Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA
www.eota.eu

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment

# ETA-23/0693 of 19 December 2023

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 | TOGE concrete screw TSM E |
| Product family to which the construction product belongs | Mechanical fasteners for use in concrete |
| Manufacturer | TOGE Dübel GmbH & Co. KG<br>Illesheimer Straße 10<br>90431 Nürnberg |
| Manufacturing plant | TOGE Dübel GmbH & Co. KG |
| This European Technical Assessment contains | 16 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 | 330232-01-0601, Edition 05/2021 |

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## Specific Part

### 1 Technical description of the product

The TOGE concrete screw TSM E is an anchor of size 8 and 10 mm made of galvanized steel or steel with zinc flake coating. 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 C4 |
| Characteristic resistance for seismic performance categorie C1 | No performance assessed |
| 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 C3 |

#### 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 19 December 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

*beglaubigt:*
Tempel

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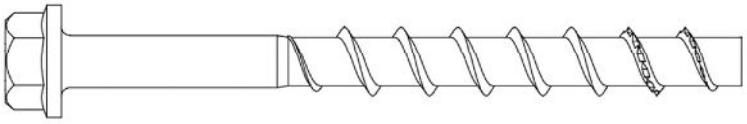
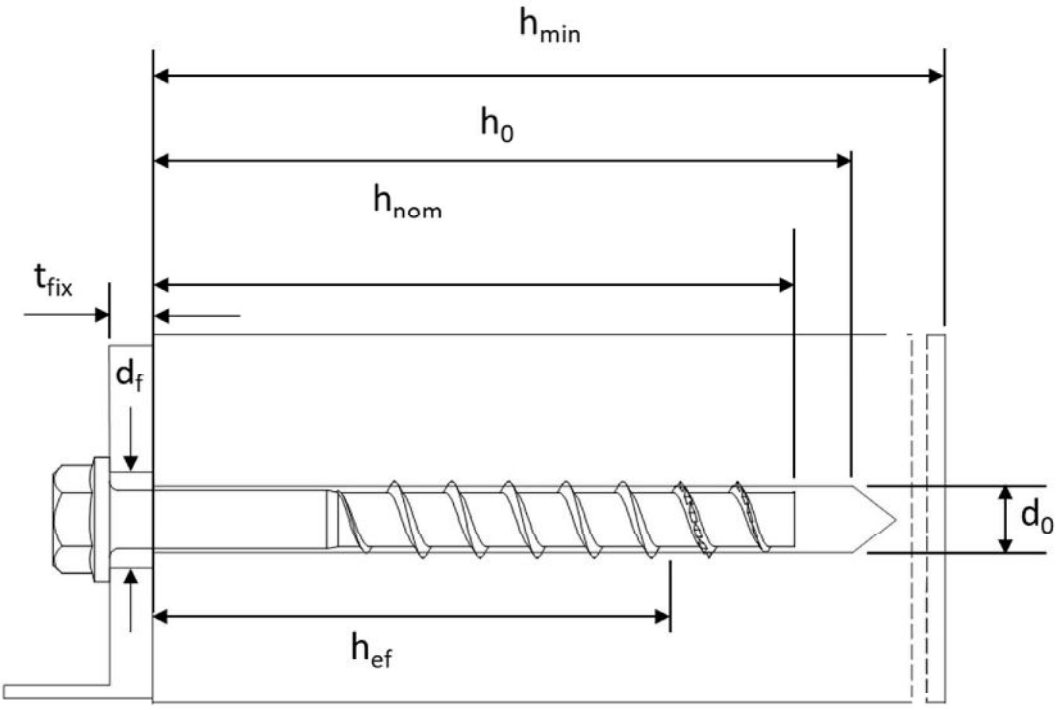
# Product in installed condition

## TOGE concrete screw TSM E



e.g. TOGE 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

| TOGE concrete screw TSM E | |
|---|---|
| **Product description**<br>Product in installed condition | **Annex A1** |

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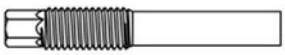
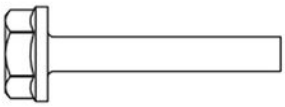
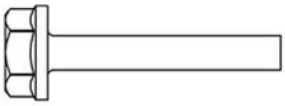



Version with metric connection thread
and hexagon drive e.g. TSM 8x105 M10 SW7; Type ST



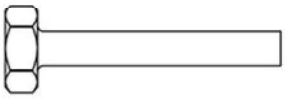


Version with washer and hexagon head
e.g. TSM 8x80 SW13 VZ 40; Type S





Version with washer, hexagon head and
TORX drive e.g. TSM 8x80 SW13; Type S





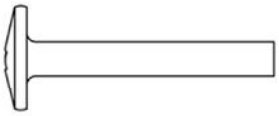
Version with hexagon head
e.g. TSM 8x80 SW13 OS; Type S



Version with countersunk head and TORX drive e.g.
TSM 8x80 C VZ 40; Type SK



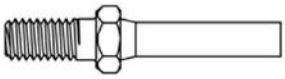
Version with pan head and TORX
drive e.g. TSM 8x80 P VZ 40; Type P



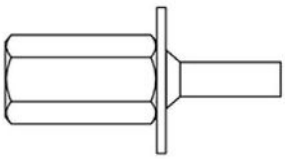
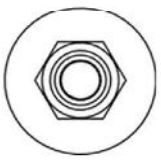


Version with large pan head and TORX
drive e.g. TSM 8x80 LP VZ 40; Type P


Version with countersunk head and
connection thread e.g. TSM 6x55 AG M8; Type ST-6




Version with hexagon drive and
connection thread e.g. TSM 6x55 M8 SW10; Type ST-6

Version with internal thread and
hexagon drive e.g. TSM 6x55 IM M8/10; Type I

| | |
|---|---|
| **TOGE concrete screw TSM E** | |
| **Product description**<br>Screw types | **Annex A2** |

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## Table 1: Material

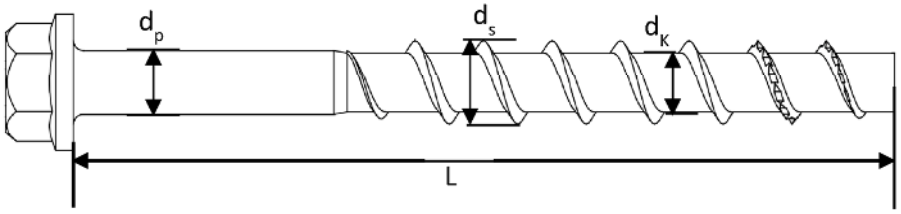
| Part | Product name | Material |
|---|---|---|
| all types | TSM E | -carbon Steel galvanized<br>-carbon Steel with zinc flake coating<br>-carbon steel with zinc flake duplex coating<br>-carbon steel with zinc flake special coating TOGE KORR |

| Part | Product name | Nominal characteristic steel | | Rupture elongation $A_5$ [%] |
|---|---|---|---|---|
| | | Yield strength $f_{yk}$ [N/mm²] | Ultimate strength $f_{uk}$ [N/mm²] | |
| all types | TSM E | 560 | 700 | ≤ 8 |

## Table 2: Dimensions

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

**Marking:**
**TSM E**
Screw type: TSM E
Screw size: 10
Screw length: 100


**TOGE concrete screw TSM E**

**Product description**
Material, dimensions and markings

**Annex A3**

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# Specification of Intended use

## Anchorages subject to:

- Static or quasi-static loading
- Fire exposure

## 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 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 anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed for static or quasi-static actions 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 df of clearance hole in the fixture in Annex B2, Table 3.

## Installation:

- Hammer drilling or hollow drilling.
- 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 CF-T 300V or ATA 2004C.
- Adjustability according to Annex B5
- Cleaning of borehole is not necessary, if using a hollow drill.

| TOGE concrete screw TSM E | Annex B1 |
|---|---|
| **Intended use**<br>Specification | |

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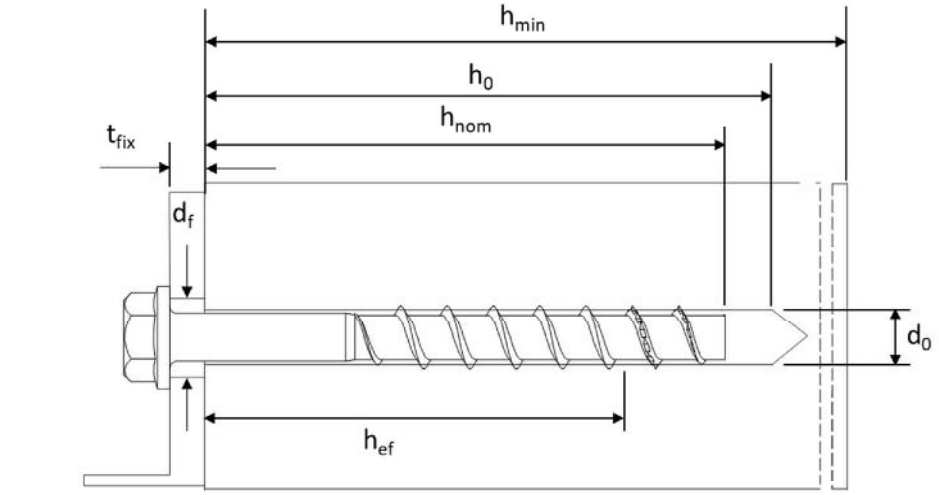
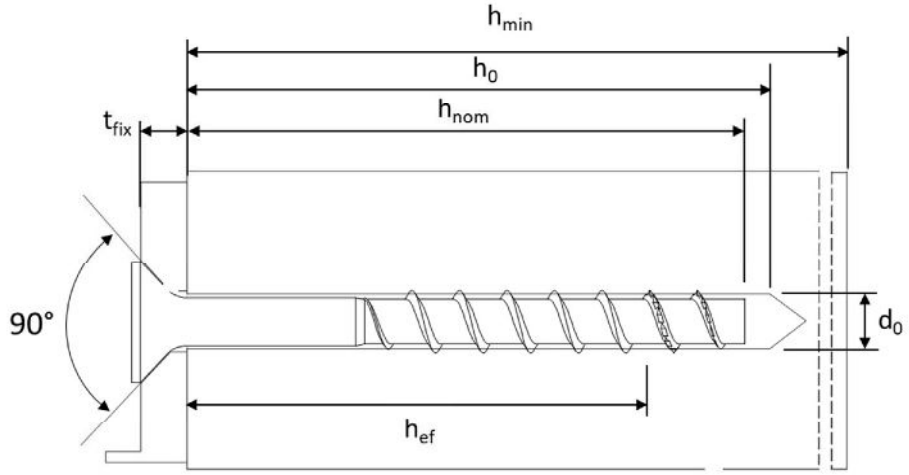
## Table 3: Installation parameters

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




**TOGE concrete screw TSM E**

**Intended use**
Installation parameters

**Annex B2**

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## Table 4: Minimum thickness of member, minimum edge distance and minimum spacing

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

**TOGE concrete screw TSM E**

**Intended use**
Minimum thickness of member, minimum edge distance and minimum spacing

**Annex B3**

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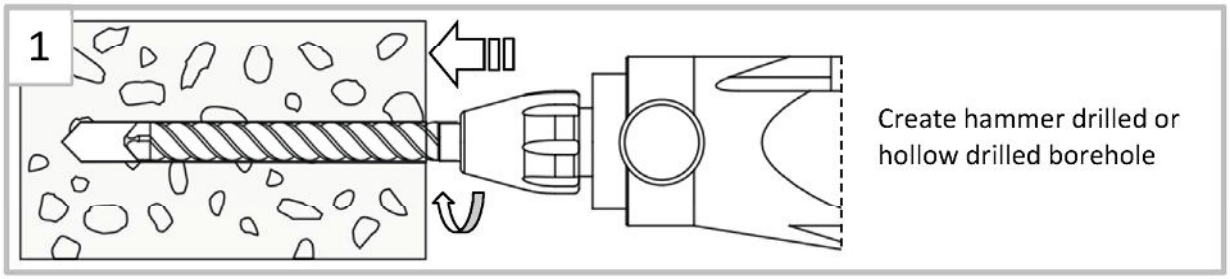
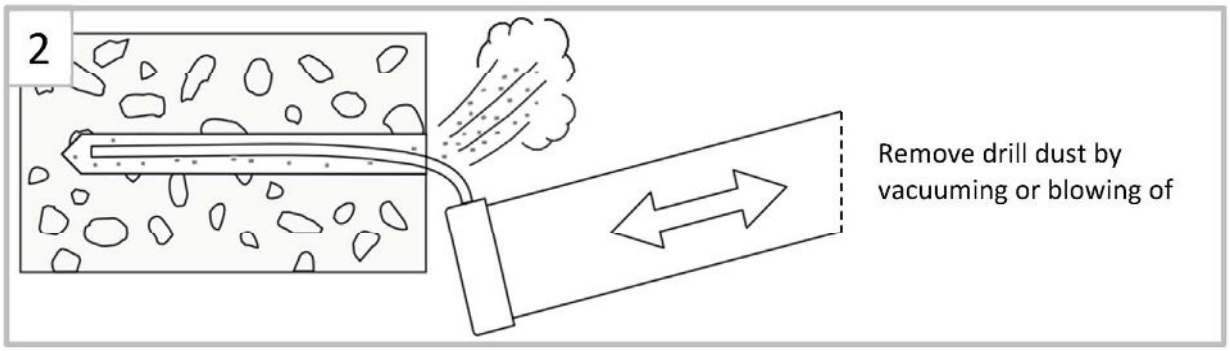
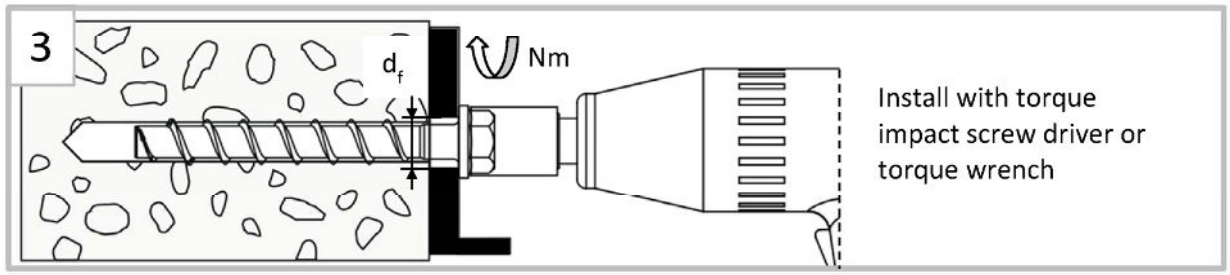
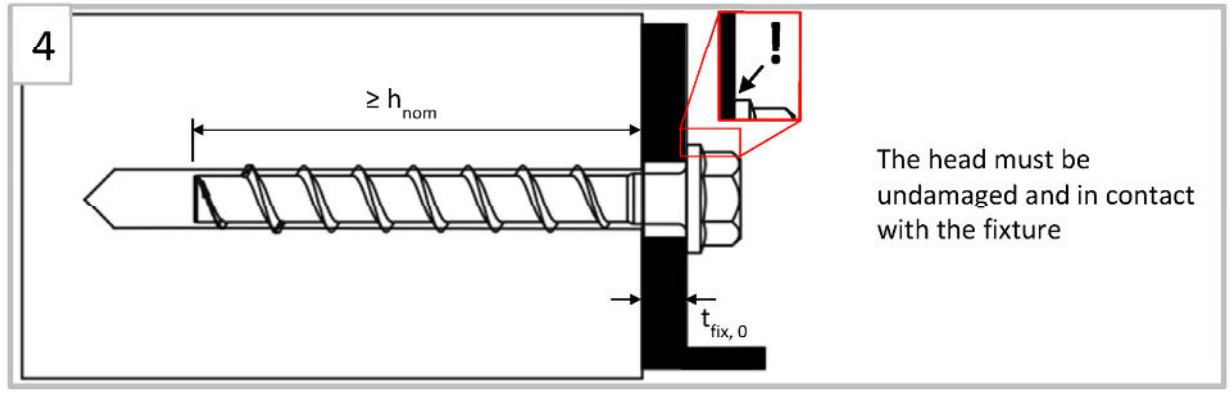
## Installation Instructions




Note:
Cleaning of borehole is not necessary when using a hollow drill

| | |
|---|---|
| **TOGE concrete screw TSM E** | |
| **Intended use**<br>Installation instructions | **Annex B4** |

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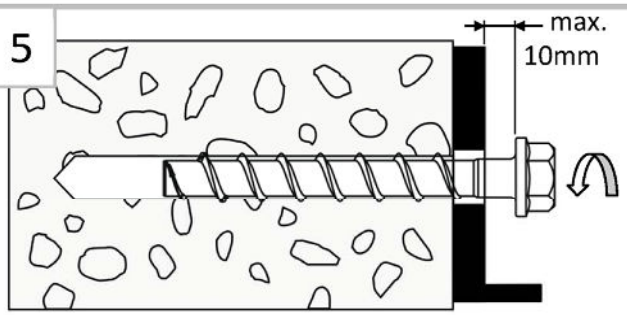
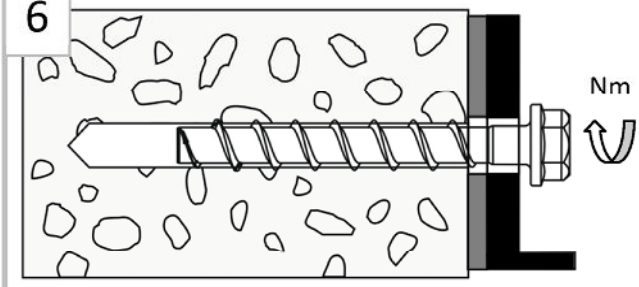
## 1. Adjustment

5



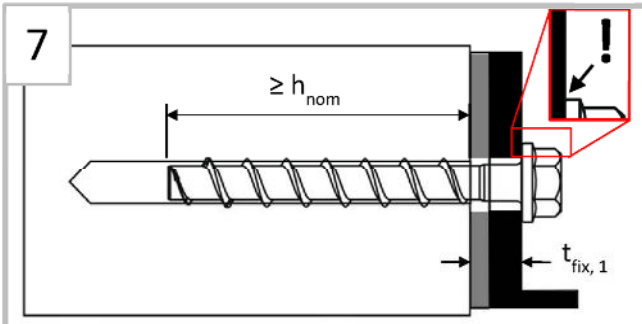

Screw may be untightened maximum 10mm

6




After adjustment, tighten the screw again

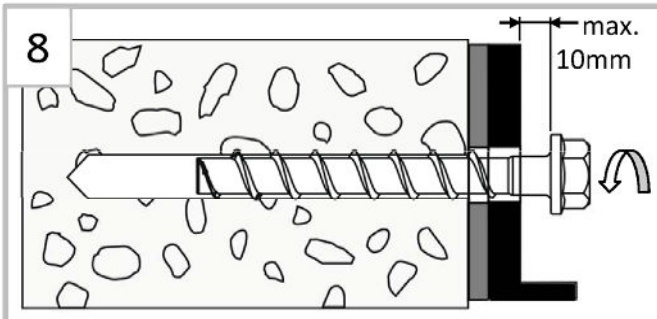
7




The head must be undamaged and in contact with the fixture

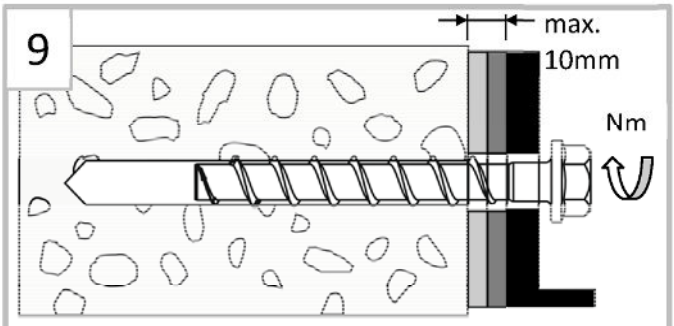
## 2. Adjustment

8



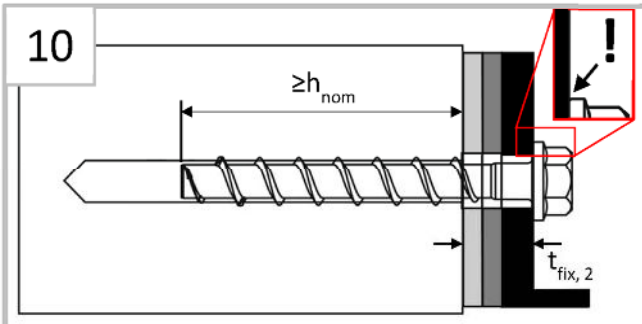

Screw may be untightened maximum 10mm

9




After adjustment, tighten the screw again

10




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 $h_{nom}$.

| | |
|---|---|
| **TOGE concrete screw TSM E** | |
| **Intended use**<br>Installation instructions - Adjustment | **Annex B5** |

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## Table 5: Characteristic values for static and quasi-static loading

| TSM concrete screw size | | | | 8 | | | 10 | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal embedment depth | | $h_{nom}$ | [mm] | $h_{nom1}$ 45 | $h_{nom2}$ 55 | $h_{nom3}$ 65 | $h_{nom1}$ 55 | $h_{nom2}$ 75 | $h_{nom3}$ 85 |
| **Steel failure for tension and shear loading** | | | | | | | | | |
| Characteristic resistance | | $N_{Rk,s}$ | [kN] | 27,0 | | | 45,0 | | |
| Partial factor | | $\gamma_{Ms,N}$ | [-] | 1,5 | | | | | |
| Characteristic resistance | | $V^0_{Rk,s}$ | [kN] | 13,5 | | 17,0 | 22,5 | 34,0 | |
| Partial factor | | $\gamma_{Ms,V}$ | [-] | 1,25 | | | | | |
| Ductility factor | | $k_7$ | [-] | 0,8 | | | | | |
| Characteristic bending moment | | $M^0_{Rk,s}$ | [Nm] | 26,0 | | | 56,0 | | |
| **Pull-out failure in uncracked concrete** | | | | | | | | | |
| Characteristic resistance to tension load in C20/25 | | $N_{Rk,p}$ | [kN] | 9,0 | 12,0 | 17,0 | 11,0 | 19,0 | 25,0 |
| Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \psi_c$ with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$ | C25/30 | m | [-] | 0,41 | 0,33 | | 0,5 | 0,39 | |
| | C30/37 | | | | | | | | |
| | C40/50 | | | | | | | | |
| | C50/60 | | | | | | | | |
| **Pull-out failure in cracked concrete** | | | | | | | | | |
| Characteristic resistance to tension load in C20/25 | | $N_{Rk,p}$ | [kN] | 3,0 | 5,5 | 8,0 | 6,0 | 13,0 | 17,0 |
| Increasing factor for $N_{Rk,p} = N_{Rk,p\,(C20/25)} \cdot \psi_c$ with $\psi_c = \left(\frac{f_{ck}}{20}\right)^m$ | C25/30 | m | [-] | 0,49 | 0,39 | | 0,42 | 0,27 | |
| | C30/37 | | | | | | | | |
| | C40/50 | | | | | | | | |
| | C50/60 | | | | | | | | |
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | | |

**TOGE concrete screw TSM E**

**Performances**
Characteristic values for static and quasi-static loading

**Annex C1**

Deutsches Institut für Bautechnik DIBt

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

| TSM concrete screw size | | | | 8 | | | 10 | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal embedment depth | | | $h_{nom}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ | $h_{nom1}$ | $h_{nom2}$ | $h_{nom3}$ |
| | | | [mm] | 45 | 55 | 65 | 55 | 75 | 85 |
| **Concrete failure: concrete cone failure and splitting failure** | | | | | | | | | |
| Effective embedment depth | | $h_{ef}$ | [mm] | 35 | 44 | 52 | 43 | 60 | 69 |
| k-factor | cracked | $k_{cr}$ | [-] | 7,7 | | | | | |
| | uncracked | $k_{ucr}$ | [-] | 11,0 | | | | | |
| Concrete cone failure | spacing | $s_{cr,N}$ | [mm] | 3 x $h_{ef}$ | | | | | |
| | edge distance | $c_{cr,N}$ | [mm] | 1,5 x $h_{ef}$ | | | | | |
| Splitting failure case 1 | resistance | $N^0_{Rk,sp}$ | [kN] | 9,0 | 12,0 | 17,0 | 11,0 | 19,0 | 25,0 |
| | spacing | $s_{cr,sp}$ | [mm] | 200 | 240 | 290 | 230 | 280 | 320 |
| | edge distance | $c_{cr,sp}$ | [mm] | 100 | 120 | 145 | 115 | 140 | 160 |
| Splitting failure case 2 | resistance | $N^0_{Rk,sp}$ | [kN] | 5,5 | 8,0 | 11,0 | 7,0 | 15,0 | 20,0 |
| | spacing | $s_{cr,sp}$ | [mm] | 128 | 164 | 196 | 160 | 224 | 260 |
| | edge distance | $c_{cr,sp}$ | [mm] | 64 | 82 | 98 | 80 | 114 | 130 |
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Pry-out failure** | | | | | | | | | |
| Factor for pry-out failure | | $k_g$ | [-] | 2,1 | 2,8 | | 2,5 | | |
| Installation factor | | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Concrete edge failure** | | | | | | | | | |
| Effective length in concrete | | $l_f$ | [mm] | 45 | 55 | 65 | 55 | 75 | 85 |
| Nominal outer diameter of screw | | $d_{nom}$ | [mm] | 8 | | | 10 | | |

**TOGE concrete screw TSM E**

**Performances**
Characteristic values for static and quasi-static loading continuation

**Annex C2**

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## Table 7: Fire exposure – characteristic values of resistance

| TSM concrete screw size | | | | 8 | | | 10 | | |
|---|---|---|---|---|---|---|---|---|---|
| Nominal embedment depth | | | $h_{nom}$ | 1 | 2 | 3 | 1 | 2 | 3 |
| | | | [mm] | 45 | 55 | 65 | 55 | 75 | 85 |
| Steel failure for tension and shear load | | | | | | | | | |
| Characteristic Resistance | R30 | $N_{Rk,s,fi30}$ | [kN] | 2,4 | | | 4,4 | | |
| | R60 | $N_{Rk,s,fi60}$ | [kN] | 1,7 | | | 3,3 | | |
| | R90 | $N_{Rk,s,fi90}$ | [kN] | 1,1 | | | 2,3 | | |
| | R120 | $N_{Rk,s,fi120}$ | [kN] | 0,7 | | | 1,7 | | |
| | R30 | $V_{Rk,s,fi30}$ | [kN] | 2,4 | | | 4,4 | | |
| | R60 | $V_{Rk,s,fi60}$ | [kN] | 1,7 | | | 3,3 | | |
| | R90 | $V_{Rk,s,fi90}$ | [kN] | 1,1 | | | 2,3 | | |
| | R120 | $V_{Rk,s,fi120}$ | [kN] | 0,7 | | | 1,7 | | |
| | R30 | $M^0_{Rk,s,fi30}$ | [Nm] | 2,4 | | | 5,9 | | |
| | R60 | $M^0_{Rk,s,fi60}$ | [Nm] | 1,8 | | | 4,5 | | |
| | R90 | $M^0_{Rk,s,fi90}$ | [Nm] | 1,2 | | | 3,0 | | |
| | R120 | $M^0_{Rk,s,fi120}$ | [Nm] | 0,9 | | | 2,3 | | |
| Pull-out failure | | | | | | | | | |
| Characteristic Resistance | R30-90 | $N_{Rk,p,fi}$ | [kN] | 0,8 | 1,4 | 2,0 | 1,5 | 3,3 | 4,3 |
| | R120 | $N_{Rk,p,fi}$ | [kN] | 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] | 1,0 | 1,9 | 2,9 | 1,7 | 4,2 | 5,9 |
| | R120 | $N^0_{Rk,c,fi}$ | [kN] | 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 ≥300mm. | | | | | | | | | |
| Spacing | | | | | | | | | |
| R30 - 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. | | | | | | | | | |

**TOGE concrete screw TSM E**

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

**Annex C3**

Deutsches Institut für Bautechnik DIBt

## Table 8: Displacements under static and quasi-static tension load

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

## Table 9: Displacements under static and quasi-static shear load

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

**TOGE concrete screw TSM E**

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

**Annex C4**