Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-16/0123 of 10 February 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	TSM high performance, TSM high performance A4, TSM high performance HCR
Product family to which the construction product belongs	Fasteners for use in concrete for redundant non-structural systems
Manufacturer	TOGE Dübel GmbH & Co. KG Illesheimer Straße 10 90431 Nürnberg DEUTSCHLAND
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	EAD 330747-00-0601, Edition 06/2018
This version replaces	ETA-16/0123 issued on 19 July 2019

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Specific Part

1 Technical description of the product

The TOGE concrete screw TSM high performance of sizes 5 and 6 mm is an anchor made of galvanised steel respectively steel with zinc flake coating and 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.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable EAD

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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 3

3.2 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B2, Annex C 1 and C 2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 and C 2
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. 330747-00-0601, the applicable European legal act is: [97/161/EC].

The system to be applied is: 2+

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 10 February 2023 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

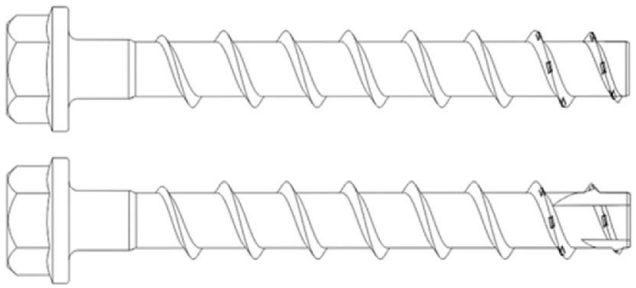
beglaubigt:
Tempel

Deutsches Institut für Bautechnik DIBt

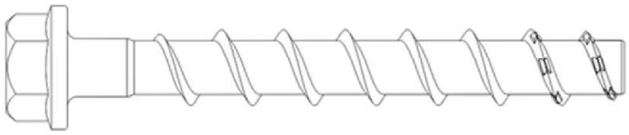
Product in installed condition

TOGE concrete screw TSM high performance (TSM 5 and TSM 6)

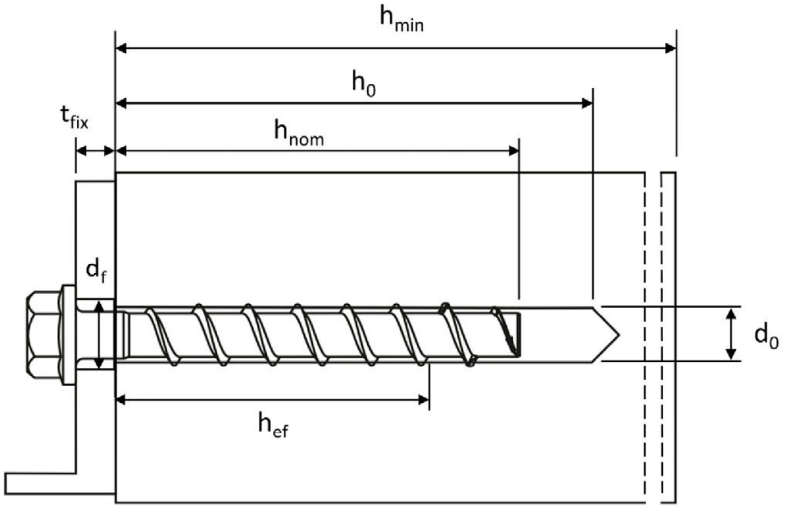
- Galvanized carbon steel
- Zinc flakes coated carbon steel



- Stainless steel A4
- High corrosion resistant steel HCR



e.g. TOGE 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

TOGE concrete screw TSM High Performance	Annex A1
Product description Product in installed condition	

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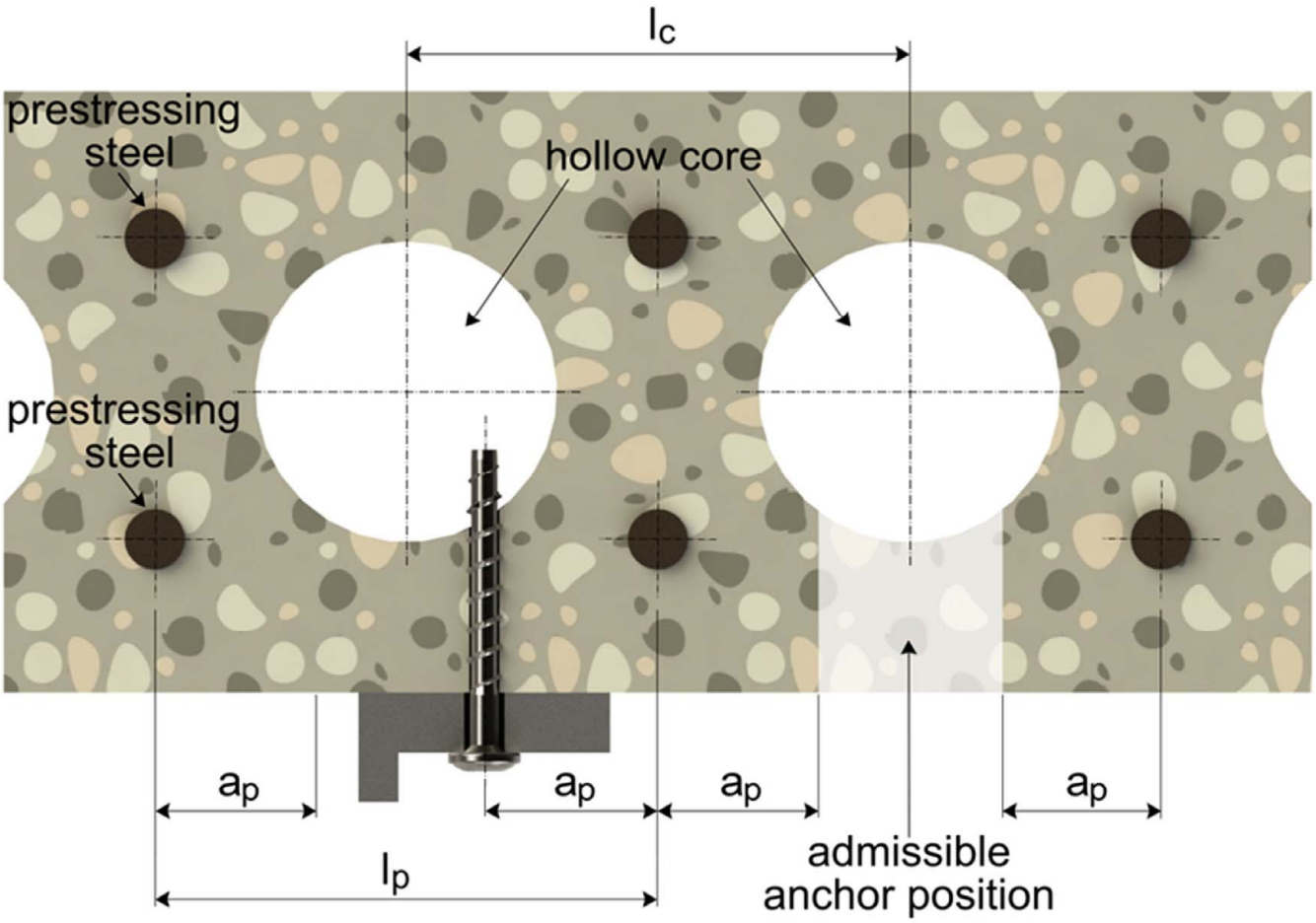
Installed condition in precast prestressed hollow core slabs



Important ratio: $\frac{w}{e} \leq 4,2$

w = core width

e = web thickness

l_c = core distance ≥ 100 mm

l_p = prestressing steel ≥ 100 mm

a_p = distance between anchor position and prestressing steel ≥ 50mm

TOGE concrete screw TSM High Performance	Annex A2
Product description Installed condition in precast prestressed hollow core slabs	

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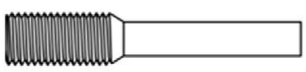
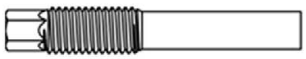
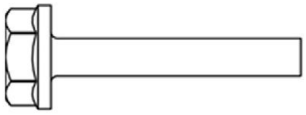


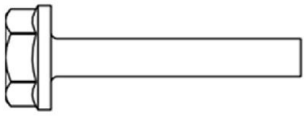

1. Configuration with metric connection threat and hexagon socket e.g. TSM 8x105 M10 SW5



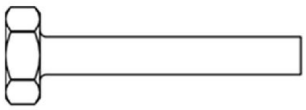

2. Configuration with metric connection threat and hexagon drive e.g. TSM 8x105 M10 SW7




3. Configuration with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40

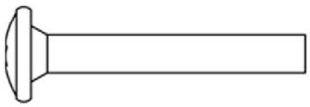



4. Configuration with washer, hexagon head and TORX drive e.g. TSM 8x80 SW13

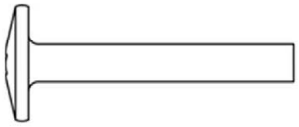



5. Configuration with hexagon head e.g. TSM 8x80 SW13 OS

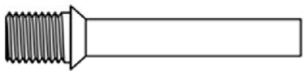

6. Configuration with countersunk head and TORX drive e.g. TSM 8x80 C VZ 40



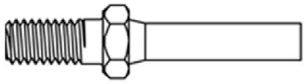

7. Configuration with pan head and TORX drive e.g. TSM 8x80 P VZ 40



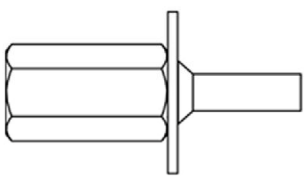

8. Configuration with large pan head and TORX drive e.g. TSM 8x80 LP VZ 40




9. Configuration with countersunk head and connection thread e.g. TSM 6x55 AG M8




10. Configuration with hexagon drive and connection thread e.g. TSM 6x55 M8 SW10




11. Configuration with internal thread and hexagon drive e.g. TSM 6x55 IM M8/10

TOGE concrete screw TSM High Performance

Product description
Screw types

Annex A3

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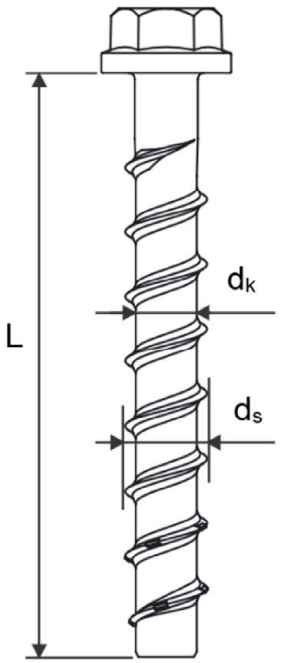
Table 1: Material

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 (≥5µm)
	TSM high performance A4	1.4401; 1.4404; 1.4571; 1.4578
	TSM high performance HCR	1.4529

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 high performance	560	700	≤ 8
	TSM high performance A4			
	TSM high performance HCR			

Table 2: Dimensions

Anchor size			TSM 5	TSM 6
Screw length	≤ L	[mm]	200	
Core diameter	d_k	[mm]	4,0	5,1
Thread outer diameter	d_s	[mm]	6,5	7,5



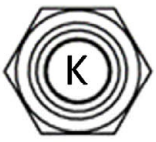
Marking:

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

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

Marking "k" or "x"
for anchors with connection thread and h_{nom}= 35mm



TOGE concrete screw TSM High Performance

Product description
Material, Dimensions and markings

Annex A4

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Specification of Intended use

Anchorages subject to:

- static and quasi static loads
- Used only for multiple use for non-structural application according to EN 1992-4:2018
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): size 5 and 6
- Used for anchorages in prestressed hollow core slabs: size 6

Base materials:

- Compacted reinforced and compacted 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 A4, screw with marking A4: CRC III
  - High corrosion resistant steel according to Annex A4, screw with marking HCR: CRC V

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, Version 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 B2, Table 3.

Installation:

- Hammer drilling or hollow drilling.
- Anchor installation carried out by appropriately qualified personal 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.

TOGE concrete screw TSM High Performance	
Intended use Specification	**Annex B1**

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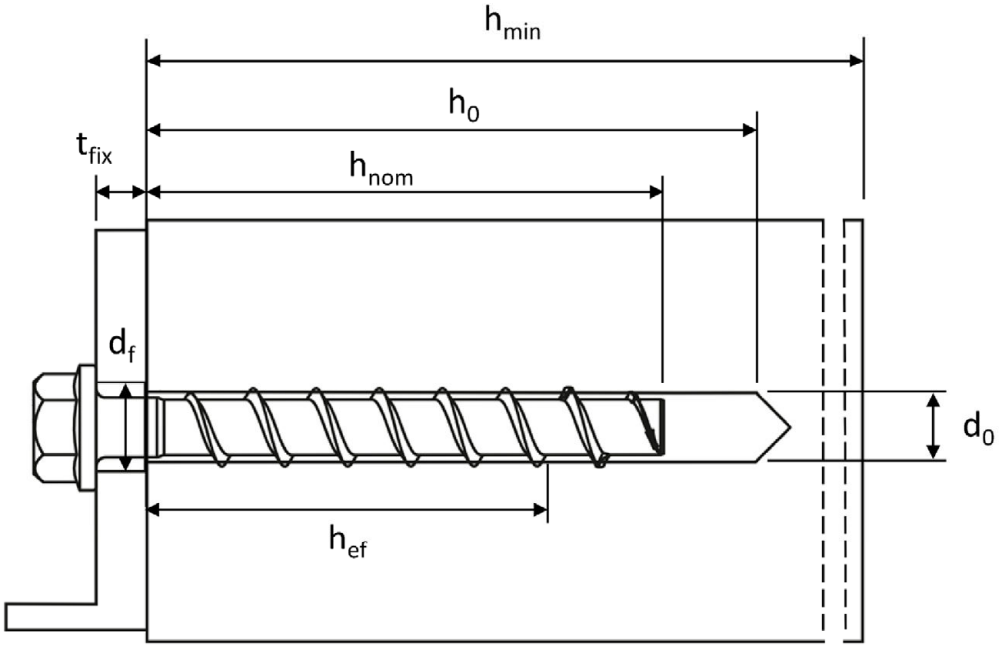
Table 3: Installation parameters

TSM concrete screw size			TSM 5	TSM 6	
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Nominal drill hole diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,40	6,40	
Drill hole depth	$h_0 \geq$	[mm]	40	40	60
Clearance hole diameter	$d_f \leq$	[mm]	7	8	
Installation torque (version with connection thread)	$T_{inst} \leq$	[Nm]	8	10	
Recommended torque impact screw driver		[Nm]	Max. torque according to manufacturer's instructions		
			110	160	

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

TSM concrete screw size			TSM 5	TSM 6	
Nominal embedment depth		h_{nom1}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Minimum thickness of member	h_{min}	[mm]	80	80	100
Minimum edge distance	c_{min}	[mm]	35	35	40
Minimum spacing	s_{min}	[mm]	35	35	40



TOGE concrete screw TSM High Performance

Intended use
Installation parameters

Annex B2

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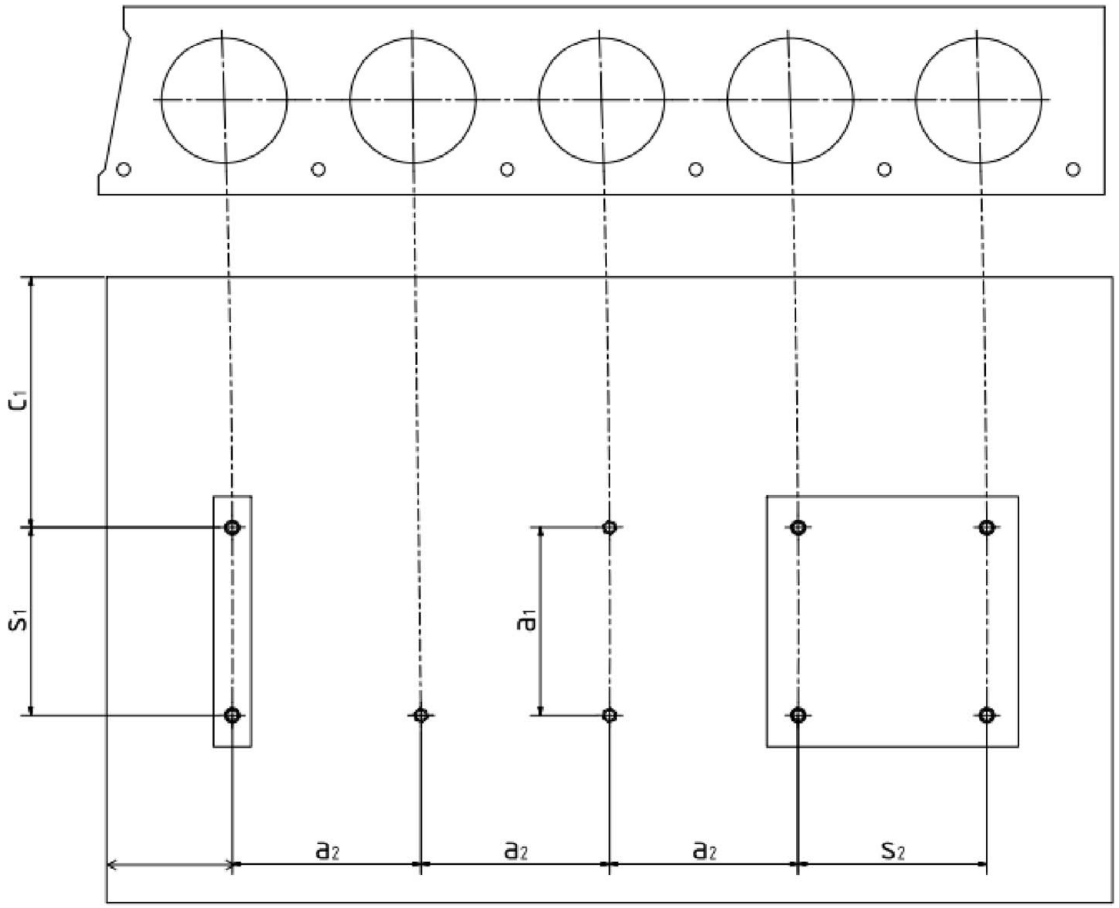
Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2 = edge distance

s_1, s_2 = anchor spacing

a_1, a_2 = distance between anchor groups

c_{min} = minimum edge distance ≥ 100 mm

s_{min} = minimum anchor spacing ≥ 100 mm

a_{min} = minimum distance between anchor groups ≥ 100 mm

TOGE concrete screw TSM High Performance	**Annex B3**
Intended use Installation parameters for anchorages in precast prestressed hollow slabs	

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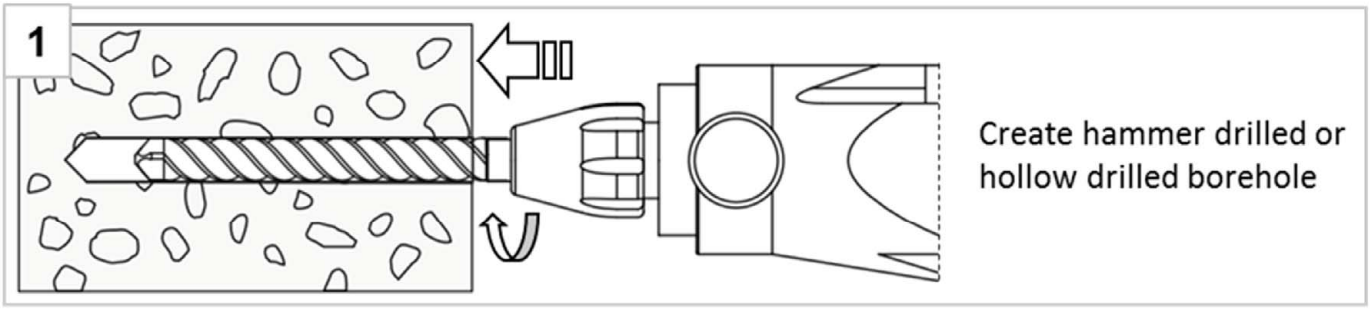
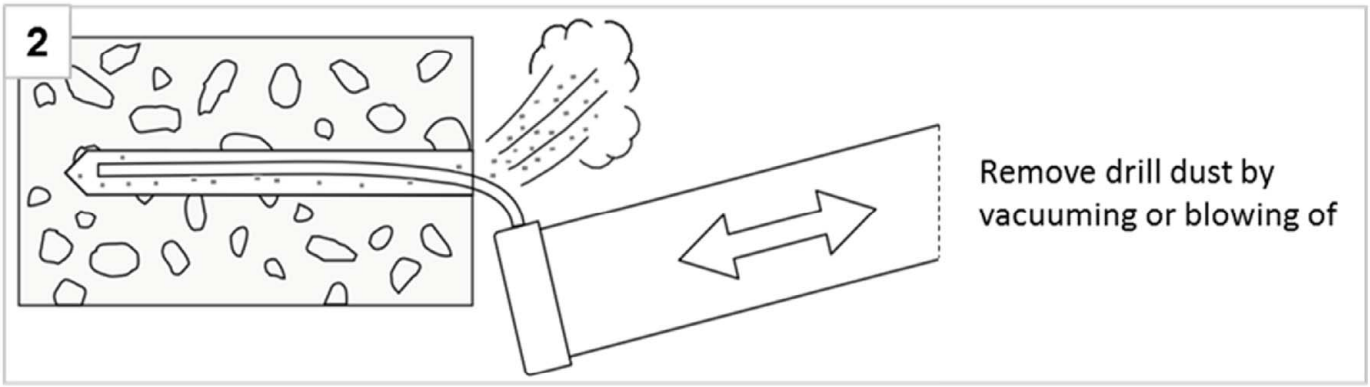
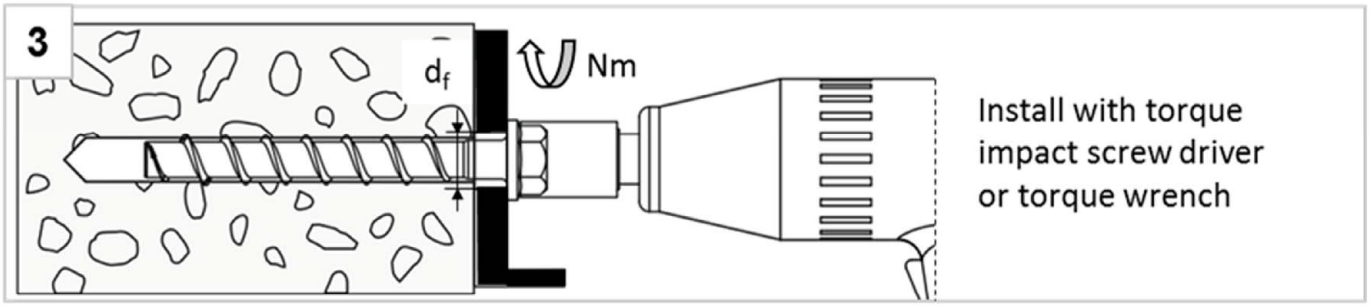
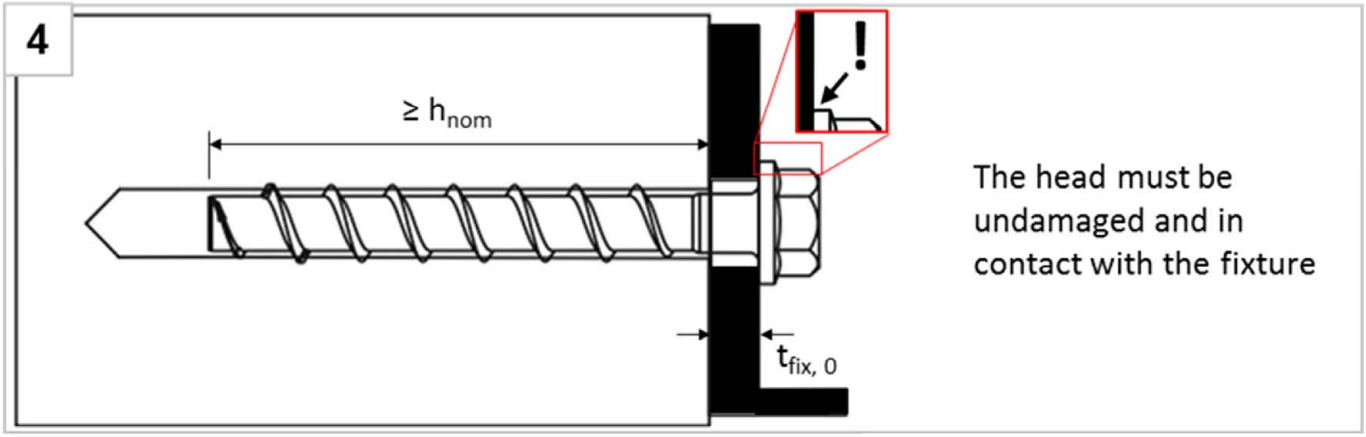
Installation Instructions









TOGE concrete screw TSM High Performance	
Intended use Installation instructions	**Annex B4**

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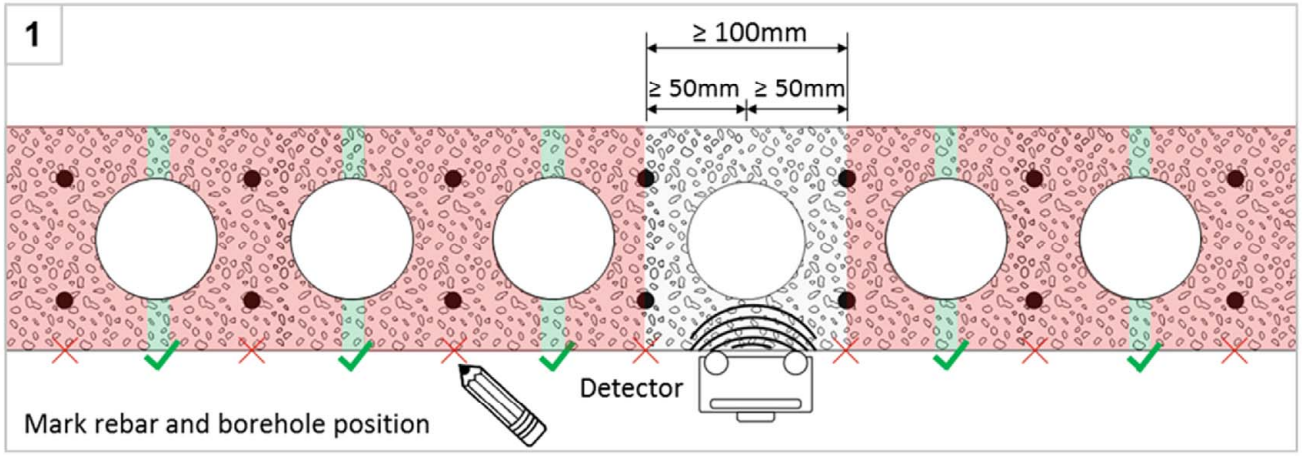
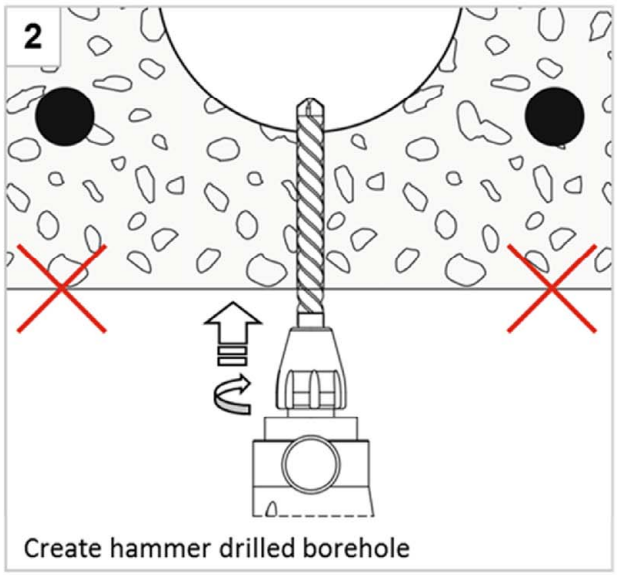
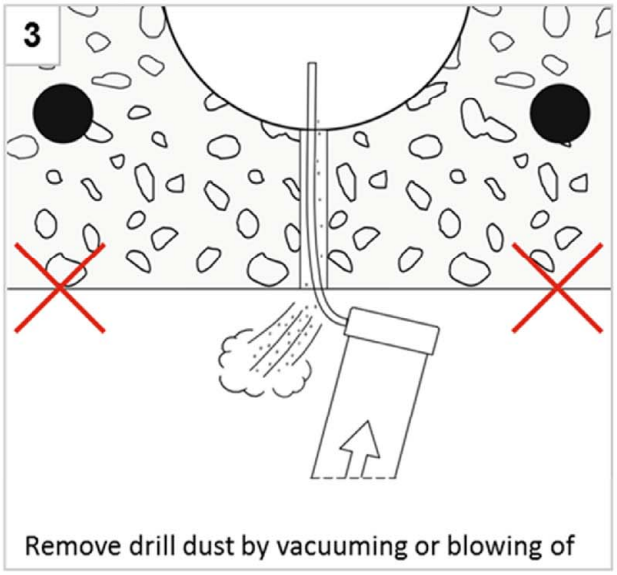
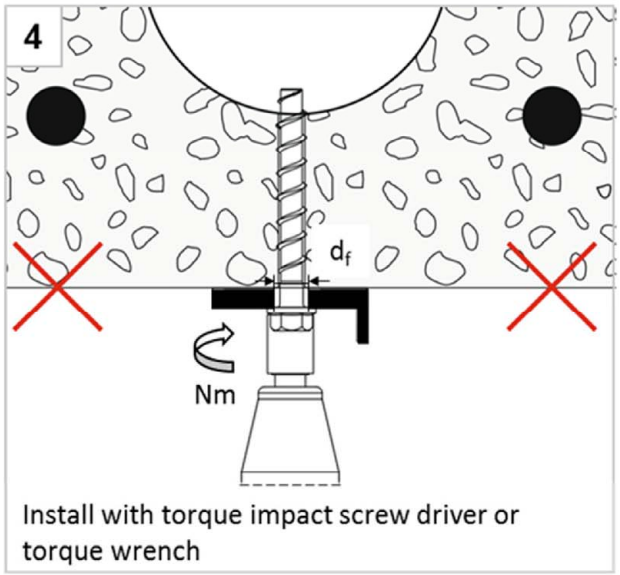
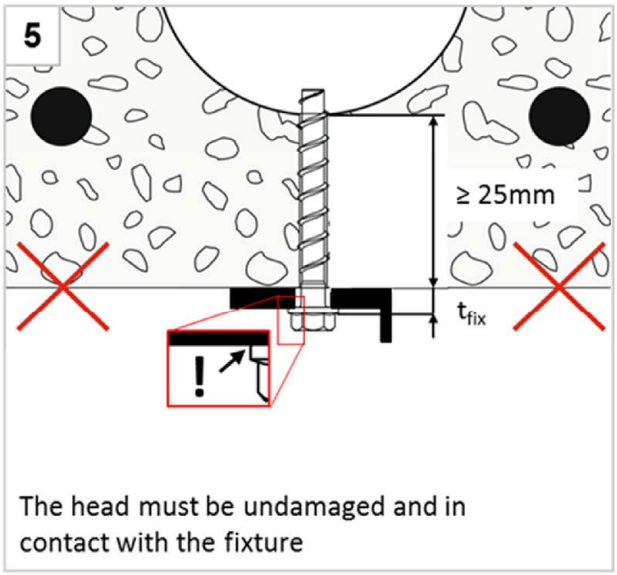
Installation Instructions for anchorages in prestressed hollow slabs











TOGE concrete screw TSM High Performance

Intended use
Installation instructions for anchorages in prepressed hollow slabs

Annex B5

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

TSM concrete screw size				TSM 5	TSM 6	
Nominal embedment depth		h_{nom}		h_{nom1}	h_{nom1}	h_{nom2}
		[mm]		35	35	55
Steel failure for tension and shear loading						
Characteristic tension load		$N_{Rk,s}$	[kN]	8,7	14,0	
Partial factor		$\gamma_{Ms,N}$	[-]	1,5		
Characteristic shear load		$V_{Rk,s}$	[kN]	4,4	7,0	
Partial factor		$\gamma_{Ms,V}$	[-]	1,25		
Ductility factor		k_7	[-]	0,8		
Characteristic bending load		$M^0_{Rk,s}$	[Nm]	5,3	10,9	
Pull-out failure						
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
	uncracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
Increasing factor for $N_{Rk,p\,p}$ = $N_{Rk,p(C20/25)}$ * ψ_c	C25/30	Ψ_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]	27	27	44
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 x h_{ef}		
	edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}		
Splitting failure	resistance	$N^0_{Rk,Sp}$	[kN]	min($N^0_{Rk,c}$; $N_{Rk,p}$)		
	spacing	$s_{cr,Sp}$	[mm]	120	120	160
	edge distance	$c_{cr,Sp}$	[mm]	60	60	80
Factor for pry-out failure		k_8	[-]	1,0		
Installation factor		γ_{inst}	[-]	1,2	1,0	1,0
Concrete edge failure						
Effective length in concrete		$l_f = h_{ef}$	[mm]	27	27	44
Nominal outer diameter of screw		d_{nom}	[mm]	5	6	

TOGE concrete screw TSM High Performance

Performances
Characteristic values for static and quasi-static loading

Annex C1

Deutsches Institut für Bautechnik DIBt

Table 6: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

TSM concrete screw size			TSM 6		
Bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F^0_{Rk}	[kN]	1	2	3
Edge distance	c_{cr}	[mm]	100		
Spacing	s_{cr}	[mm]	200		
Installation factor	γ_{inst}	[-]	1,0		

Table 7: Limiting distances for application in precast prestressed hollow core slabs

Distances for application in precast prestressed hollow core slabs			
Minimum edge distance	c_{min}	[mm]	≥ 100
Minimum anchor spacing	s_{min}	[mm]	≥ 100
Minimum distance between anchor groups	a_{min}	[mm]	≥ 100
Distance of core	l_c	[mm]	≥ 100
Distance of prestressing steel	l_p	[mm]	≥ 100
Distance between anchor position and prestressing steel	a_p	[mm]	≥ 50

TOGE concrete screw TSM High Performance

Performances
Characteristic values and limiting distances in precast prestressed hollow core slabs

Annex C2

Deutsches Institut für Bautechnik DIBt

Table 8: Fire exposure – characteristic values of resistance [1)]

TSM concrete screw size				TSM 5	TSM 6			
Material				TSM high performance	TSM high performance		TSM high performance A4/HCR	
Nominal embedment depth		h_{nom}		h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
			[mm]	35	35	55	35	55
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)								
Characteristic Resistance	R30	$F_{Rk,s,fi30}$	[kN]	0,8	0,9		1,2	
	R60	$F_{Rk,s,fi60}$	[kN]	0,6	0,8		1,2	
	R90	$F_{Rk,s,fi90}$	[kN]	0,4	0,6		1,2	
	R120	$F_{Rk,s,fi120}$	[kN]	0,3	0,4		0,8	
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,5	0,7		0,9	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,4	0,6		0,9	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,2	0,5		0,9	
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,2	0,3		0,6	
Pull-out failure								
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,375	0,75	1,875	0,75	1,875
	R120	$N_{Rk,p,fi}$	[kN]	0,3	0,6	1,5	0,6	1,5
Concrete cone failure								
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,65	0,65	2,21	0,65	2,21
	R120	$N^0_{Rk,c,fi}$	[kN]	0,52	0,52	1,76	0,52	1,76
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]	$4 \times h_{ef}$				
Pry-out failure								
R30 - R120		k_8	[-]	1,0				
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.								

[1)] Not for application in prestressed hollow core slabs

TOGE concrete screw TSM High Performance

Performances
Characteristic values under fire exposure

Annex C3