

**PRESTATIEVERKLARING****DoP 0271**

voor Upat Betonschroef UCS (mechanisch anker voor gebruik in beton)

NL

1. Unieke identificatiecode van het producttype: **DoP 0271**
2. Beoogd(e) gebruik(en): **Bevestigingen in gescheurd of ongescheurd beton, zie bijlage, met name de bijlagen B1 - B4.**
3. Fabrikant: **Upat Vertriebs GmbH, Bebelstraße 11, 79108 Freiburg im Breisgau, Duitsland**
4. Gemachtigde: **-**
5. Het systeem of de systemen voor de beoordeling en verificatie van de prestatiebestendigheid: **1**
6. Europees beoordelingsdocument: **EAD 330232-00-0601**  
Europese technische beoordeling: **ETA-18/0762; 2018-12-12**  
Technische beoordelingsinstantie: **DIBt- Deutsches Institut für Bautechnik**  
Aangemelde instantie(s): **2873 TU Darmstadt**

7. Aangegeven prestatie(s):**Mechanische weerstand en stabiliteit (BWR 1)****Kenmerkende weerstand tegen spanningsbelasting (statische en quasi-statische belasting):**

Weerstand tegen staalbreuk: Bijlage C1

 $E_s = 210\,000\text{ MPa}$ 

Weerstand tegen uittrekken: Bijlage C1

Weerstand tegen betonnen kegelbreuk: Bijlage C1

Robuustheid: Bijlage C1

Minimale rand- en hartafstand: Bijlage B3

Randafstand om spleetbreuk onder belasting te voorkomen: Bijlage C1

 $N^0_{Rk,sp} = \text{NPD}$ **Kenmerkende weerstand tegen schuifbelasting (statische en quasi-statische belasting):**

Weerstand tegen staalbreuk (afschuifbelasting): Bijlage C1

Weerstand tegen uitbreken (pryout): Bijlage C1

Weerstand tegen bezwijken van betonranden: Bijlage C1

Verplaatsingen onder statische en quasi-statische belasting: Bijlage C5

Duurzaamheid: Bijlagen A2, B1

**Kenmerkende weerstand en verplaatsingen voor de seismische prestatiecategorieën C1 en C2:**

Weerstand tegen staalbreuk: Bijlagen C2, C3

Weerstand tegen uittrekken: Bijlagen C2, C3

Breukverlenging: Bijlage A2

Factor ringvormige opening: Bijlagen C2, C3

Verplaatsingen: Bijlage C5

**Veiligheid in geval van brand (BWR 2)**

Reactie op brand: Klasse (A1)

**Weerstand tegen vuur:**

Weerstand bij brand, staalbreuk (trekbelasting): Bijlage C4

Weerstand bij brand, uittrekken, (trekbelasting): Bijlage C4

Weerstand bij brand, staalbreuk (afschuifbelasting): Bijlage C4

8. Geëigende technische documentatie en/of specifieke technische documentatie: **-**

De prestaties van het hierboven omschreven product zijn conform de aangegeven prestaties. Deze prestatieverklaring wordt in overeenstemming met Verordening (EU) nr. 305/2011 onder de exclusieve verantwoordelijkheid van de hierboven vermelde fabrikant verstrekt.

Ondertekend voor en namens de fabrikant door:



Dr.-Ing. Oliver Geibig, Directeur Business Units & Engineering  
Tumlingen, 2021-01-19



Jürgen Grün, Directeur Chemie & Kwaliteit

Deze DoP is opgesteld in meerdere talen. In het geval van geschillen over de interpretatie zal de Engelse tekst altijd prevaleren.

Het aanhangsel bevat vrijwillige en aanvullende informatie in het Engels die de (taal-neutraal gespecificeerde) wettelijke vereisten overschrijdt.

## Specific Part

### 1 Technical description of the product

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

The product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

#### 3.1 Mechanical resistance and stability (BWR 1)

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

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

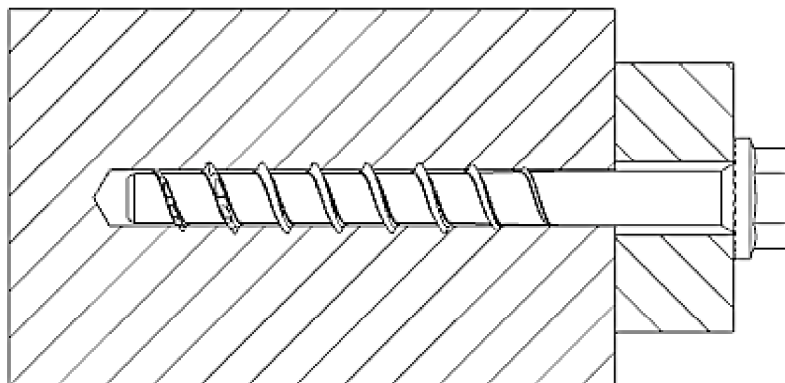
| Essential characteristic | Performance   |
|--------------------------|---------------|
| Reaction to fire         | Class A1      |
| Resistance to fire       | See Annex C 4 |

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

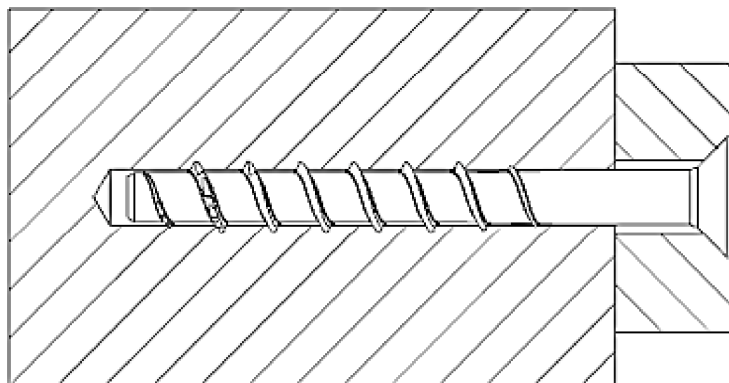
In accordance with European Assessment Document EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

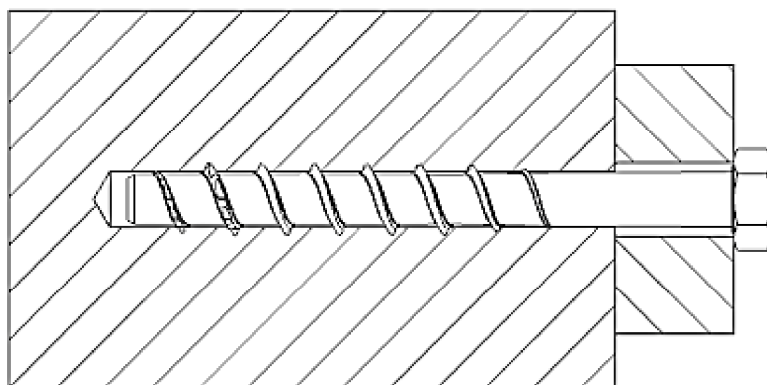
## Product in the installed condition



UCS US



UCS SK



UCS S

Upat concrete screw UCS

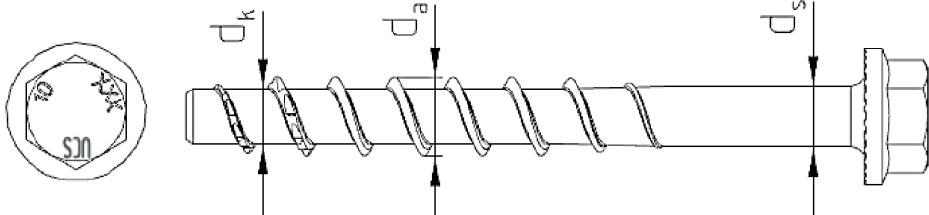
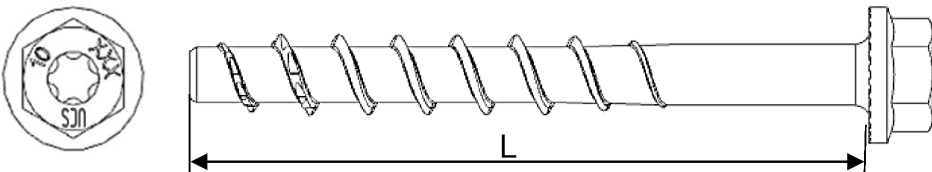
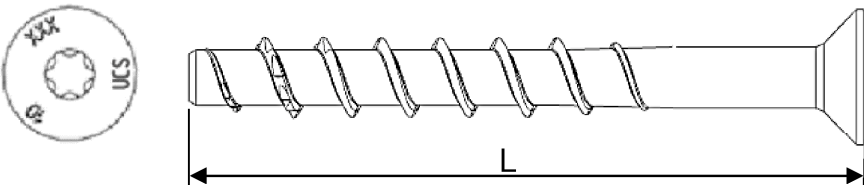
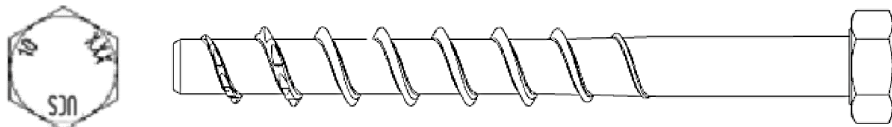
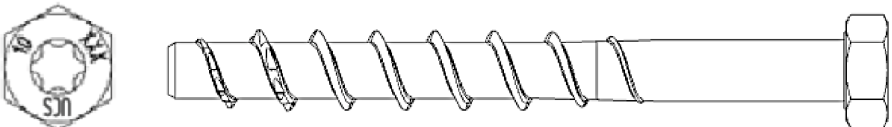
### Product description

Product in the installed condition

**Annex A 1**

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**Table A1: Material and screw types**

| Type of screw / size                    |                                                                                      |      | UCS US / SK / S                             |      |      |      |
|-----------------------------------------|--------------------------------------------------------------------------------------|------|---------------------------------------------|------|------|------|
|                                         |                                                                                      |      | 8                                           | 10   | 12   | 14   |
| Thread outer diameter                   | d <sub>a</sub>                                                                       | [mm] | 10,3                                        | 12,5 | 14,5 | 16,6 |
| Core diameter                           | d <sub>k</sub>                                                                       | [mm] | 7,4                                         | 9,4  | 11,3 | 13,3 |
| Shaft diameter                          | d <sub>s</sub>                                                                       | [mm] | 8,0                                         | 9,9  | 11,7 | 13,7 |
| Material                                |                                                                                      |      | Hardened carbon steel; A <sub>5%</sub> ≥ 8% |      |      |      |
| Coating                                 |                                                                                      |      | galvanized                                  |      |      |      |
| Hexagon head with formed washer (US)    |    |      |                                             |      |      |      |
| Hexagon head with formed washer (US TX) |    |      |                                             |      |      |      |
| Countersunk Head (SK)                   |   |      |                                             |      |      |      |
| Hexagon Head (S)                        |  |      |                                             |      |      |      |
| Hexagon Head (S TX)                     |  |      |                                             |      |      |      |

## Head Marking



UCS : Product description

10: screw size

XXX: screw length

Upat concrete screw UCS

**Product description**  
Material and screw types

**Annex A 2**

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## Specifications of intended use

**Table B1.1:** Anchorages subject to

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

### Base materials:

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

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.

### Design:

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

### Installation:

- Hammer drilling or diamond drilling or hollow drilling according to Annex B4:  
All sizes and all embedment depths.
- Screw installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: New hole must be drilled at a minimum distance of twice the depth of the aborted hole or closer, if the hole is filled with a high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- Adjustability according to Annex B3 for: All sizes and all embedment depths.
- Cleaning of drill hole is not necessary when using a hollow drill or:
  - If drilling vertically upwards
  - If drilling vertical downwards and the drill hole depth has been increased. It is recommended to increase the drill depth with additional  $3 d_0$ .
- After correct installation further turning of the screw head should not be possible
- The head of the screw must be fully engaged on the fixture and show no signs of damage.
- For Seismic Performance Category C2 applications: The gap between screw shaft and fixture must be filled with mortar; compressive strength  $\geq 50 \text{ N/mm}^2$  (for example UPM 44 or UPM 55).

Upat concrete screw UCS

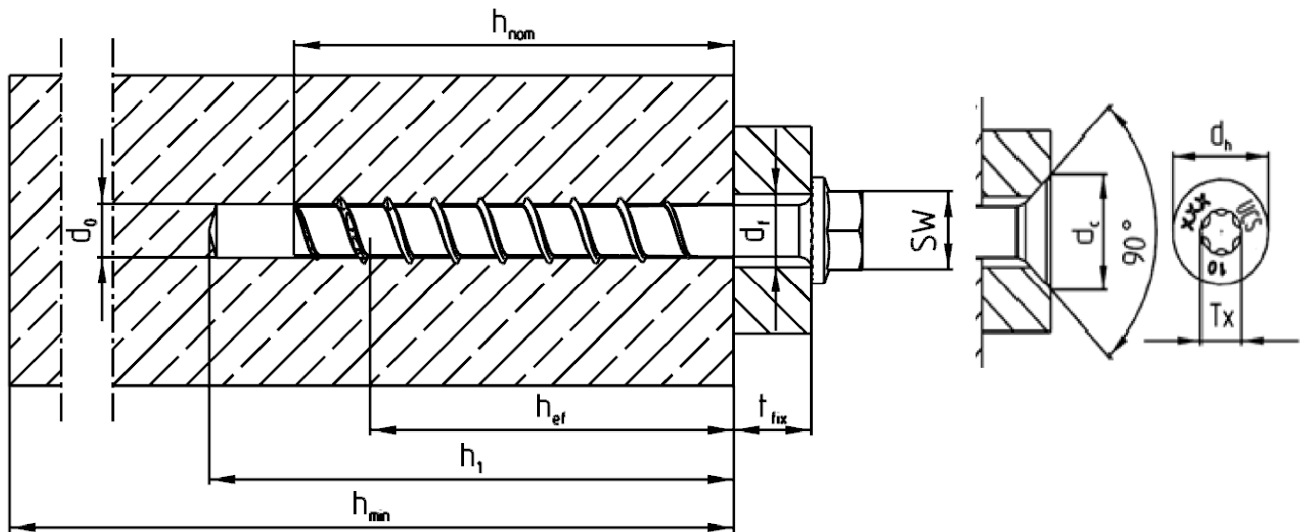
**Intended Use**  
Specifications

**Annex B 1**

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**Table B2.1: Installation parameters**

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



Upat concrete screw UCS

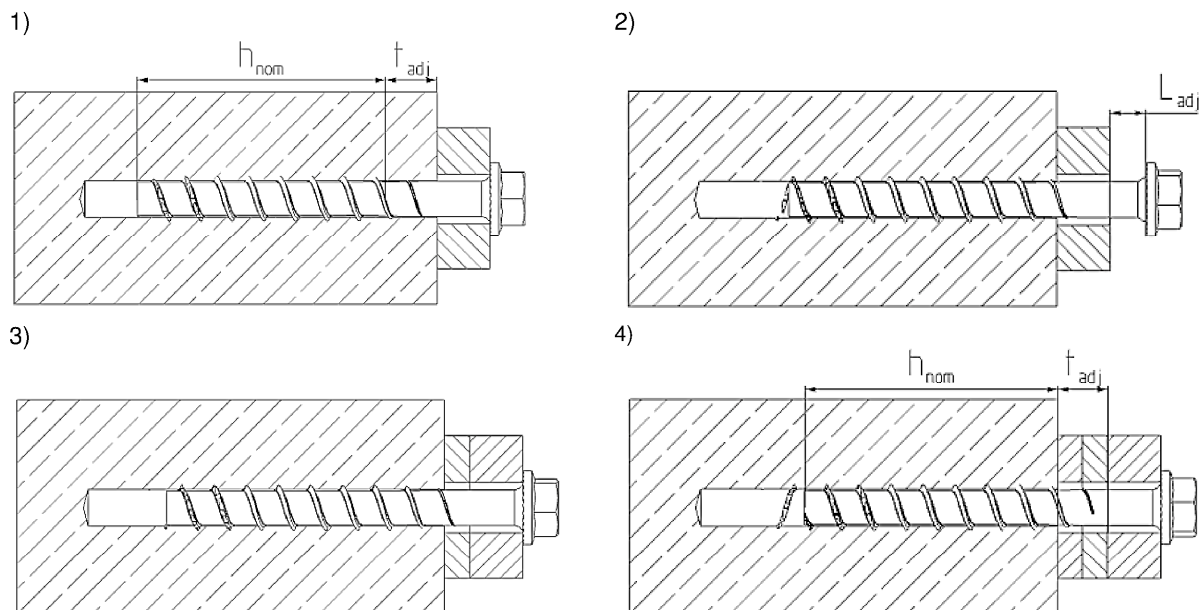
**Intended Use**

Installation parameters UCS 8 - 14

**Annex B 2**

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## Adjustment



It is permissible to untighten the screw up to two times for adjustment purposes.

Therefor the screw may be untighten to a maximum

of  $L_{adj} = 20$  mm off the surface of the initial fixture.

The total permissible thickness of shims added during the adjustment process is  $t_{adj} = 10$  mm.

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

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

Upat concrete screw UCS

### Intended Use

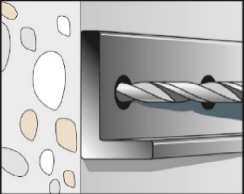
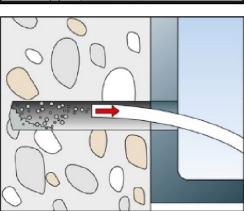
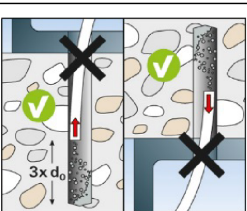
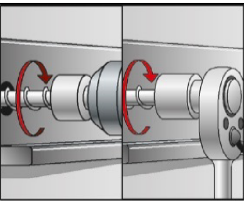
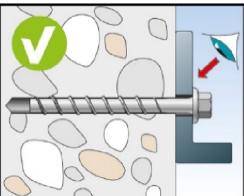
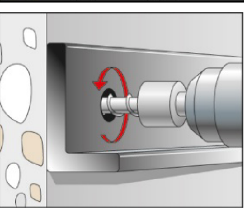
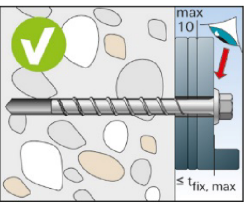
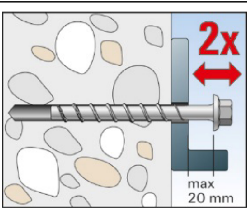
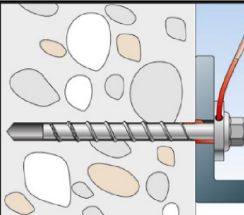
Adjustment

Minimum thickness of concrete members, minimum spacing and edge distance

**Annex B 3**

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## Installation instruction

|                                                                                                                                                                                           |                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                           |                                                                                               | <p>Drill the hole using hammer drill, hollow drill or diamond core drill.</p> <p>Drill hole diameter <math>d_0</math> and drill hole depth <math>h_1</math> according to table B2.1</p>                                                                                                                                                                                                                                  |
| <p>a)</p>                                                                                                 | <p>b)</p>    | <p>Option a): Clean the drill hole</p> <p>Option b): Cleaning of drill hole is not necessary when using a hollow drill or a diamond drill or:</p> <ul style="list-style-type: none"> <li>- If drilling vertically upwards or</li> <li>- If drilling vertically downwards and the drill hole depth has been increased. It is recommended to increase the drill hole depth additional 3 times <math>d_0</math>.</li> </ul> |
|                                                                                                           |                                                                                               | <p>Installation with any torque impact screw driver up to the maximum mentioned torque moment (<math>T_{imp,max}</math> according to table B2.1). Alternatively, all other tools without an indicated torque moment are allowed (e.g. ratchet spanner). The indicated torque moments for impact screw driver are therefore not decisive.</p>                                                                             |
|                                                                                                          |                                                                                               | <p>After installation a further turning of the screw must not be possible. The head of the screw must be in contact with the fixture and is not damaged</p>                                                                                                                                                                                                                                                              |
| <p>1.</p>  <p>3.</p>  | <p>2.</p>  | <p>Optional:</p> <p>It is permissible to adjust the screw twice. Therefore the screw may be untightened to a maximum of <math>L_{adj} = 20</math> mm off the surface of the initial fixture. The total permissible thickness of shims added during the adjustment process is <math>t_{adj} = 10</math> mm.</p>                                                                                                           |
|                                                                                                         |                                                                                               | <p>For seismic performance category C2 applications:</p> <p>The gap between screw shaft and fixture must be filled with mortar; mortar compressive strength <math>\geq 50</math> N/mm<sup>2</sup> (e. g. UPM 44 or UPM 55). As an aid for filling the gap, the filling disc FFD is recommended.</p>                                                                                                                      |

Upat concrete screw UCS

**Intended Use**  
Installation instructions

**Annex B 4**

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**Table C1: Performance for static and quasi-static action**

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

<sup>1)</sup> Pullout failure not decisive.

Upat concrete screw UCS

**Performances**

Performance for static and quasi-static action

**Annex C 1**

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**Table C2: Characteristic values for Seismic Performance Category C1**

| Screw size                                       |                 |            | UCS          |      |      |      |
|--------------------------------------------------|-----------------|------------|--------------|------|------|------|
|                                                  |                 |            | 8            | 10   | 12   | 14   |
| Nominal embedment depth                          | $h_{nom}$       | [mm]       | 65           | 85   | 100  | 115  |
| Steel failure for tension load and shear load C1 |                 |            |              |      |      |      |
| Characteristic resistance                        | $N_{Rk,s,eq}$   | [kN]       | 35           | 55   | 76   | 103  |
|                                                  | $V_{Rk,s,eq}$   | [kN]       | 11,4         | 22,3 | 26,9 | 38,3 |
| Without filling of the annular gap               | $\alpha_{gap}$  | [-]        | 0,5          |      |      |      |
| With filling of the annular gap <sup>1)</sup>    | $\alpha_{gap}$  | [-]        | 1,0          |      |      |      |
| Pullout failure                                  |                 |            |              |      |      |      |
| Characteristic resistance in cracked concrete    | $N_{Rk,p,eq}$   | [kN]       | 12           | _2)  |      |      |
| Concrete cone failure                            |                 |            |              |      |      |      |
| Effective embedment depth                        | $h_{ef}$        | [mm]       | 52           | 68   | 81   | 93   |
| Concrete cone failure                            | Edge distance   | $c_{cr,N}$ | 1,5 $h_{ef}$ |      |      |      |
|                                                  | Spacing         | $s_{cr,N}$ | 3 $h_{ef}$   |      |      |      |
| Installation factor                              | $\gamma_{inst}$ | [-]        | 1,0          |      |      |      |
| Concrete pryout failure                          |                 |            |              |      |      |      |
| Factor for pryout failure                        | $k_8$           | [-]        | 2,0          |      |      |      |
| Concrete edge failure                            |                 |            |              |      |      |      |
| Effective length in concrete                     | $l_f$           | [mm]       | 65           | 85   | 100  | 115  |
| Nominal diameter of screw                        | $d_{nom}$       | [mm]       | 8            | 10   | 12   | 14   |

<sup>1)</sup> Filling of the annular gap according to Annex B4

<sup>2)</sup> Pullout failure not decisive.

Upat concrete screw UCS

### Performances

Characteristic values for Seismic Performance Category C1

## Annex C 2

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**Table C3: Characteristic values for Seismic Performance Category C2**

Gap between screw shaft and fixture must be filled with mortar

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

<sup>1)</sup> Filling of the annular gap according to annex B4. Application without filling of the annular gap not allowed

Upat concrete screw UCS

**Performances**

Characteristic values for Seismic Performance Category C2

**Annex C 3**

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**Table C4:** Characteristic values for resistance to fire<sup>1)</sup>

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

<sup>1)</sup> The embedment depth has to be increased for wet concrete by at least 30 mm compared to the given value.

Upat concrete screw UCS

**Performances:**  
Characteristic values for resistance to fire

**Annex C 4**

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**Table C5: Displacements due to tension loads (static)**

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

**Table C6: Displacements due to shear loads (static)**

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

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

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

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

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

Upat concrete screw UCS

**Performances:**

Displacements under tension and shear loads

**Annex C 5**

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