

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body  
for construction products



## European Technical Assessment

ETA-25/0820  
of 9 October 2025

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

TILCA concrete screw TSM high performance A4, HCR

Product family  
to which the construction product belongs

Mechanical fasteners for use in concrete

Manufacturer

EFCO Befestigungstechnik AG  
Grabenstraße 1  
8606 NÄNIKON  
SCHWEIZ

Manufacturing plant

Werk 3, Deutschland

This European Technical Assessment  
contains

19 pages including 3 annexes which form an integral part  
of this assessment

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

EAD 330232-01-0601, Edition 05/2021

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

## Specific Part

### 1 Technical description of the product

The TILCA concrete screw TSM high performance A4, HCR is an anchor in size 6, 8 und 10 mm made of stainless 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.

Product and product description are 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 B4, C1 and C2 |
| Characteristic resistance to shear load (static and quasi-static loading)        | See Annex C1 and C2     |
| Displacements (static and quasi-static loading)                                  | See Annex C5            |
| Characteristic resistance for seismic performance categorie C1                   | See Annex C3            |
| Characteristic resistance and displacements for seismic performance categorie C2 | No performance assessed |

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

| Essential characteristic | Performance  |
|--------------------------|--------------|
| Reaction to fire         | Class A1     |
| Resistance to fire       | See Annex C4 |

#### 3.3 Aspects of durability linked with the Basic Works Requirements

| 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 European Assessment Document EAD No. 330232-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

**5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document**

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 9 October 2025 by Deutsches Institut für Bautechnik

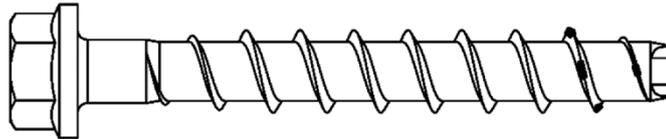
Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Tempel

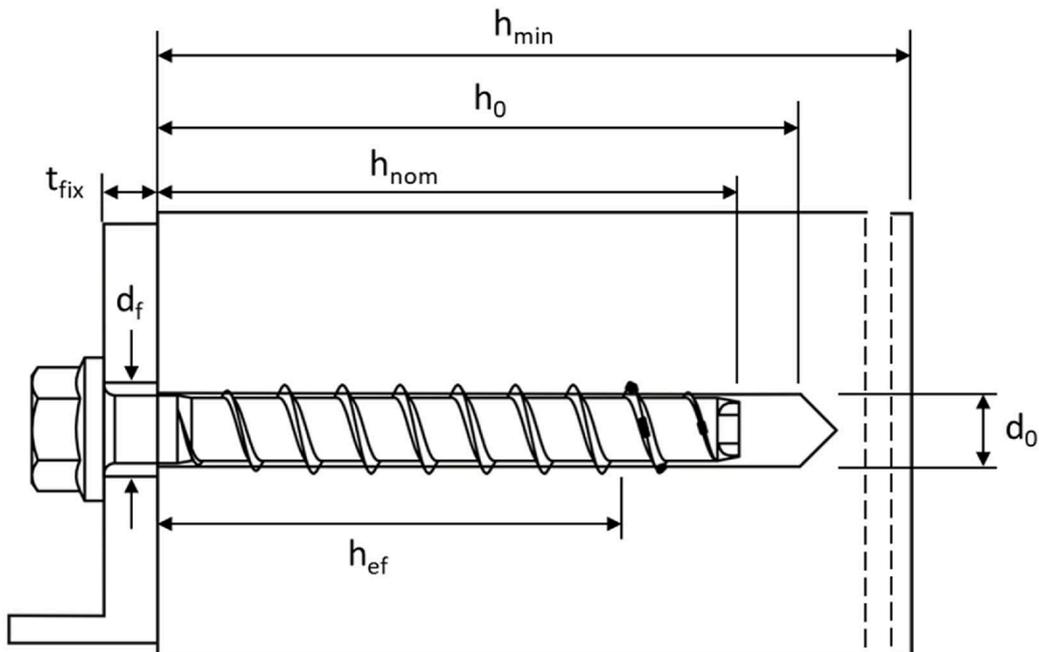
## Product in installed condition

### TILCA concrete screw TSM high performance

- stainless steel A4
- high corrosion resistant steel HCR

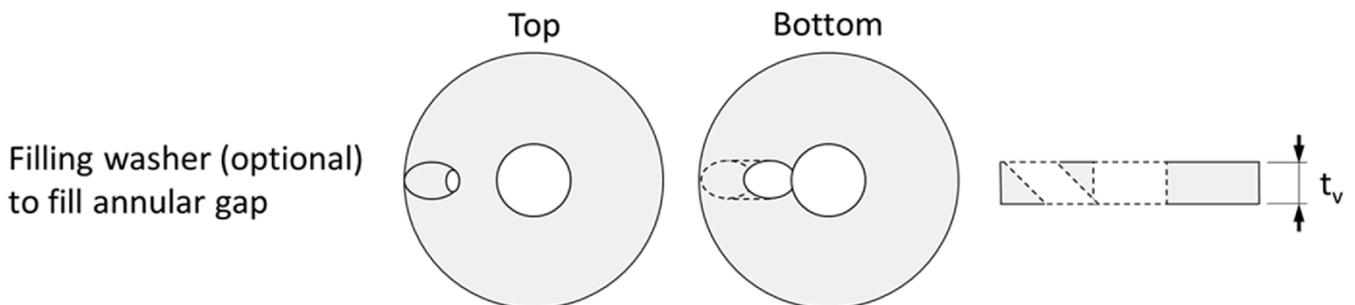


e.g. TILCA concrete screw with hexagon head and fixture



$d_0$  = nominal diameter of drill hole  
 $t_{fix}$  = thickness of fixture  
 $d_f$  = diameter of clearance hole

$h_{min}$  = minimum thickness of member  
 $h_{nom}$  = nominal embedment depth  
 $h_0$  = depth of drill hole  
 $h_{ef}$  = effective embedment depth



Filling washer (optional)  
to fill annular gap

TILCA concrete screw TSM high performance

**Product description**  
Product in installed condition

**Annex A1**

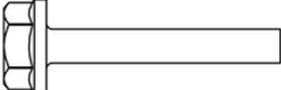
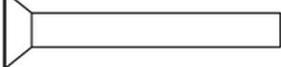
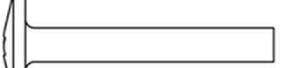
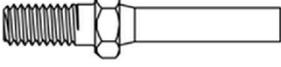
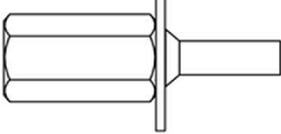
|   |   |   |
|---|---|---|
|    |    | Version with metric connection thread and hexagon drive e.g. TSM 8x105 M10 SW7; Type ST |
|    |    | Version with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40; Type S                   |
|    |    | Version with washer, hexagon head and TORX drive e.g. TSM 8x80 SW13; Type S             |
|    |    | Version with hexagon head e.g. TSM 8x80 SW13 OS; Type S                                 |
|    |    | Version with countersunk head and TORX drive e.g. TSM 8x80 C VZ 40; Type SK             |
|  |  | Version with pan head and TORX drive e.g. TSM 8x80 P VZ 40; Type LK                     |
|  |  | Version with large pan head and TORX drive e.g. TSM 8x80 LP VZ 40; Type GLK             |
|  |  | Version with countersunk head and connection thread e.g. TSM 6x55 AG M8; Type T25       |
|  |  | Version with hexagon drive and connection thread e.g. TSM 6x55 M8 SW10; Type GW         |
|  |  | Version with internal thread and hexagon drive e.g. TSM 6x55 IM M8/10; Type KM          |
| <b>TILCA concrete screw TSM high performance</b>                                    |   | <b>Annex A2</b>   |
| <b>Product description</b><br>Screw types   |   |   |

Table 1: Material

| Part      | Product name | Material  |  |                                 |
|-----------|--------------|---|--|---------------------------------|
| all types | TSM A4       | 1.4401; 1.4404; 1.4571; 1.4578                  |  |                                 |
|           | TSM HCR      | 1.4529  |  |                                 |
| Part      | Product name | Nominal characteristic steel                    |  | Rupture elongation<br>$A_5$ [%] |
|           |              | Yield strength<br>$f_{yk}$ [N/mm <sup>2</sup> ] | Uimate strength<br>$f_{uk}$ [N/mm <sup>2</sup> ] |                                 |
| all types | TSM A4       | 560   | 700  | ≤ 8                             |
|           | TSM HCR      |   |  |                                 |

Table 2: Dimensions

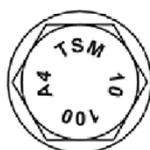
| Anchor size                 |            | 6               |    |    | 8    |    |    | 10   |    |    |
|-----------------------------|------------|-----------------|----|----|------|----|----|------|----|----|
| Nominal embedment depth     | $h_{nom}$  | 1 <sup>1)</sup> | 2  | 3  | 1    | 2  | 3  | 1    | 2  | 3  |
|                             | [mm]       | 35              | 45 | 55 | 45   | 55 | 65 | 55   | 75 | 85 |
| Screw length                | ≤ L [mm]   | 500             |    |    |      |    |    |      |    |    |
| Core diameter               | $d_k$ [mm] | 5,1             |    |    | 7,2  |    |    | 9,2  |    |    |
| Thread outer diameter       | $d_s$ [mm] | 7,6             |    |    | 10,5 |    |    | 12,5 |    |    |
| Thickness of filling washer | $t_v$ [mm] | 5               |    |    | 5    |    |    | 5    |    |    |

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

**Marking:**

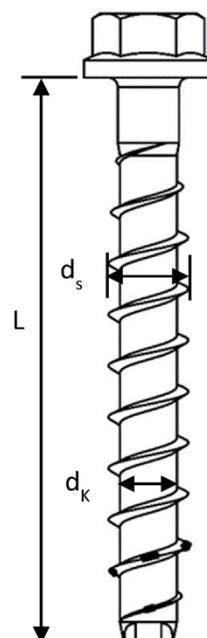
**TSM high performance A4**

Screw type: TSM  
Screw size: 10  
Screw length: 100  
Material: A4



**TSM high performance HCR**

Screw type: TSM  
Screw size: 10  
Screw length: 100  
Material: HCR



TILCA concrete screw TSM high performance

**Product description**  
Material, dimensions and markings

**Annex A3**

## Specification of Intended use

Table 3: Anchorages subject to

| TSM concrete screw size       |           | 6                                  |            |            | 8          |            |            | 10         |            |            |
|-------------------------------|-----------|------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Nominal embedment depth       | $h_{nom}$ | $h_{nom1}$ <sup>1)</sup>           | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |
|                               | [mm]      | 35                                 | 45         | 55         | 45         | 55         | 65         | 55         | 75         | 85         |
| Static and quasi-static loads |           | All sizes and all embedment depths |            |            |            |            |            |            |            |            |
| Fire exposure                 |           |                                    |            |            |            |            |            |            |            |            |
| C1 category - seismic         |           | 2)                                 | ok         | ok         | ok         | 2)         | ok         | ok         | 2)         | ok         |

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

<sup>2)</sup> no performance assessed

### Base materials:

- Compacted reinforced and unreinforced concrete without fibers according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and uncracked concrete.

### Use conditions (Environmental conditions):

- Concrete screws subject to dry internal conditions: all screw types.
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 + A1:2015
  - Stainless steel according to Annex A3, screw with marking A4: CRC III
  - High corrosion resistant steel according to Annex A3, screw with marking HCR: CRC V

TILCA concrete screw TSM high performance

**Intended use**  
Specification

**Annex B1**

## Specification of Intended use - continuation

### 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 anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed according to EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

The design for shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters  $d_f$  of clearance hole in the fixture in Annex B3, Table 4.

### Installation:

- Hammer drilling or hollow drilling. Hollow drilling only for size 6-10.
- Anchor 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 drilling must be drilled at a minimum distance of twice the depth of aborted hole or closer, if the aborted hole is filled with high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- After installation further turning of the anchor must not be possible. The head of the anchor is supported in the fixture and is not damaged.
- The borehole may be filled with injection mortar TILCA TIM P-E.
- Adjustability according to Annex B6 for sizes 6-10.
- Cleaning of borehole is not necessary, if using a hollow drill.

TILCA concrete screw TSM high performance

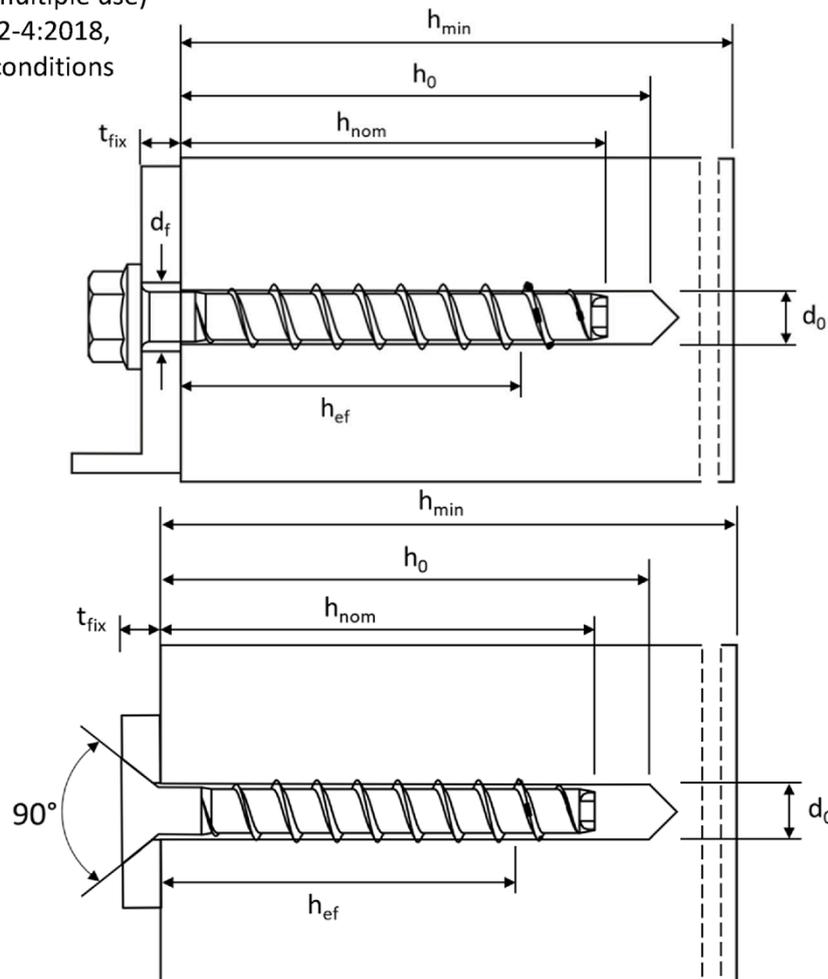
**Intended use**  
Specification continuation

**Annex B2**

Table 4: Installation parameters

| TSM concrete screw size                              |                |  | 6          |            |            | 8          |            |            | 10         |            |    |
|--|----------------|--|------------|------------|------------|------------|------------|------------|------------|------------|----|
| Nominal embedment depth                              | $h_{nom}$      | $h_{nom1}^{1)}$                                      | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |    |
|  | [mm]           | 35   | 45         | 55         | 45         | 55         | 65         | 55         | 75         | 85         |    |
| Nominal drill hole diameter                          | $d_0$          | [mm]   | 6          |            |            | 8          |            |            | 10         |            |    |
| Cutting diameter of drill bit                        | $d_{cut} \leq$ | [mm]   | 6,40       |            |            | 8,45       |            |            | 10,45      |            |    |
| Depth of drill hole                                  | $h_0 \geq$     | [mm]   | 40         | 50         | 60         | 55         | 65         | 75         | 65         | 85         | 95 |
| Clearance hole diameter                              | $d_f \leq$     | [mm]   | 8          |            |            | 12         |            |            | 14         |            |    |
| Installation torque (version with connection thread) | $T_{inst}$     | [Nm]   | 10         |            |            | 20         |            |            | 40         |            |    |
| Torque impact screw driver                           | [-]            | Max. torque according to manufacturer's instructions |            |            |            |            |            |            |            |            |    |
|  |                | 160  |            |            | 300        |            |            | 450        |            |            |    |

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions



TILCA concrete screw TSM high performance

Intended use  
Installation parameters

Annex B3

Table 5: Minimum thickness of member, minimum edge distance and minimum spacing

| TSM concrete screw size     |           | 6               |            |            | 8          |            |            | 10         |            |            |     |
|-----------------------------|-----------|-----------------|------------|------------|------------|------------|------------|------------|------------|------------|-----|
| Nominal embedment depth     | $h_{nom}$ | $h_{nom1}^{1)}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |     |
|                             | [mm]      | 35              | 45         | 55         | 45         | 55         | 65         | 55         | 75         | 85         |     |
| Minimum thickness of member | $h_{min}$ | [mm]            | 80         | 80         | 100        | 80         | 100        | 120        | 100        | 130        | 130 |
| Minimum edge distance       | $c_{min}$ | [mm]            | 35         | 35         | 35         | 35         | 35         | 35         | 40         | 40         | 40  |
| Minimum spacing             | $s_{min}$ | [mm]            | 35         | 35         | 35         | 35         | 35         | 35         | 40         | 40         | 40  |

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

**TILCA concrete screw TSM high performance**

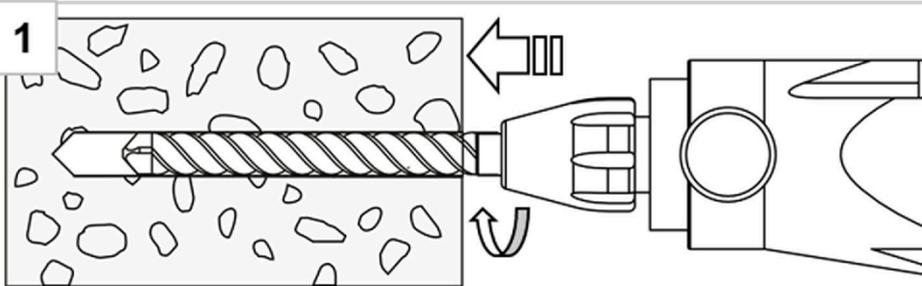
**Intended use**

Minimum thickness of member, minimum edge distance and minimum spacing

**Annex B4**

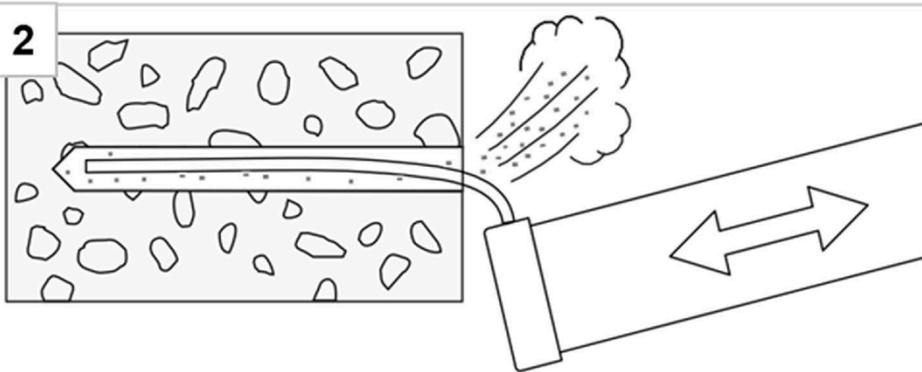
## Installation Instructions

1



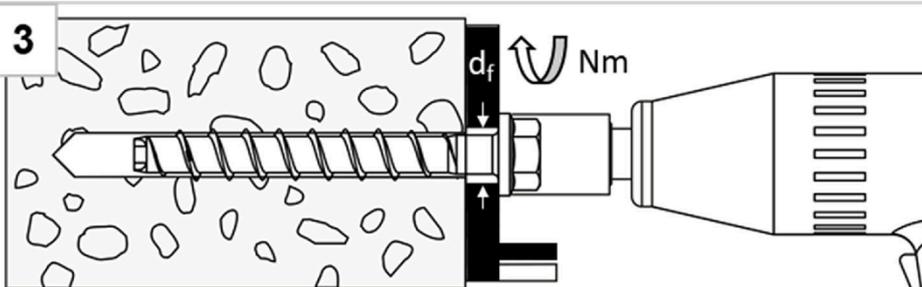
Create hammer drilled or hollow drilled borehole

2



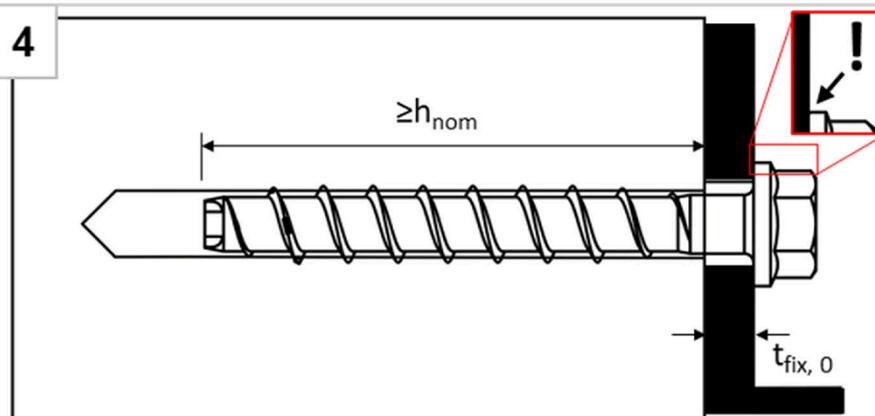
Remove drill dust by vacuuming or blowing of

3



Install with torque impact screw driver or torque wrench

4



The head must be undamaged and in contact with the fixture

For screw size 6 with  $h_{nom} = 35\text{mm}$ , installation only with impact screw drivers.

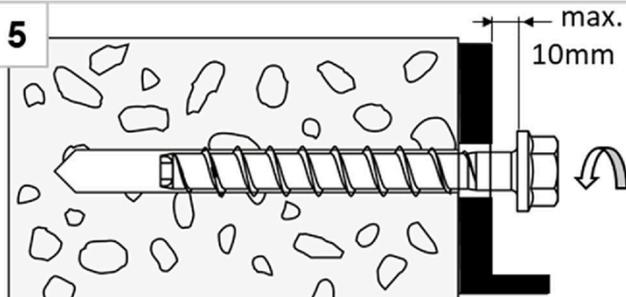
TILCA concrete screw TSM high performance

Intended use  
Installation instructions

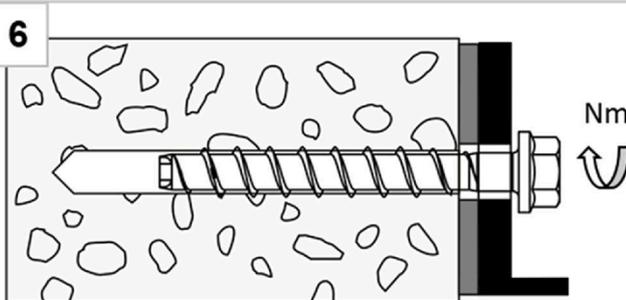
Annex B5

## Installation Instructions – Adjustment

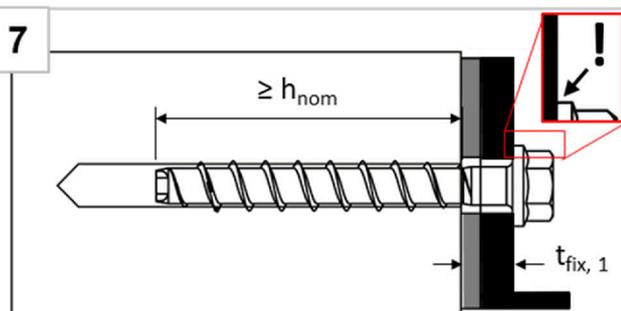
### 1. Adjustment



Screw may be untightened maximum 10mm

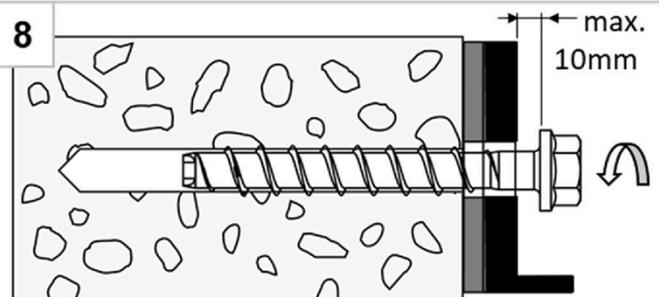


After adjustment, tighten the screw again

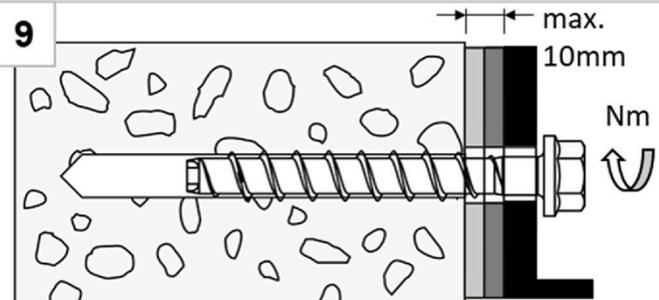


The head must be undamaged and in contact with the fixture

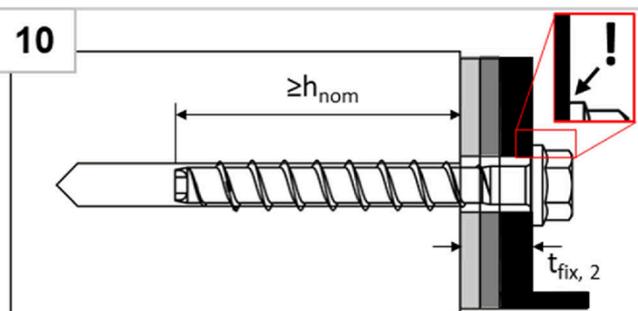
### 2. Adjustment



Screw may be untightened maximum 10mm



After adjustment, tighten the screw again



The head must be undamaged and in contact with the fixture

**Note:**

The fastener can be adjusted maximum two times. The total allowed thickness of shims added during the adjustment process is 10mm. The final embedment depth after adjustment process must be larger or equal than  $h_{nom}$ .

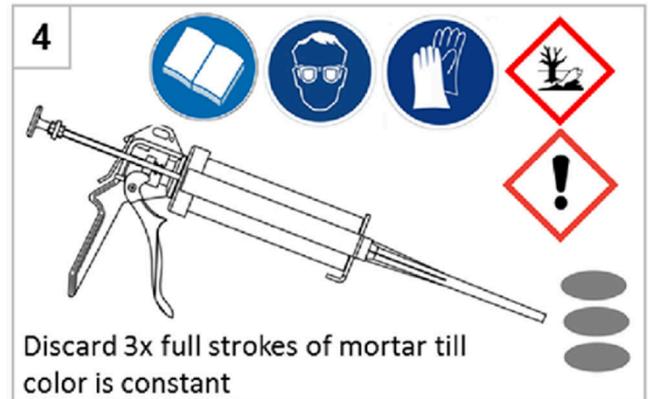
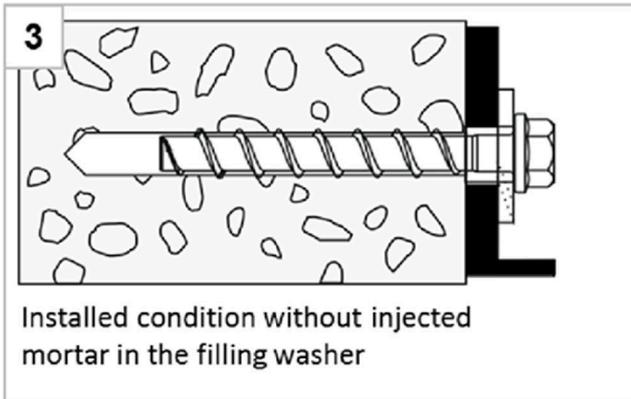
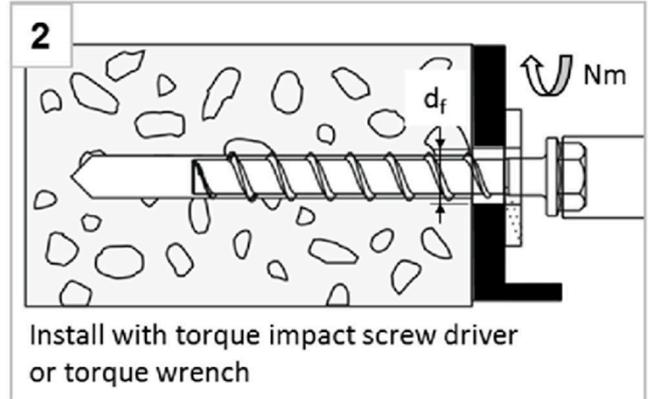
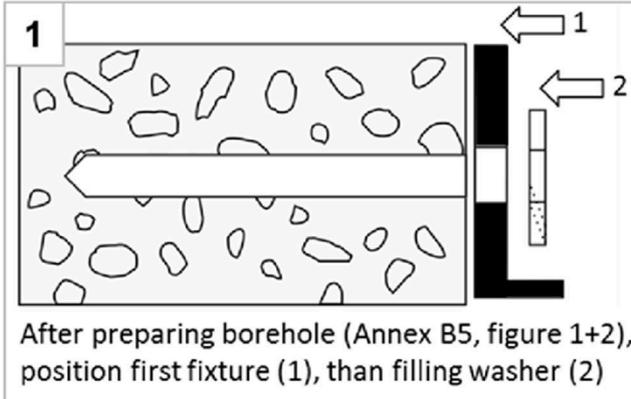
TILCA concrete screw TSM high performance

**Intended use**  
Installation instructions - Adjustment

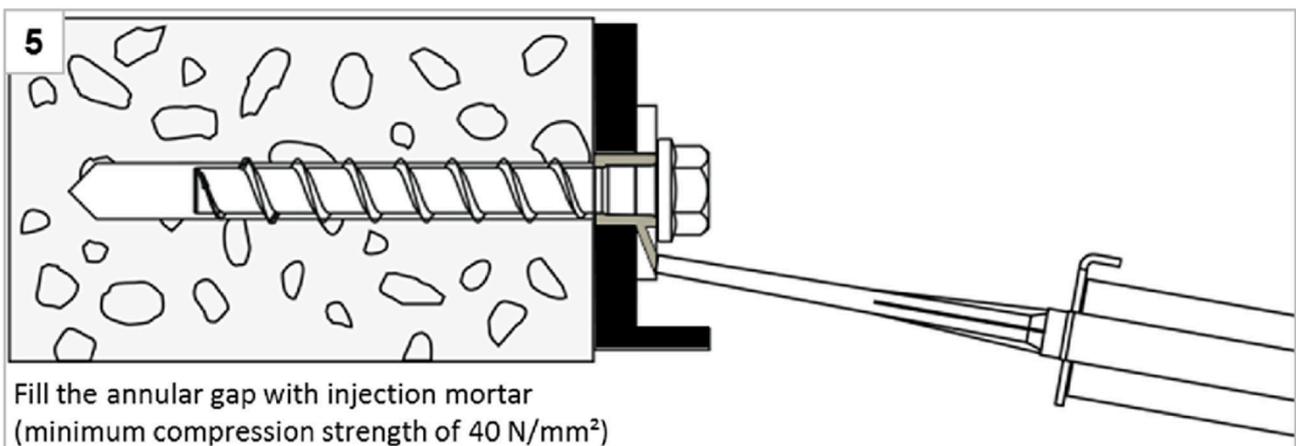
**Annex B6**

## Installation Instructions – Filling annular gap

### Positioning of fixture and filling washer



### Filling the annular gap



**Note:**

For seismic loading the installation with filled and without filled annular gap is approved. Differences in performance can be found in Annex C3.

**TILCA concrete screw TSM high performance**

**Intended use**  
Installation instructions – Filling annular gap

**Annex B7**

Table 6: Characteristic values for static and quasi-static loading

| TSM concrete screw size  |                 |                 | 6                 |            |            | 8          |            |            | 10              |            |      |
|--|-----------------|-----------------|-------------------|------------|------------|------------|------------|------------|-----------------|------------|------|
| Nominal embedment depth  | $h_{nom}$       | $h_{nom1}^{1)}$ | $h_{nom2}$        | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$      | $h_{nom3}$ |      |
|  | [mm]            | 35              | 45                | 55         | 45         | 55         | 65         | 55         | 75              | 85         |      |
| <b>Steel failure for tension and shear loading</b>   |                 |                 |                   |            |            |            |            |            |                 |            |      |
| Characteristic resistance  | $N_{Rk,s}$      | [kN]            | 14,0              |            |            | 27,0       |            |            | 45,0            |            |      |
| Partial factor   | $\gamma_{Ms,N}$ | [-]             | 1,5               |            |            |            |            |            |                 |            |      |
| Characteristic resistance  | $V_{Rk,s}^0$    | [kN]            | 7,0               |            |            | 13,5       |            | 17,0       | 22,5            | 34,0       |      |
| Partial factor   | $\gamma_{Ms,V}$ | [-]             | 1,25              |            |            |            |            |            |                 |            |      |
| Ductility factor   | $k_7$           | [-]             | 0,8               |            |            |            |            |            |                 |            |      |
| Characteristic bending load  | $M_{Rk,s}^0$    | [Nm]            | 10,9              |            |            | 26,0       |            |            | 56,0            |            |      |
| <b>Pull-out failure in uncracked concrete</b>  |                 |                 |                   |            |            |            |            |            |                 |            |      |
| Characteristic resistance in C20/25  | $N_{Rk,p}$      | [kN]            | 3,5 <sup>1)</sup> | 4,0        | 8,5        | 9,0        | 12,0       | 17,0       | 11,0            | 19,0       | 25,0 |
| Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} \cdot \psi_c$<br>with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$                       | C25/30          | m               | [-]               | 0,35       | 0,50       | 0,38       | 0,50       |            | 0,30            | 0,50       |      |
|  | C30/37          |                 |                   | 0,35       | 0,50       | 0,38       | 0,50       |            | 0,30            | 0,50       |      |
|  | C40/50          |                 |                   | 0,35       | 0,50       | 0,38       | 0,50       |            | 0,30            | 0,50       |      |
|  | C50/60          |                 |                   | 0,35       | 0,50       | 0,38       | 0,50       |            | 0,30            | 0,50       |      |
| <b>Pull-out failure in cracked concrete</b>  |                 |                 |                   |            |            |            |            |            |                 |            |      |
| Characteristic resistance in C20/25  | $N_{Rk,p}$      | [kN]            | 2,5 <sup>1)</sup> | 1,5        | 3,0        | 3,0        | 5,5        | 8,0        | 6,0             | 13,0       | 17,0 |
| Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} \cdot \psi_c$<br>with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$                       | C25/30          | m               | [-]               | 0,41       | 0,35       | 0,50       |            |            | 0,39            |            |      |
|  | C30/37          |                 |                   | 0,41       | 0,35       | 0,50       |            |            | 0,39            |            |      |
|  | C40/50          |                 |                   | 0,40       | 0,35       | 0,50       |            |            | 0,39            |            |      |
|  | C50/60          |                 |                   | 0,41       | 0,35       | 0,50       |            |            | 0,39            |            |      |
| <sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions |                 |                 |                   |            |            |            |            |            |                 |            |      |
| <b>TILCA concrete screw TSM high performance</b>   |                 |                 |                   |            |            |            |            |            | <b>Annex C1</b> |            |      |
| <b>Performances</b><br>Characteristic values for static and quasi-static loading   |                 |                 |                   |            |            |            |            |            |                 |            |      |

Table 7: Characteristic values for static and quasi-static loading continuation

| TSM concrete screw size  |                 |                 | 6                   |               |            | 8          |            |            | 10         |            |      |      |
|--|-----------------|-----------------|---------------------|---------------|------------|------------|------------|------------|------------|------------|------|------|
| Nominal embedment depth  | $h_{nom}$       | $h_{nom1}^{1)}$ | $h_{nom2}$          | $h_{nom3}$    | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |      |      |
|  | [mm]            | 35              | 45                  | 55            | 45         | 55         | 65         | 55         | 75         | 85         |      |      |
| <b>Concrete failure: concrete cone failure and splitting failure</b> |                 |                 |                     |               |            |            |            |            |            |            |      |      |
| Effective embedment depth  | $h_{ef}$        | [mm]            | 25                  | 34            | 42         | 32         | 41         | 49         | 40         | 57         | 65   |      |
| k-factor   | cracked         | $k_{cr}$        | 7,7                 |               |            |            |            |            |            |            |      |      |
|  | uncracked       | $k_{ucr}$       | 11,0                |               |            |            |            |            |            |            |      |      |
| Concrete cone failure  | spacing         | $s_{cr,N}$      | $3 \times h_{ef}$   |               |            |            |            |            |            |            |      |      |
|  | edge distance   | $c_{cr,N}$      | $1,5 \times h_{ef}$ |               |            |            |            |            |            |            |      |      |
| Splitting failure case 1   | resistance      | $N_{Rk,sp}^0$   | [kN]                | 3,5           | 4,0        | 8,5        | 9,0        | 12,0       | 17,0       | 11,0       | 19,0 | 25,0 |
|  | spacing         | $s_{cr,sp}$     | [mm]                | 120           | 160        | 240        | 200        | 240        | 290        | 230        | 280  | 320  |
|  | edge distance   | $c_{cr,sp}$     | [mm]                | 60            | 80         | 120        | 100        | 120        | 145        | 115        | 140  | 160  |
| Splitting failure case 2   | resistance      | $N_{Rk,sp}^0$   | [kN]                | <sup>2)</sup> | 2,5        | 5,5        | 5,5        | 8,0        | 11,0       | 7,0        | 15,0 | 20,0 |
|  | spacing         | $s_{cr,sp}$     | [mm]                | <sup>2)</sup> | 116        | 168        | 128        | 164        | 196        | 160        | 224  | 260  |
|  | edge distance   | $c_{cr,sp}$     | [mm]                | <sup>2)</sup> | 58         | 84         | 64         | 82         | 98         | 80         | 114  | 130  |
| <b>Pry-out failure</b>   |                 |                 |                     |               |            |            |            |            |            |            |      |      |
| Factor for pry-out failure   | $k_8$           | [-]             | 1,0                 | 1,6           | 2,1        | 2,8        | 2,5        |            |            |            |      |      |
| Installation factor  | $\gamma_{inst}$ | [-]             | 1,0                 |               |            |            |            |            |            |            |      |      |
| <b>Concrete edge failure</b>   |                 |                 |                     |               |            |            |            |            |            |            |      |      |
| Effective length in concrete   | $l_f$           | [mm]            | 35                  | 45            | 55         | 45         | 55         | 65         | 55         | 75         | 85   |      |
| Nominal outer diameter of screw                                      | $d_{nom}$       | [mm]            | 6                   |               |            | 8          |            |            | 10         |            |      |      |

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

<sup>2)</sup> no performance assessed

TILCA concrete screw TSM high performance

**Performances**

Characteristic values for static and quasi-static loading continuation

**Annex C2**

**Table 8: Seismic category C1 – Characteristic load values (only type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK and type KM<sup>1)</sup>)**

| TSM concrete screw size  |                 |      | 6              |               |            | 8          |            | 10         |  |
|--|-----------------|------|----------------|---------------|------------|------------|------------|------------|--|
| Nominal embedment depth  | $h_{nom}$       |      | $h_{nom2}$     | $h_{nom3}$    | $h_{nom1}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom3}$ |  |
|  | [mm]            |      | 45             | 55            | 45         | 65         | 55         | 85         |  |
| <b>Steel failure for tension and shear load (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK and type KM<sup>1)</sup>)</b> |                 |      |                |               |            |            |            |            |  |
| Characteristic resistance  | $N_{Rk,s,C1}$   | [kN] | 14,0           |               |            | 27,0       |            | 45,0       |  |
| Partial factor   | $\gamma_{Ms,N}$ | [-]  | 1,5            |               |            |            |            |            |  |
| Characteristic resistance<br><b>Type S, Type ST, Type LK/GLK</b>   | $V_{Rk,s,C1}$   | [kN] | 3,5            | 4,0           | 8,0        | 10,0       | 14,0       | 16,0       |  |
| Characteristic resistance<br><b>Type SK</b>  | $V_{Rk,s,C1}$   | [kN] | 2,5            | <sup>2)</sup> | 4,5        | 7,0        | 14,0       | 10,0       |  |
| Partial factor   | $\gamma_{Ms,V}$ | [-]  | 1,25           |               |            |            |            |            |  |
| Without filling of the annular gap <sup>3)</sup>   | $\alpha_{gap}$  | [-]  | 0,5            |               |            |            |            |            |  |
| With filling of the annular gap <sup>4)</sup>  | $\alpha_{gap}$  | [-]  | 1,0            |               |            |            |            |            |  |
| <b>Pull-out failure (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK and type KM<sup>1)</sup>)</b>                         |                 |      |                |               |            |            |            |            |  |
| Characteristic resistance in cracked concrete C20/25   | $N_{Rk,p,C1}$   | [kN] | 1,5            | 3,0           | 3,0        | 8,5        | 6,0        | 17,0       |  |
| <b>Concrete cone failure (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK and type KM<sup>1)</sup>)</b>                    |                 |      |                |               |            |            |            |            |  |
| Effective embedment depth  | $h_{ef}$        | [mm] | 34             | 42            | 32         | 49         | 40         | 65         |  |
| Edge distance  | $c_{cr,N}$      | [mm] | 1,5 x $h_{ef}$ |               |            |            |            |            |  |
| Spacing  | $s_{cr,N}$      | [mm] | 3 x $h_{ef}$   |               |            |            |            |            |  |
| Installation safety factor   | $\gamma_{inst}$ | [-]  | 1,0            |               |            |            |            |            |  |
| <b>Concrete pry-out failure (version type S, type SK, type ST and type LK/GLK)</b>   |                 |      |                |               |            |            |            |            |  |
| Factor for pry-out failure   | $k_8$           | [-]  | 1,6            |               |            | 2,1        | 2,8        | 2,5        |  |
| <b>Concrete edge failure (version type S, type SK, type ST and type LK/GLK)</b>  |                 |      |                |               |            |            |            |            |  |
| Effective length in concrete   | $l_f$           | [mm] | 45             | 55            | 45         | 65         | 55         | 85         |  |
| Nominal outer diameter of screw  | $d_{nom}$       | [mm] | 6              |               |            | 8          |            | 10         |  |

<sup>1)</sup> only tension load

<sup>2)</sup> no performance assessed

<sup>3)</sup> without filling of the annular gap according to annex B5

<sup>4)</sup> with filling of the annular gap according to annex B7

**TILCA concrete screw TSM high performance**

**Performances**

Fire exposure – characteristic values of resistance

**Annex C3**

Table 9: Fire exposure – characteristic values of resistance

| TSM concrete screw size                  |      |                    |                 | 6   |    |    | 8   |    |    | 10  |    |  |
|--|------|--------------------|-----------------|-----|----|----|-----|----|----|-----|----|--|
| Nominal embedment depth                  |      | $h_{nom}$          | 1 <sup>1)</sup> | 2   | 3  | 1  | 2   | 3  | 1  | 2   | 3  |  |
|  |      | [mm]               | 35              | 45  | 55 | 45 | 55  | 65 | 55 | 75  | 85 |  |
| Steel failure for tension and shear load |      |                    |                 |     |    |    |     |    |    |     |    |  |
| Characteristic Resistance                | R30  | $N_{Rk,s,fi30}$    | [kN]            | 0,9 |    |    | 2,4 |    |    | 4,4 |    |  |
|  | R60  | $N_{Rk,s,fi60}$    | [kN]            | 0,8 |    |    | 1,7 |    |    | 3,3 |    |  |
|  | R90  | $N_{Rk,s,fi90}$    | [kN]            | 0,6 |    |    | 1,1 |    |    | 2,3 |    |  |
|  | R120 | $N_{Rk,s,fi120}$   | [kN]            | 0,4 |    |    | 0,7 |    |    | 1,7 |    |  |
|  | R30  | $V_{Rk,s,fi30}$    | [kN]            | 0,9 |    |    | 2,4 |    |    | 4,4 |    |  |
|  | R60  | $V_{Rk,s,fi60}$    | [kN]            | 0,8 |    |    | 1,7 |    |    | 3,3 |    |  |
|  | R90  | $V_{Rk,s,fi90}$    | [kN]            | 0,6 |    |    | 1,1 |    |    | 2,3 |    |  |
|  | R120 | $V_{Rk,s,fi120}$   | [kN]            | 0,4 |    |    | 0,7 |    |    | 1,7 |    |  |
|  | R30  | $M^0_{Rk,s,fi30}$  | [Nm]            | 0,7 |    |    | 2,4 |    |    | 5,9 |    |  |
|  | R60  | $M^0_{Rk,s,fi60}$  | [Nm]            | 0,6 |    |    | 1,8 |    |    | 4,5 |    |  |
|  | R90  | $M^0_{Rk,s,fi90}$  | [Nm]            | 0,5 |    |    | 1,2 |    |    | 3,0 |    |  |
|  | R120 | $M^0_{Rk,s,fi120}$ | [Nm]            | 0,3 |    |    | 0,9 |    |    | 2,3 |    |  |

| Pull-out failure          |        |               |      |     |     |     |     |     |     |     |     |     |
|---------------------------|--------|---------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Characteristic Resistance | R30-90 | $N_{Rk,p,fi}$ | [kN] | 0,6 | 0,4 | 0,8 | 0,8 | 1,4 | 2,0 | 1,5 | 3,3 | 4,3 |
|                           | R120   | $N_{Rk,p,fi}$ | [kN] | 0,5 | 0,3 | 0,6 | 0,6 | 1,1 | 1,6 | 1,2 | 2,6 | 3,4 |

| Concrete cone failure     |        |                 |      |     |     |     |     |     |     |     |     |     |
|---------------------------|--------|-----------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Characteristic Resistance | R30-90 | $N^0_{Rk,c,fi}$ | [kN] | 0,5 | 1,2 | 2,0 | 1,0 | 1,9 | 2,9 | 1,7 | 4,2 | 5,9 |
|                           | R120   | $N^0_{Rk,c,fi}$ | [kN] | 0,4 | 0,9 | 1,6 | 0,8 | 1,5 | 2,3 | 1,4 | 3,4 | 4,7 |

| Edge distance |  |             |      |                   |  |  |  |  |  |  |  |
|---------------|--|-------------|------|-------------------|--|--|--|--|--|--|--|
| R30 - R120    |  | $c_{cr,fi}$ | [mm] | $2 \times h_{ef}$ |  |  |  |  |  |  |  |

In case of fire attack from more than one side, the minimum edge distance shall be  $\geq 300\text{mm}$ .

| Spacing      |  |             |      |                   |  |  |  |  |  |  |  |
|--------------|--|-------------|------|-------------------|--|--|--|--|--|--|--|
| R30 bis R120 |  | $s_{cr,fi}$ | [mm] | $4 \times h_{ef}$ |  |  |  |  |  |  |  |

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

<sup>1)</sup> only for use in redundant non-structural systems (multiple use) according to EN 1992-4:2018, only in dry internal conditions

TILCA concrete screw TSM high performance

**Performances**  
Fire exposure – characteristic values of resistance

**Annex C4**

Table 10: Displacements under static and quasi-static tension load

| TSM concrete screw size |              |                    |           | 6          |            |            | 8          |            |            | 10         |            |  |
|-------------------------|--------------|--------------------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|--|
| Nominal embedment depth |              |                    | $h_{nom}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |  |
|                         |              |                    | [mm]      | 45         | 55         | 45         | 55         | 65         | 55         | 75         | 85         |  |
| Cracked concrete        | tension load | N                  | [kN]      | 0,72       | 1,45       | 1,63       | 2,74       | 4,06       | 3,04       | 6,22       | 8,46       |  |
|                         | displacement | $\delta_{N0}$      | [mm]      | 0,19       | 0,27       | 0,27       | 0,53       | 0,45       | 0,26       | 0,58       | 0,61       |  |
|                         |              | $\delta_{N\infty}$ | [mm]      | 0,55       | 0,84       | 0,49       | 0,66       | 0,61       | 0,69       | 0,92       | 1,1        |  |
| Uncracked concrete      | tension load | N                  | [kN]      | 2,11       | 4,07       | 4,24       | 5,97       | 8,03       | 5,42       | 9,17       | 12,28      |  |
|                         | displacement | $\delta_{N0}$      | [mm]      | 0,42       | 0,43       | 0,33       | 0,49       | 0,58       | 0,84       | 0,62       | 0,79       |  |
|                         |              | $\delta_{N\infty}$ | [mm]      | 0,42       | 0,43       | 0,58       |            |            | 0,79       |            |            |  |

Table 11: Displacements under static and quasi-static shear load

| TSM concrete screw size        |              |                    |           | 6          |            |            | 8          |            |            | 10         |            |  |
|--------------------------------|--------------|--------------------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|--|
| Nominal embedment depth        |              |                    | $h_{nom}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |  |
|                                |              |                    | [mm]      | 45         | 55         | 45         | 55         | 65         | 55         | 75         | 85         |  |
| Cracked and uncracked concrete | shear load   | V                  | [kN]      | 3,3        |            |            | 8,6        |            |            | 16,2       |            |  |
|                                | displacement | $\delta_{V0}$      | [mm]      | 1,55       |            |            | 2,7        |            |            | 2,7        |            |  |
|                                |              | $\delta_{V\infty}$ | [mm]      | 3,1        |            |            | 4,1        |            |            | 4,3        |            |  |

TILCA concrete screw TSM high performance

**Performances**  
Displacements under static and quasi-static loads

**Annex C5**