

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

European Technical Assessment Body  
for construction products



## European Technical Assessment

ETA-25/0819  
of 27 October 2025

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family  
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment  
contains

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

Deutsches Institut für Bautechnik

TILCA concrete screw TSM high performance

Mechanical fasteners for use in concrete

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

EAD 330232-01-0601, Edition 05/2021

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## Specific Part

### 1 Technical description of the product

The TILCA concrete screw TSM high performance is an anchor in size 6, 8, 10, 12 und 14 mm made of galvanised 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 C7
Characteristic resistance and displacements for seismic performance category C1 and C2	See Annex C3 to C5 and C8

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

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C6

#### 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 27 October 2025 by Deutsches Institut für Bautechnik

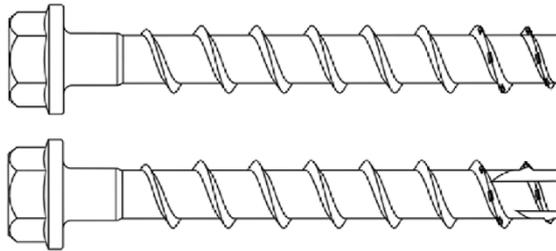
Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Tempel

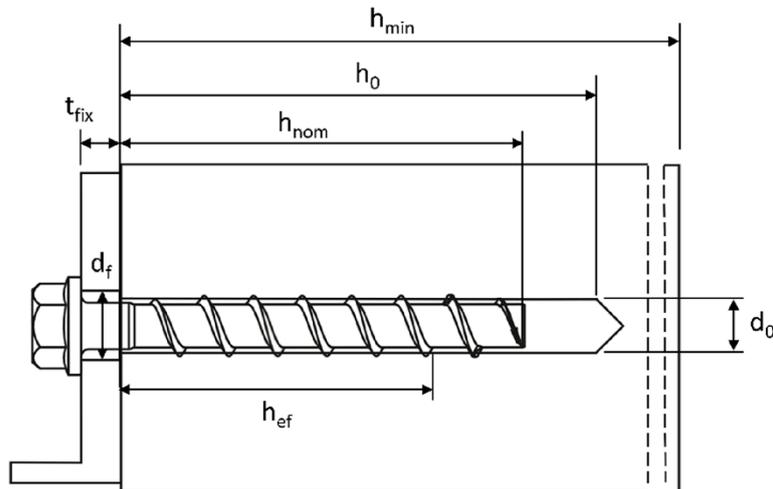
## Product in installed condition

### TILCA concrete screw TSM high performance

- Galvanized carbon steel
- Zinc flakes coated carbon steel



e.g. TILCA concrete screw, zinc flakes coated, with hexagon head and fixture



$d_0$  = nominal drill hole diameter

$t_{fix}$  = thickness of fixture

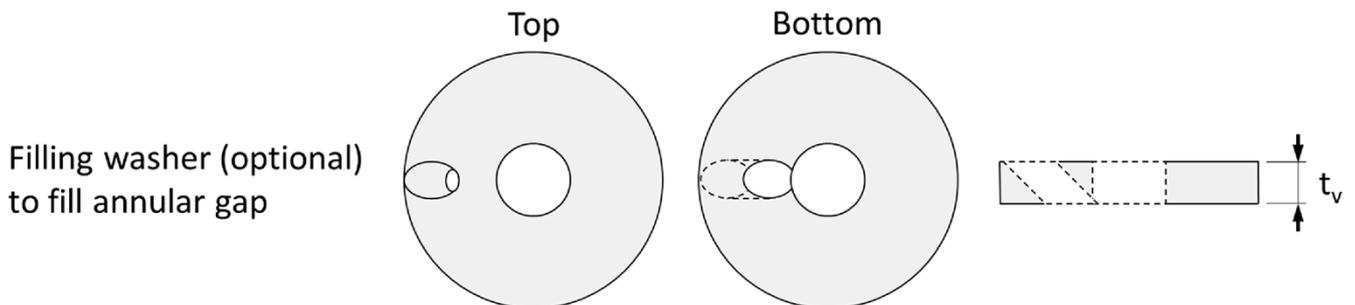
$d_f$  = clearance hole diameter

$h_{min}$  = minimum thickness of member

$h_{nom}$  = nominal embedment depth

$h_0$  = drill hole depth

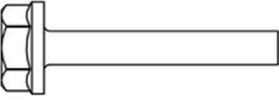
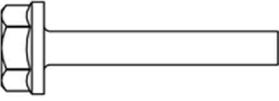
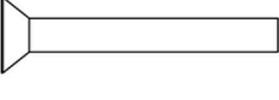
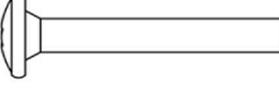
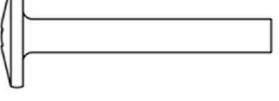
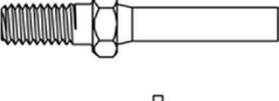
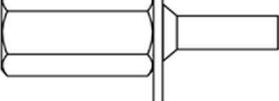
$h_{ef}$  = effective embedment depth



TILCA concrete screw TSM high performance

**Product description**  
Product in installed condition

**Annex A1**

		Configuration with metric connection thread and hexagon socket e.g. TSM 8x105 M10 SW5; Type ST
		Configuration with metric connection thread and hexagon drive e.g. TSM 8x105 M10 SW7; Type ST
		Configuration with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40; Type S
		Configuration with washer, hexagon head and TORX drive e.g. TSM 8x80 SW13; Type S
		Configuration with washer and bund e.g. TSM BC ST 14x130 SW24 VZ 40; Type BND
		Configuration with hexagon head e.g. TSM 8x80 SW13 OS; Type S
		Configuration with countersunk head and TORX drive e.g. TSM 8x80 C VZ 40; Type SK
		Configuration with pan head and TORX drive e.g. TSM 8x80 P VZ 40; Type LK
		Configuration with large pan head and TORX drive e.g. TSM 8x80 LP VZ 40; Type GLK
		Configuration with countersunk head and connection thread e.g. TSM 6x55 AG M8; Type T25
		Configuration with hexagon drive and connection thread e.g. TSM 6x55 M8 SW10; Type GW
		Configuration with internal thread and hexagon drive e.g. TSM 6x55 IM M8/10; Type KM

TILCA concrete screw TSM high performance

**Product description**  
Screw types

**Annex A2**

English translation prepared by DIBt

Table 1: Material

Part	Product name	Material		
all types	TSM high performance	- Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 - Zinc flake coating according to EN ISO 10683:2018 ( $\geq 5\mu\text{m}$ ) - Zinc flake coating according to EN ISO 10683:2018 special coating TILCA KORR ( $\geq 20\mu\text{m}$ )		
Part	Product name	Nominal characteristic steel		Rupture elongation $A_5$ [%]
		Yield strength $f_{yk}$ [N/mm <sup>2</sup> ]	Ultimate strength $f_{uk}$ [N/mm <sup>2</sup> ]	
all types	TSM high performance	560	700	$\leq 8$

Table 2: Dimensions

Anchor size			6		8			10			12			14		
Nominal embedment depth	$h_{nom}$		1	2	1	2	3	1	2	3	1	2	3	1	2	3
	[mm]		40	55	45	55	65	55	75	85	65	85	100	75	100	115
Screw length	$\leq L$	[mm]	500													
Core diameter	$d_k$	[mm]	5,1		7,1			9,1			11,1			13,1		
Thread outer diameter	$d_s$	[mm]	7,5		10,6			12,6			14,6			16,6		
Thickness of filling washer	$t_v$	[mm]	-		5			5			5			5		

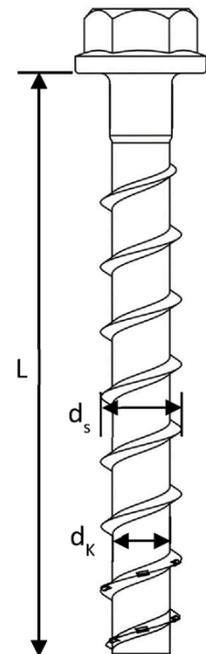
**Marking:**

**TSM high performance**

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

**TSM high performance BC ST**

Screw type: TSM BC ST  
Screw size: 14  
Screw length: 130



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			12			14				
Nominal embedment depth		$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$											
	[mm]	40	55	45	55	65	55	75	85	65	85	100	65	85	115		
Static and quasi-static loads		All sizes and all embedment depths															
Fire exposure		All sizes and all embedment depths															
C1 category - seismic		ok	ok	1)			ok	1)			ok	1)			ok		
C2 category – seismic		1)		1)			ok	1)	ok	1)			ok	1)			ok

<sup>1)</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.

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.
- 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 6-14, all embedment depths except for seismic application.
- Cleaning of borehole is not necessary, if using a hollow drill.

TILCA concrete screw TSM high performance

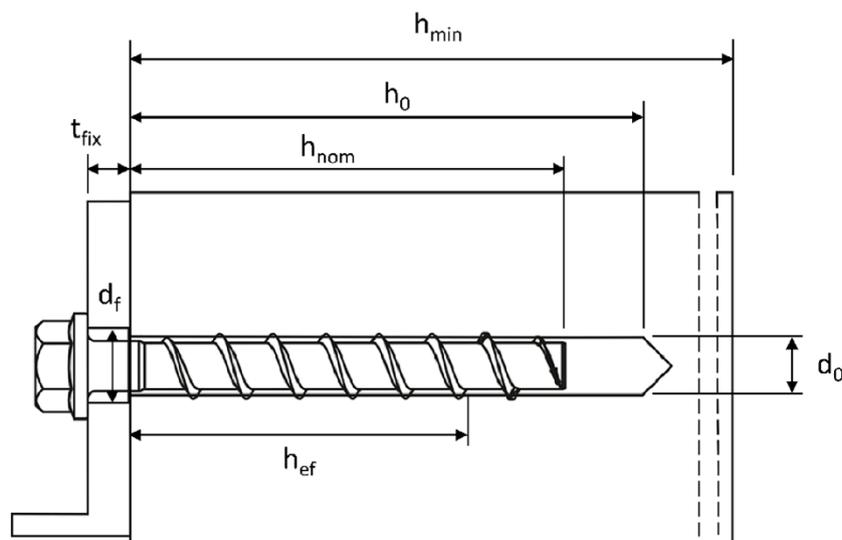
**Intended use**  
Specification continuation

**Annex B2**

Table 4: Installation parameters

TSM concrete screw size		6		8			10		
Nominal embedment depth	$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
	[mm]	40	55	45	55	65	55	75	85
Nominal drill hole diameter	$d_0$	6		8			10		
Cutting diameter of drill bit	$d_{cut} \leq$	6,40		8,45			10,45		
Drill hole depth	$h_0 \geq$	45	60	55	65	75	65	85	95
Clearance hole diameter	$d_f \leq$	8		12			14		
Installation torque (version with connection thread)	$T_{inst}$	10		20			40		
Torque impact screw driver	[Nm]	Max. torque according to manufacturer's instructions							
		160		300			400		

TSM concrete screw size		12			14		
Nominal embedment depth	$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
	[mm]	65	85	100	75	100	115
Nominal drill hole diameter	$d_0$	12			14		
Cutting diameter of drill bit	$d_{cut} \leq$	12,50			14,50		
Drill hole depth	$h_0 \geq$	75	95	110	85	110	125
Clearance hole diameter	$d_f \leq$	16			18		
Installation torque (version with connection thread)	$T_{inst}$	60			80		
Torque impact screw driver	[Nm]	Max. torque according to manufacturer's instructions					
		650			650		



TILCA concrete screw TSM high performance

Intended use  
Installation parameters

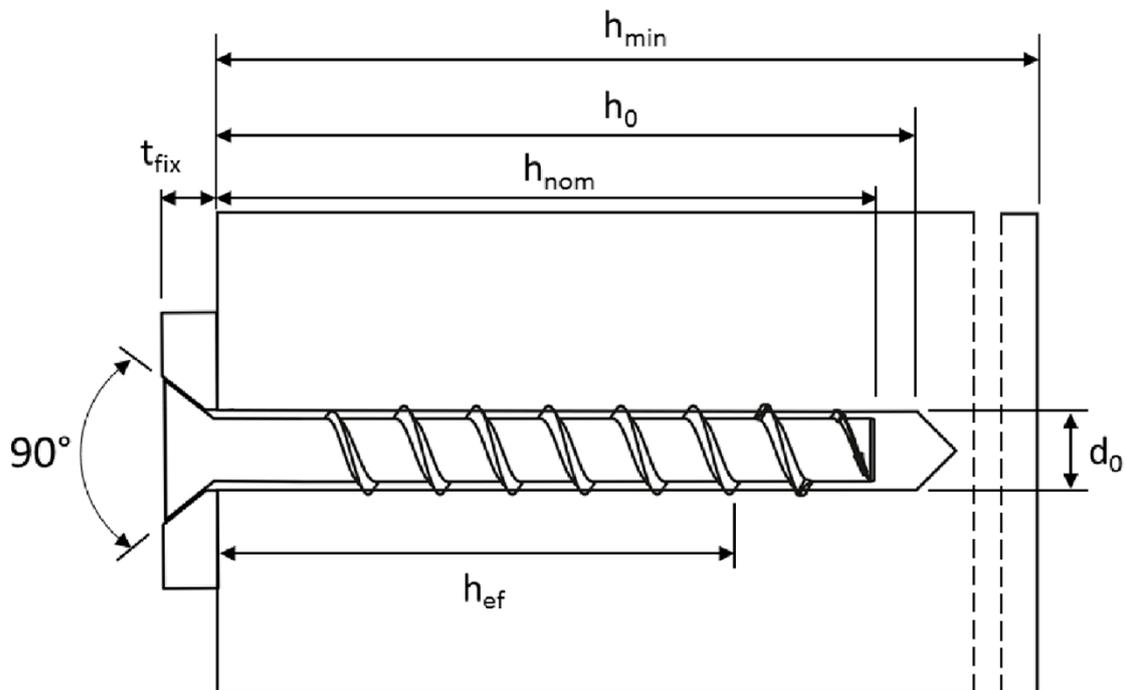
Annex B3

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

TSM concrete screw size		6			8			10		
Nominal embedment depth	$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
	[mm]	40	55	45	55	65	55	75	85	
Minimum thickness of member	$h_{min}$	[mm]	100	100	100	120	100	130		
Minimum edge distance	$c_{min}$	[mm]	40	40	50	50	50	50		
Minimum spacing	$s_{min}$	[mm]	40	40	50	50	50	50		

TSM concrete screw size		12			14			
Nominal embedment depth	$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
	[mm]	65	85	100	75	100	115	
Minimum thickness of member	$h_{min}$	[mm]	120	130	150	130	150	170
Minimum edge distance	$c_{min}$	[mm]	50	50	70	50	70	
Minimum spacing	$s_{min}$	[mm]	50	50	70	50	70	



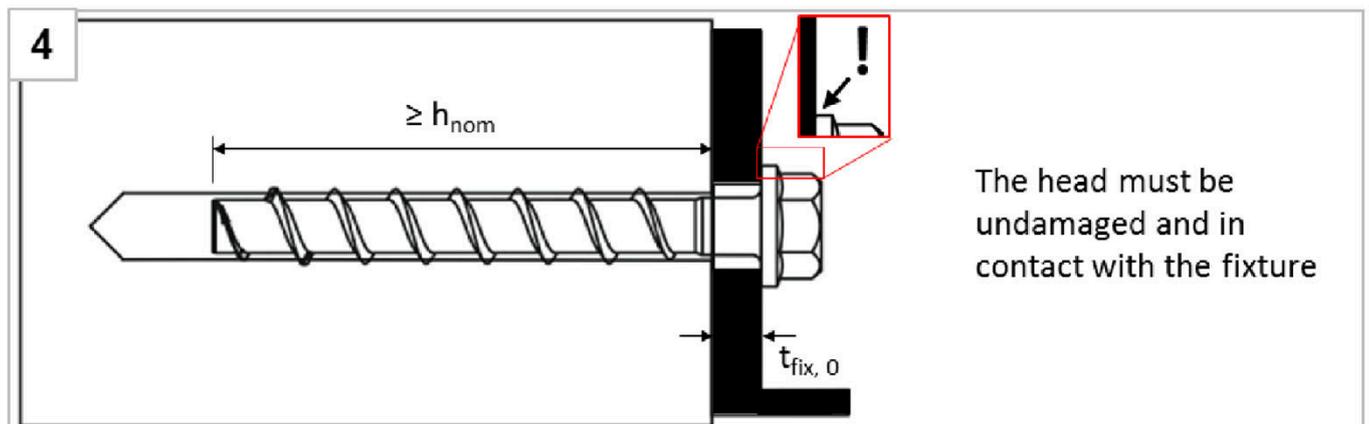
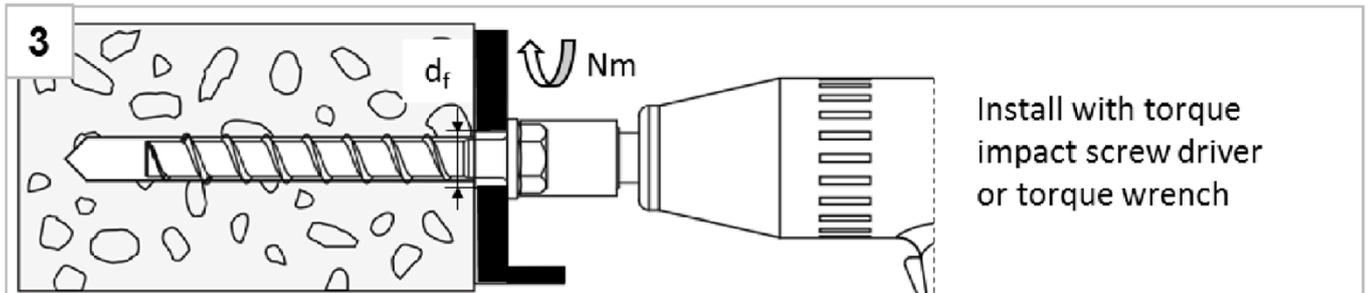
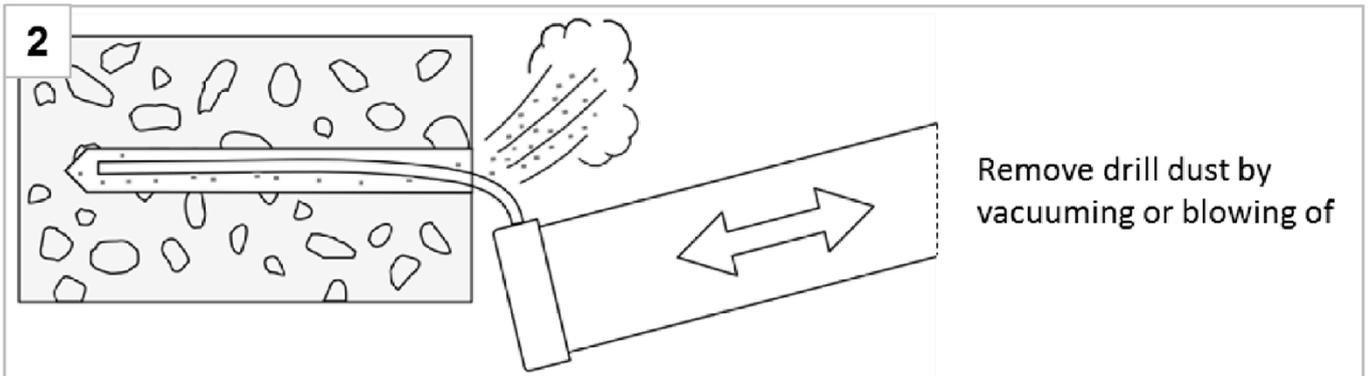
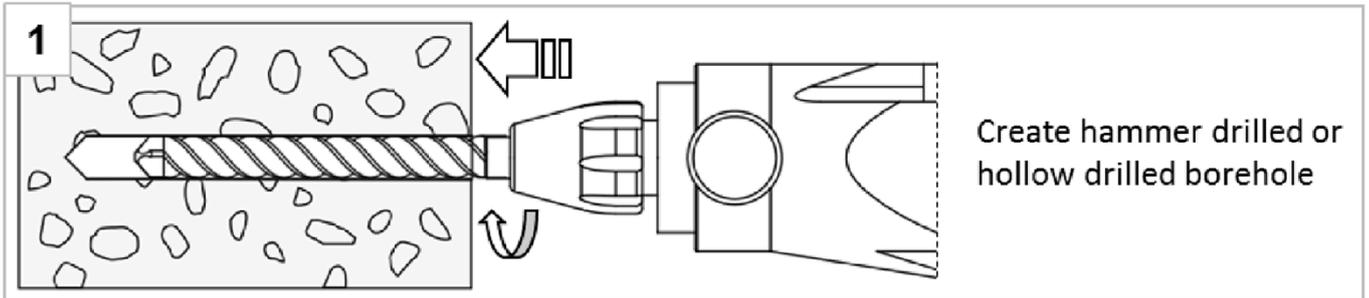
TILCA concrete screw TSM high performance

**Intended use**

Minimum thickness of member, minimum edge distance and minimum spacing

**Annex B4**

## Installation Instructions



Note:

Cleaning of borehole is not necessary when using a hollow drill

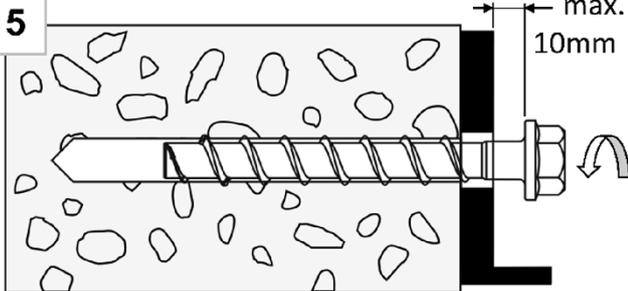
TILCA concrete screw TSM high performance

Intended use  
Installation instructions

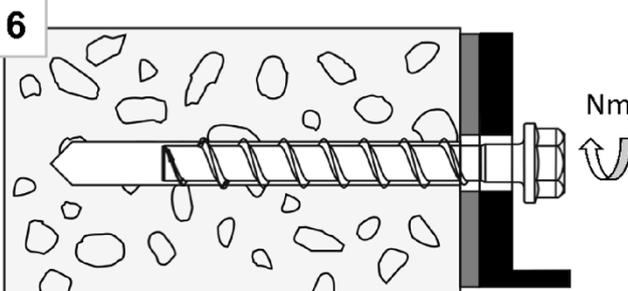
Annex B5

## Installation Instructions – Adjustment

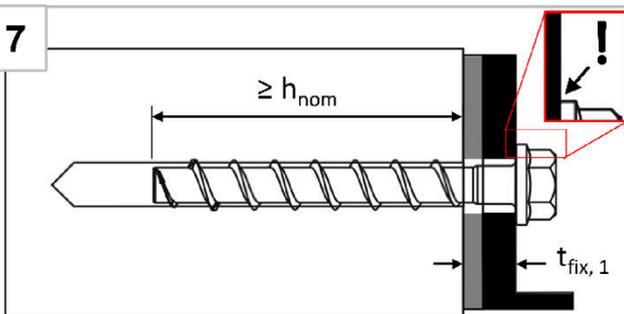
### 1. Adjustment



Screw may be untightened maximum 10mm

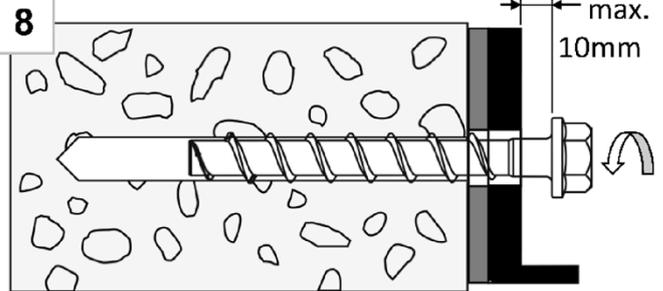


After adjustment, tighten the screw again

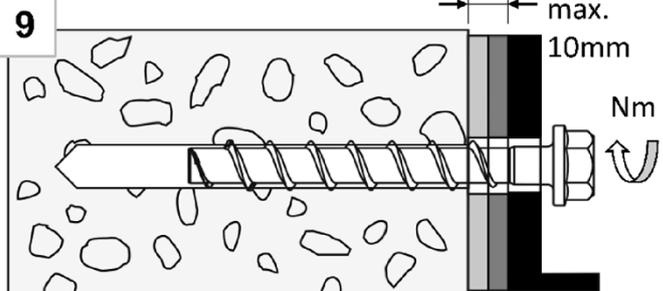


The head must be undamaged and in contact with the fixture

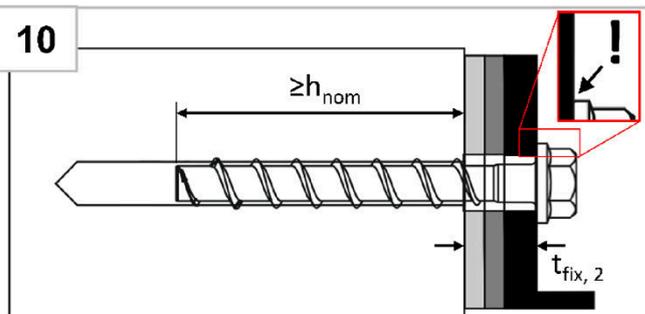
### 2. Adjustment



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  $h_{nom}$ .

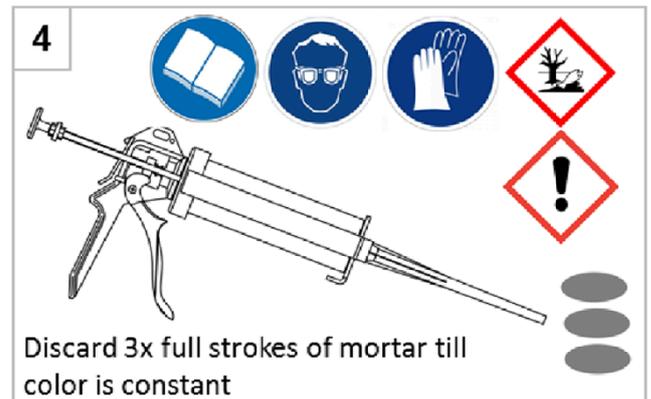
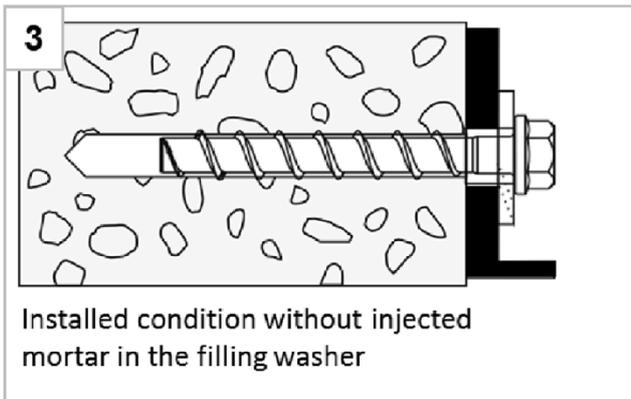
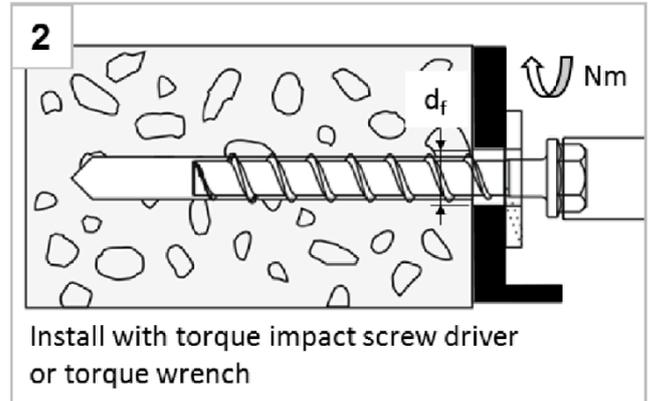
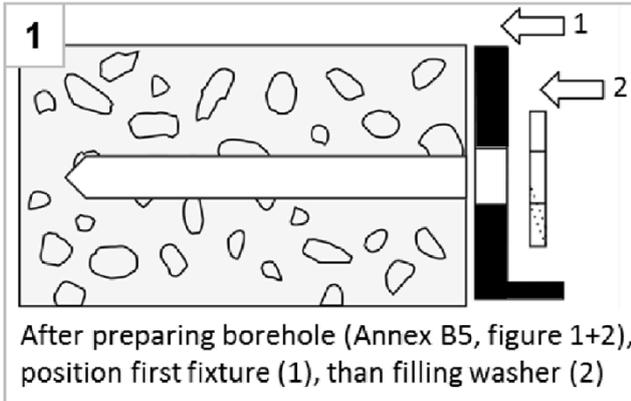
TILCA concrete screw TSM high performance

**Intended use**  
Installation instructions - Adjustment

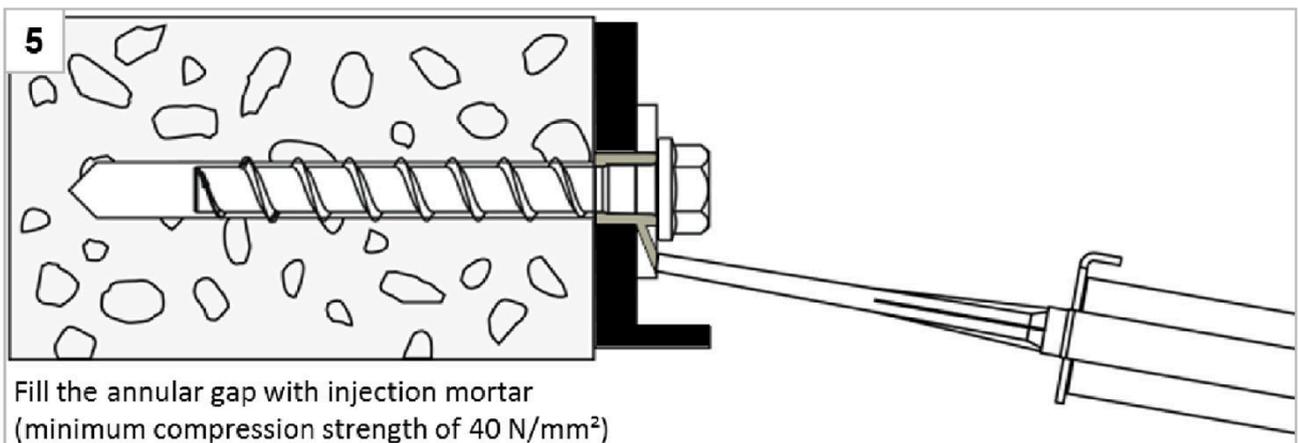
**Annex B6**

## 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 C5 - C7.

**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, sizes 6-10

TSM concrete screw size			6		8			10			
Nominal embedment depth	$h_{nom}$		$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
	[mm]		40	55	45	55	65	55	75	85	
Steel failure for tension and shear loading											
Characteristic resistance	$N_{Rk,s}$	[kN]	14,0		27,0			45,0			
Partial factor	$\gamma_{Ms,N}$	[-]	1,5								
Characteristic resistance	$V^0_{Rk,s}$	[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	$M^0_{Rk,s}$	[Nm]	10,9		26,0			56,0			
Pull-out failure											
Characteristic resistance in C20/25	cracked	$N_{Rk,p}$	[kN]	2,0	4,0	5,0	9,0	12,0	9,0	$\geq N^0_{Rk,c}$ <sup>1)</sup>	
	uncracked	$N_{Rk,p}$	[kN]	4,0	9,0	7,5	12,0	16,0	12,0	20,0	26,0
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} \cdot \psi_c$	C25/30	$\psi_c$	[-]	1,12							
	C30/37			1,22							
	C40/50			1,41							
	C50/60			1,58							
Concrete failure: Splitting failure, concrete cone failure and pry-out failure											
Effective embedment depth	$h_{ef}$	[mm]	31	44	35	43	52	43	60	68	
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	resistance	$N^0_{Rk,sp}$	[kN]	4,0	9,0	7,5	12,0	16,0	12,0	20,0	26,0
	spacing	$S_{cr,sp}$	[mm]	120	160	120	140	150	140	180	210
	edge distance	$C_{cr,sp}$	[mm]	60	80	60	70	75	70	90	105
Factor for pry-out failure	$k_g$	[-]	1,0						2,0		
Installation factor	$\gamma_{inst}$	[-]	1,0								
Concrete edge failure											
Effective length in concrete	$l_f = h_{ef}$	[mm]	31	44	35	43	52	43	60	68	
Nominal outer diameter of screw	$d_{nom}$	[mm]	6		8			10			
<sup>1)</sup> $N^0_{Rk,c}$ according to EN 1992-4:2018											
<b>TILCA concrete screw TSM high performance</b>									<b>Annex C1</b>		
<b>Performances</b> Characteristic values for static and quasi-static loading, sizes 6-10											

Table 7: Characteristic values for static and quasi-static loading, sizes 12-14

TSM concrete screw size			12			14			
Nominal embedment depth	$h_{nom}$		$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
	[mm]		65	85	100	75	100	115	
<b>Steel failure for tension and shear loading</b>									
Characteristic resistance	$N_{Rk,s}$	[kN]	67,0			94,0			
Partial factor	$\gamma_{Ms,N}$	[-]	1,5						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	33,5	42,0		56,0			
Partial factor	$\gamma_{Ms,V}$	[-]	1,25						
Ductility factor	$k_7$	[-]	0,8						
Characteristic bending load	$M^0_{Rk,s}$	[Nm]	113,0			185,0			
<b>Pull-out failure</b>									
Characteristic resistance in C20/25	cracked	$N_{Rk,p}$	[kN]	12,0	$\geq N^0_{Rk,c}$ <sup>1)</sup>				
	uncracked	$N_{Rk,p}$	[kN]	16,0					
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	C25/30	$\psi_c$	[-]	1,12					
	C30/37			1,22					
	C40/50			1,41					
	C50/60			1,58					
<b>Concrete failure: Splitting failure, concrete cone failure and pry-out failure</b>									
Effective embedment depth	$h_{ef}$	[mm]	50	67	80	58	79	92	
k-factor	cracked	$k_1 = k_{cr}$	[-]	7,7					
	uncracked	$k_1 = k_{ucr}$	[-]	11,0					
Concrete cone failure	spacing	$S_{cr,N}$	[mm]	$3 \times h_{ef}$					
	edge distance	$C_{cr,N}$	[mm]	$1,5 \times h_{ef}$					
Splitting failure	resistance	$N^0_{Rk,sp}$	[kN]	16,0	27,0	35,0	21,5	34,5	43,5
	spacing	$S_{cr,sp}$	[mm]	150	210	240	180	240	280
	edge distance	$C_{cr,sp}$	[mm]	75	105	120	90	120	140
Factor for pry-out failure	$k_8$	[-]	1,0	2,0		1,0	2,0		
Installation factor	$\gamma_{inst}$	[-]	1,0						
<b>Concrete edge failure</b>									
Effective length in concrete	$l_f = h_{ef}$	[mm]	50	67	80	58	79	92	
Nominal outer diameter of screw	$d_{nom}$	[mm]	12			14			

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

**TILCA concrete screw TSM high performance**

**Performances**

Characteristic values for static and quasi-static loading, sizes 12-14

**Annex C2**

Table 8: Seismic category C1 – Characteristic load values (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	12	14		
Nominal embedment depth	$h_{nom}$		$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom3}$	$h_{nom3}$	
	[mm]		40	55	65	55	85	100	115
<b>Steel failure for tension and shear load (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK, type KM<sup>1)</sup>)</b>									
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	14,0	27,0	45,0	67,0	94,0		
Partial factor	$\gamma_{Ms,N}$	[-]	1,5						
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	4,7	5,5	8,5	13,5	15,3	21,0	22,4
Partial factor	$\gamma_{Ms,V}$	[-]	1,25						
With filling of the annular gap <sup>2)</sup>	$\alpha_{gap}$	[-]	1,0						
Without filling of the annular gap <sup>3)</sup>	$\alpha_{gap}$	[-]	0,5						
<b>Pull-out failure (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK, type KM<sup>1)</sup>)</b>									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p,C1}$	[kN]	2,0	4,0	12,0	9,0	$\geq N_{Rk,c}^0$ <sup>4)</sup>		
<b>Concrete cone failure (version type S, type SK, type ST, type T25/GW<sup>1)</sup>, type LK/GLK, type KM<sup>1)</sup>)</b>									
Effective embedment depth	$h_{ef}$	[mm]	31	44	52	43	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$						
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$						
Installation factor	$\gamma_{inst}$	[-]	1,0						
<b>Concrete pry-out failure (version type S, type SK, type ST, type LK/GLK)</b>									
Factor for pry-out failure	$k_g$	[-]	1,0			2,0			
<b>Concrete edge failure (version type S, type SK, type ST, type LK/GLK)</b>									
Effective length in concrete	$l_f = h_{ef}$	[mm]	31	44	52	43	68	80	92
Nominal outer diameter of screw	$d_{nom}$	[mm]	6	6	8	10	10	12	14

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

<sup>2)</sup> With filling of the annular gap according to annex B7, figure 5

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

<sup>4)</sup>  $N_{Rk,c}^0$  according to EN 1992-4:2018

TILCA concrete screw TSM high performance

**Performances**  
Seismic category C1 – Characteristic load values

**Annex C3**

**Table 9: Seismic category C2 – Characteristic load values with filled annular gap according to annex B7, figure 5 (type S, type ST, type LK/GLK)**

TSM concrete screw size			8	10	12	14
Nominal embedment depth	$h_{nom}$	$h_{nom3}$				
	[mm]	65	85	100	115	
<b>Steel failure for tension and shear load (version type S, type ST, type LK/GLK)</b>						
Characteristic resistance	$N_{RK,s,C2}$	[kN]	27,0	45,0	67,0	94,0
Partial factor	$\gamma_{Ms,N}$	[-]	1,5			
Characteristic resistance	$V_{RK,s,C2}$	[kN]	9,9	18,5	31,6	40,7
Partial factor	$\gamma_{Ms,V}$	[-]	1,25			
With filling of the annular gap	$\alpha_{gap}$	[-]	1,0			
<b>Pull-out failure (version type S, type ST, type LK/GLK)</b>						
Characteristic resistance in cracked concrete	$N_{RK,p,C2}$	[kN]	2,4	5,4	7,1	10,5
<b>Concrete cone failure (version type S, type ST, type LK/GLK)</b>						
Effective embedment depth	$h_{ef}$	[mm]	52	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Installation factor	$\gamma_{inst}$	[-]	1,0			
<b>Concrete pry-out failure (version type S, type ST, type LK/GLK)</b>						
Factor for pry-out failure	$k_g$	[-]	1,0	2,0		
<b>Concrete edge failure (version type S, type ST, type LK/GLK)</b>						
Effective length in concrete	$l_f = h_{ef}$	[mm]	52	68	80	92
Nominal outer diameter of screw	$d_{nom}$	[mm]	8	10	12	14

TILCA concrete screw TSM high performance

**Performances**

Seismic category C2 – Characteristic load values with filled annular gap

**Annex C4**

**Table 10: Seismic category C2 – Characteristic load values *without filled annular gap according to annex B5* (type S, type ST, type LK/GLK and type SK)**

TSM concrete screw size			8	10	12	14
Nominal embedment depth	$h_{nom}$	$h_{nom3}$				
	[mm]	65	85	100	115	
<b>Steel failure for tension and shear load (version type S, type ST, type LK/GLK)</b>						
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	27,0	45,0	67,0	94,0
Partial factor	$\gamma_{Ms,N}$	[-]	1,5			
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	10,3	21,9	24,4	23,3
Partial factor	$\gamma_{Ms,V}$	[-]	1,25			
Without filling of the annular gap	$\alpha_{gap}$	[-]	0,5			
<b>Pull-out failure (version type S, type ST, type LK/GLK)</b>						
Characteristic resistance In cracked concrete	$N_{Rk,p,C2}$	[kN]	2,4	5,4	7,1	10,5
<b>Steel failure for tension and shear load (version type SK)</b>						
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	27,0	45,0	no performance assessed	
Partial factor	$\gamma_{Ms,N}$	[-]	1,5			
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	3,6	13,7		
Partial factor	$\gamma_{Ms,V}$	[-]	1,25			
Without filling of the annular gap	$\alpha_{gap}$	[-]	0,5			
<b>Pull-out failure (version type SK)</b>						
Characteristic resistance in cracked concrete	$N_{Rk,p,C2}$	[kN]	2,4	5,4	no performance assessed	
<b>Concrete cone failure (version type S, type SK, type ST and type LK/GLK)</b>						
Effective embedment depth	$h_{ef}$	[mm]	52	68	80	92
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Installation 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	$k_8$	[-]	1,0	2,0		
<b>Concrete edge failure (version type S, type SK, type ST and type LK/GLK)</b>						
Effective length in concrete	$l_f = h_{ef}$	[mm]	52	68	80	92
Nominal outer diameter of screw	$d_{nom}$	[mm]	8	10	12	14

**TILCA concrete screw TSM high performance**

**Performances**

Seismic category C2 – Characteristic load values without filled annular gap

**Annex C5**

Table 11: Fire exposure – characteristic values of resistance

TSM concrete screw size				6		8			10			12			14			
Nominal embedment depth				$h_{nom}$	1	2	1	2	3	1	2	3	1	2	3	1	2	3
				[mm]	40	55	45	55	65	55	75	85	65	85	100	75	100	115
<b>Steel failure for tension and shear load</b>																		
Characteristic Resistance	R30	$N_{Rk,s,fi30}$	[kN]	0,9		2,4			4,4			7,3			10,3			
	R60	$N_{Rk,s,fi60}$	[kN]	0,8		1,7			3,3			5,8			8,2			
	R90	$N_{Rk,s,fi90}$	[kN]	0,6		1,1			2,3			4,2			5,9			
	R120	$N_{Rk,s,fi120}$	[kN]	0,4		0,7			1,7			3,4			4,8			
	R30	$V_{Rk,s,fi30}$	[kN]	0,9		2,4			4,4			7,3			10,3			
	R60	$V_{Rk,s,fi60}$	[kN]	0,8		1,7			3,3			5,8			8,2			
	R90	$V_{Rk,s,fi90}$	[kN]	0,6		1,1			2,3			4,2			5,9			
	R120	$V_{Rk,s,fi120}$	[kN]	0,4		0,7			1,7			3,4			4,8			
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,7		2,4			5,9			12,3			20,4			
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,6		1,8			4,5			9,7			15,9			
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,5		1,2			3,0			7,0			11,6			
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,3		0,9			2,3			5,7			9,4			
<b>Pull-out failure</b>																		
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,5	1,0	1,3	2,3	3,0	2,3	4,0	4,8	3,0	4,7	6,2	3,8	6,0	7,6	
	R120	$N_{Rk,p,fi}$	[kN]	0,4	0,8	1,0	1,8	2,4	1,8	3,2	3,9	2,4	3,8	4,9	3,0	4,8	6,1	
<b>Concrete cone failure</b>																		
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,9	2,2	1,2	2,1	3,4	2,1	4,8	6,6	3,0	6,3	9,9	4,4	9,6	14,0	
	R120	$N^0_{Rk,c,fi}$	[kN]	0,7	1,8	1,0	1,7	2,7	1,7	3,8	5,3	2,4	5,1	7,9	3,5	7,6	11,2	
<b>Edge distance</b>																		
R30 bis 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 $\geq 300$ mm.																		
<b>Spacing</b>																		
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.																		
<b>TILCA concrete screw TSM high performance</b>															<b>Annex C6</b>			
<b>Performances</b> Fire exposure – characteristic values of resistance																		

Table 12: Displacements under static and quasi-static tension load

TSM concrete screw size				6			8			10		
Nominal embedment depth			$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
			[mm]	40	55	45	55	65	55	75	85	
Cracked concrete	tension load	N	[kN]	0,95	1,9	2,4	4,3	5,7	4,3	7,9	9,6	
	displacement	$\delta_{N0}$	[mm]	0,3	0,6	0,6	0,7	0,8	0,6	0,5	0,9	
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2	
Uncracked concrete	tension load	N	[kN]	1,9	4,3	3,6	5,7	7,6	5,7	9,5	11,9	
	displacement	$\delta_{N0}$	[mm]	0,4	0,6	0,7	0,9	0,5	0,7	1,1	1,0	
		$\delta_{N\infty}$	[mm]	0,4	0,4	0,6	1,0	0,9	0,4	1,2	1,2	

TSM concrete screw size				12			14		
Nominal embedment depth			$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
			[mm]	65	85	100	75	100	115
Cracked concrete	tension load	N	[kN]	5,7	9,4	12,3	7,6	12,0	15,1
	displacement	$\delta_{N0}$	[mm]	0,9	0,5	1,0	0,5	0,8	0,7
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0
Uncracked concrete	tension load	N	[kN]	7,6	13,2	17,2	10,6	16,9	21,2
	displacement	$\delta_{N0}$	[mm]	1,0	1,1	1,2	0,9	1,2	0,8
		$\delta_{N\infty}$	[mm]	1,0	1,2	1,2	0,9	1,2	1,0

Table 13: Displacements under static and quasi-static shear load

TSM concrete screw size				6			8			10		
Nominal embedment depth			$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
			[mm]	40	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		

TSM concrete screw size				12			14		
Nominal embedment depth			$h_{nom}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
			[mm]	65	85	100	75	100	115
Cracked and uncracked concrete	shear load	V	[kN]	20,0			30,5		
	displacement	$\delta_{V0}$	[mm]	4,0			3,1		
		$\delta_{V\infty}$	[mm]	6,0			4,7		

TILCA concrete screw TSM high performance

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

**Annex C7**

**Table 14: Seismic category C2 – Displacements with filled annular gap according to annex B7, figure 5 (type S, type ST, type LK/GLK)**

TSM concrete screw size			8	10	12	14
Nominal embedment depth	$h_{nom}$	$h_{nom3}$				
	[mm]	65	85	100	115	
Displacements under tension loads (version <b>type S, type ST, type LK/GLK</b> )						
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	0,66	0,32	0,57	1,16
Displacement ULS	$\delta_{N,C2(ULS)}$	[mm]	1,74	1,36	2,36	4,39
Displacements under shear loads (version <b>type S, type ST, type LK/GLK</b> with hole clearance)						
Displacement DLS	$\delta_{V,C2(DLS)}$	[mm]	1,68	2,91	1,88	2,42
Displacement ULS	$\delta_{V,C2(ULS)}$	[mm]	5,19	6,72	5,37	9,27

**Table 15: Seismic category C2 – Displacements without filled annular gap according to annex B5 (version type S, type SK, type ST, type LK/GLK)**

TSM concrete screw size			8	10	12	14
Nominal embedment depth	$h_{nom}$	$h_{nom3}$				
	[mm]	65	85	100	115	
Displacements under tension loads (version <b>type S, type ST, type LK/GLK</b> )						
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	0,66	0,32	0,57	1,16
Displacement ULS	$\delta_{N,C2(ULS)}$	[mm]	1,74	1,36	2,36	4,39
Displacements under tension loads (version <b>type SK</b> )						
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	0,66	0,32	no performance assessed	
Displacement ULS	$\delta_{N,C2(ULS)}$	[mm]	1,74	1,36		
Displacements under shear loads (version <b>type S, type ST, type LK/GLK</b> with hole clearance)						
Displacement DLS	$\delta_{V,C2(DLS)}$	[mm]	4,21	4,71	4,42	5,60
Displacement ULS	$\delta_{V,C2(ULS)}$	[mm]	7,13	8,83	6,95	12,63
Displacements under shear loads (version <b>type SK</b> with hole clearance)						
Displacement DLS	$\delta_{V,C2(DLS)}$	[mm]	2,51	2,98	no performance assessed	
Displacement ULS	$\delta_{V,C2(ULS)}$	[mm]	7,76	6,25		

TILCA concrete screw TSM high performance

**Performances**  
Displacements under seismic loads

**Annex C8**