |
|                                                                                            | $V_{\text{Rk,s,C2}}$ FSU R     |                       |      | 70,3                                  |                                  |
|                                                                                            | $V_{\text{Rk,s,C2}}$ FSU-P     |                       |      | 89,4                                  | 120,2                            |
|                                                                                            | $V_{\text{Rk,s,C2}}$ FSU-P R   |                       |      | 107,4                                 | 152,0                            |

**fischer Strong Undercut Anchor FSU**

**Performances**

Characteristic resistance under seismic performance categories C2 for a working life of 50 and 100 years

**Annex C8**

**Table C9.1: Displacements under static and quasi-static tension loads  
for a working life of 50 and 100 years**

| Size                                      |                              |      | FSU, FSU-P, FSU R, FSU-P R |         |         |
|-------------------------------------------|------------------------------|------|----------------------------|---------|---------|
|                                           |                              |      | M10x100                    | M12x125 | M16x190 |
| Tension load in cracked concrete C20/25   | N                            | [kN] | 21,8                       | 33,1    | 59,8    |
| Displacements                             | $\delta_{N0}$                | [mm] | 1,1                        | 1,3     | 1,8     |
|                                           | $\delta_{N,50\text{years}}$  |      | 1,3                        | 1,3     | 1,5     |
|                                           | $\delta_{N,100\text{years}}$ |      |                            |         |         |
| Tension load in uncracked concrete C20/25 | N                            | [kN] | 21,8                       | 33,1    | 59,8    |
| Displacements                             | $\delta_{N0}$                | [mm] | 1,1                        | 1,7     | 1,8     |
|                                           | $\delta_{N,50\text{years}}$  |      | 2,8                        | 2,8     | 2,4     |
|                                           | $\delta_{N,100\text{years}}$ |      |                            |         | 2,5     |

**Table C9.2: Displacements under static and quasi-static shear loads  
for a working life of 50 and 100 years**

| Size                                                |                    |      | FSU, FSU-P, FSU R, FSU-P R |         |         |
|-----------------------------------------------------|--------------------|------|----------------------------|---------|---------|
|                                                     |                    |      | M10x100                    | M12x125 | M16x190 |
| Shear load in cracked and uncracked concrete C20/25 | V                  | [kN] | 13,8                       | 21,3    | 32,9    |
| Displacements FSU                                   | $\delta_{V0}$      | [mm] | 5,4                        | 6,7     | 2,1     |
|                                                     | $\delta_{V\infty}$ |      | 8,0                        | 10,0    | 3,2     |
| Shear load in cracked and uncracked concrete C20/25 | V                  | [kN] | 16,9                       | 25,6    | 41,9    |
| Displacements FSU R                                 | $\delta_{V0}$      | [mm] | 2,4                        | 3,8     | 4,0     |
|                                                     | $\delta_{V\infty}$ |      | 3,6                        | 5,8     | 6,0     |
| Shear load in cracked and uncracked concrete C20/25 | V                  | [kN] | 36,3                       | 52,2    | 108,0   |
| Displacements FSU-P                                 | $\delta_{V0}$      | [mm] | 5,9                        | 7,2     | 8,5     |
|                                                     | $\delta_{V\infty}$ |      | 8,8                        | 10,7    | 12,8    |
| Shear load in cracked and uncracked concrete C20/25 | V                  | [kN] | 39,6                       | 55,4    | 134,9   |
| Displacements FSU-P R                               | $\delta_{V0}$      | [mm] | 8,91                       | 8,7     | 11,0    |
|                                                     | $\delta_{V\infty}$ |      | 13,4                       | 13,1    | 16,5    |

**fischer Strong Undercut Anchor FSU**

**Performances**

Displacements under static and quasi-static loads for a working life of 50 and 100 years

**Annex C9**

**Table C10.1: Displacements under tension loads for seismic performance category C2  
for a working life of 50 and 100 years**

| Size          |                      | FSU, FSU-P, FSU R, FSU-P R |         |         |
|---------------|----------------------|----------------------------|---------|---------|
|               |                      | M10x100                    | M12x125 | M16x190 |
| Displacements | $\delta_{N,C2(0,5)}$ | 4,6                        | 4,6     | 2,6     |
|               | $\delta_{N,C2(0,8)}$ | 11,4                       | 10,4    | 5,1     |

**Table C10.2: Displacements under shear loads for seismic performance category C2  
for a working life of 50 and 100 years**

| Size          |                      | FSU, FSU-P, FSU R, FSU-P R |                           |                        |                           |
|---------------|----------------------|----------------------------|---------------------------|------------------------|---------------------------|
|               |                      | M10x100                    |                           | M12x125                |                           |
| for $t_{fix}$ |                      | $10 \leq t_{fix} < 15$     | $15 \leq t_{fix} \leq 20$ | $12 \leq t_{fix} < 20$ | $20 \leq t_{fix} \leq 50$ |
| Displacements | $\delta_{V,C2(0,5)}$ | 5,2                        |                           | 5,0                    |                           |
|               | $\delta_{V,C2(0,8)}$ | 7,3                        |                           | 6,7                    |                           |
| Displacements | $\delta_{V,C2(0,5)}$ | 4,7                        |                           | 4,1                    |                           |
|               | $\delta_{V,C2(0,8)}$ | 6,8                        |                           | 5,9                    |                           |
| Displacements | $\delta_{V,C2(0,5)}$ | 4,8                        |                           | 5,0                    |                           |
|               | $\delta_{V,C2(0,8)}$ | 10,7                       |                           | 18,5                   |                           |
| Displacements | $\delta_{V,C2(0,5)}$ | 3,7                        |                           | 4,2                    |                           |
|               | $\delta_{V,C2(0,8)}$ | 7,8                        |                           | 13,2                   |                           |

**Table C10.3: Displacements under shear loads for seismic performance category C2  
for a working life of 50 and 100 years**

| Size          |                      | FSU, FSU-P, FSU R, FSU-P R |                           |
|---------------|----------------------|----------------------------|---------------------------|
|               |                      | M16x190                    |                           |
| for $t_{fix}$ |                      | $15 \leq t_{fix} < 40$     | $40 \leq t_{fix} \leq 60$ |
| Displacements | $\delta_{V,C2(0,5)}$ | 6,1                        |                           |
|               | $\delta_{V,C2(0,8)}$ | 8,9                        |                           |
| Displacements | $\delta_{V,C2(0,5)}$ | 5,8                        |                           |
|               | $\delta_{V,C2(0,8)}$ | 9,7                        |                           |
| Displacements | $\delta_{V,C2(0,5)}$ | 4,5                        | 5,6                       |
|               | $\delta_{V,C2(0,8)}$ | 7,0                        | 13,0                      |
| Displacements | $\delta_{V,C2(0,5)}$ | 3,6                        | 4,9                       |
|               | $\delta_{V,C2(0,8)}$ | 5,3                        | 16,7                      |

**fischer Strong Undercut Anchor FSU**

**Performances**

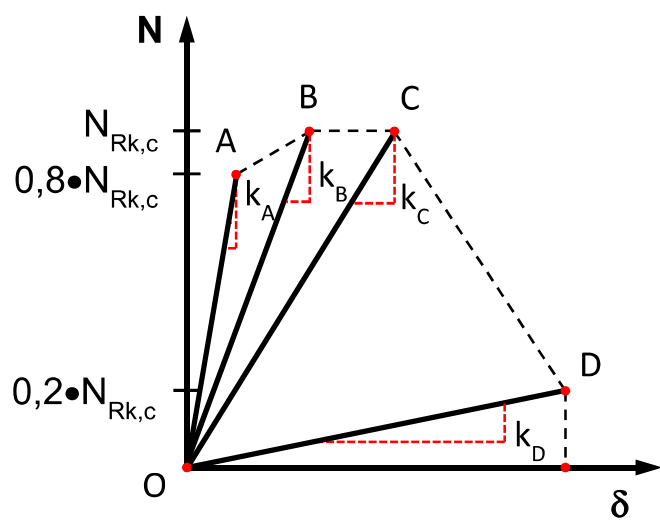
Displacements under static and quasi-static loads for seismic performance category C2  
for a working life of 50 and 100 years

**Annex C10**

**Table C11.1: Stiffness characteristics (mean values) under static and quasi-static tension loads for a working life of 50 and 100 years**

| Size                                            |             | FSU, FSU-P, FSU-R, FSU-P R |         |         |
|-------------------------------------------------|-------------|----------------------------|---------|---------|
|                                                 |             | M10x100                    | M12x125 | M16x190 |
| Stiffness characteristics in cracked concrete   | $k_{A,cr}$  | 20,1                       | 22,6    | 21,8    |
|                                                 | $k_{B,cr}$  | 13,8                       | 16,0    | 15,4    |
|                                                 | $k_{C,cr}$  | 10,4                       | 12,2    | 10,9    |
|                                                 | $k_{D,cr}$  | 1,8                        | 2,0     | 1,9     |
| Stiffness characteristics in uncracked concrete | $k_{A,ucr}$ | 33,1                       | 35,0    | 28,6    |
|                                                 | $k_{B,ucr}$ | 25,2                       | 24,5    | 23,5    |
|                                                 | $k_{C,ucr}$ | 20,6                       | 17,3    | 18,3    |
|                                                 | $k_{D,ucr}$ | 3,7                        | 3,4     | 3,3     |

- The stiffness characteristics  $k_A$ - $k_D$  are intended to be used in finite element calculations, such as linear- and non-linear spring models ( $k_A$  for linear spring model and  $k_A$ - $k_D$  for non-linear spring model), for the design of the fastener group as a function of fastener displacements and the anchor plate stiffness.
- For linear spring model: mean displacement for any load  $N$ :  $\delta_{mean} = N / k_A$ .



**fischer Strong Undercut Anchor FSU**

**Performances**  
Stiffness characteristics under static and quasi-static loads for a working life of 50 and 100 years

**Annex C11**