

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-22/0331  
of 1 July 2022

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

TOX screw anchor Sumo Max 1

Product family  
to which the construction product belongs

Fasteners for use in concrete for redundant non-  
structural systems

Manufacturer

TOX-Dübel-Technik GmbH  
Brunnenstraße 31  
72505 Krauchenwies  
DEUTSCHLAND

Manufacturing plant

Werk 1

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

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## Specific Part

### 1 Technical description of the product

The TOX screw anchor Sumo Max 1 is an anchor of size 5 and 6 mm 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 C3

#### 3.2 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B2, Annex C1 and C2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C1 and C2
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 on 1 July 2022 by Deutsches Institut für Bautechnik

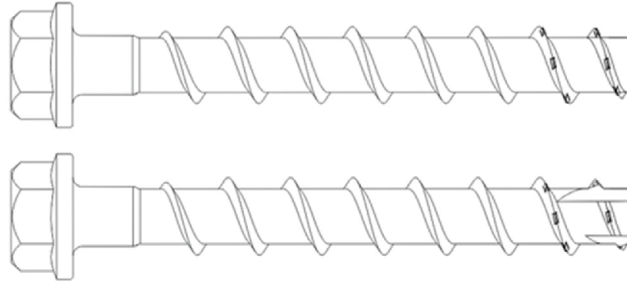
Dipl.-Ing. Beatrix Wittstock  
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*beglaubigt:*  
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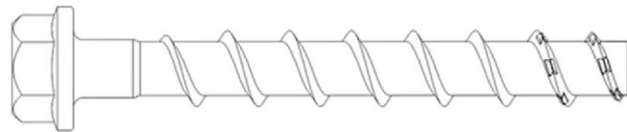
## Product in installed condition

### TOX screw anchor Sumo Max 1 (TSM 5 and TSM 6)

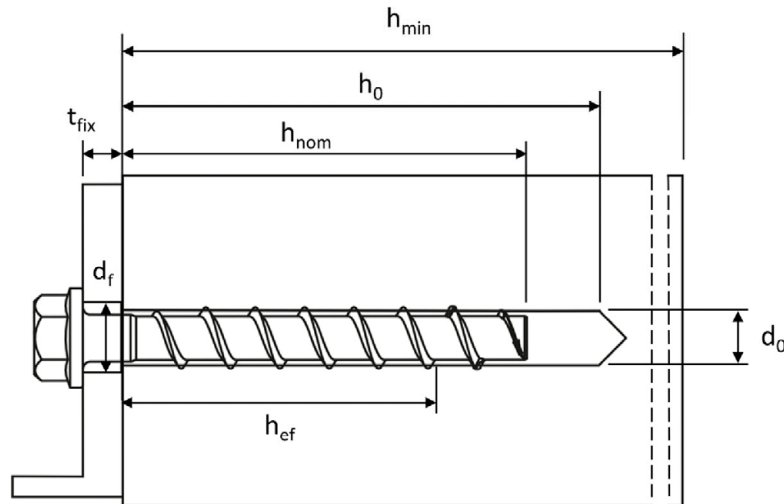
- Galvanized carbon steel
- Zinc flakes coated carbon steel



- Stainless steel A4
- Stainless steel HCR



e.g. TOX screw anchor, zinc flakes coated, with hexagon head and fixture



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

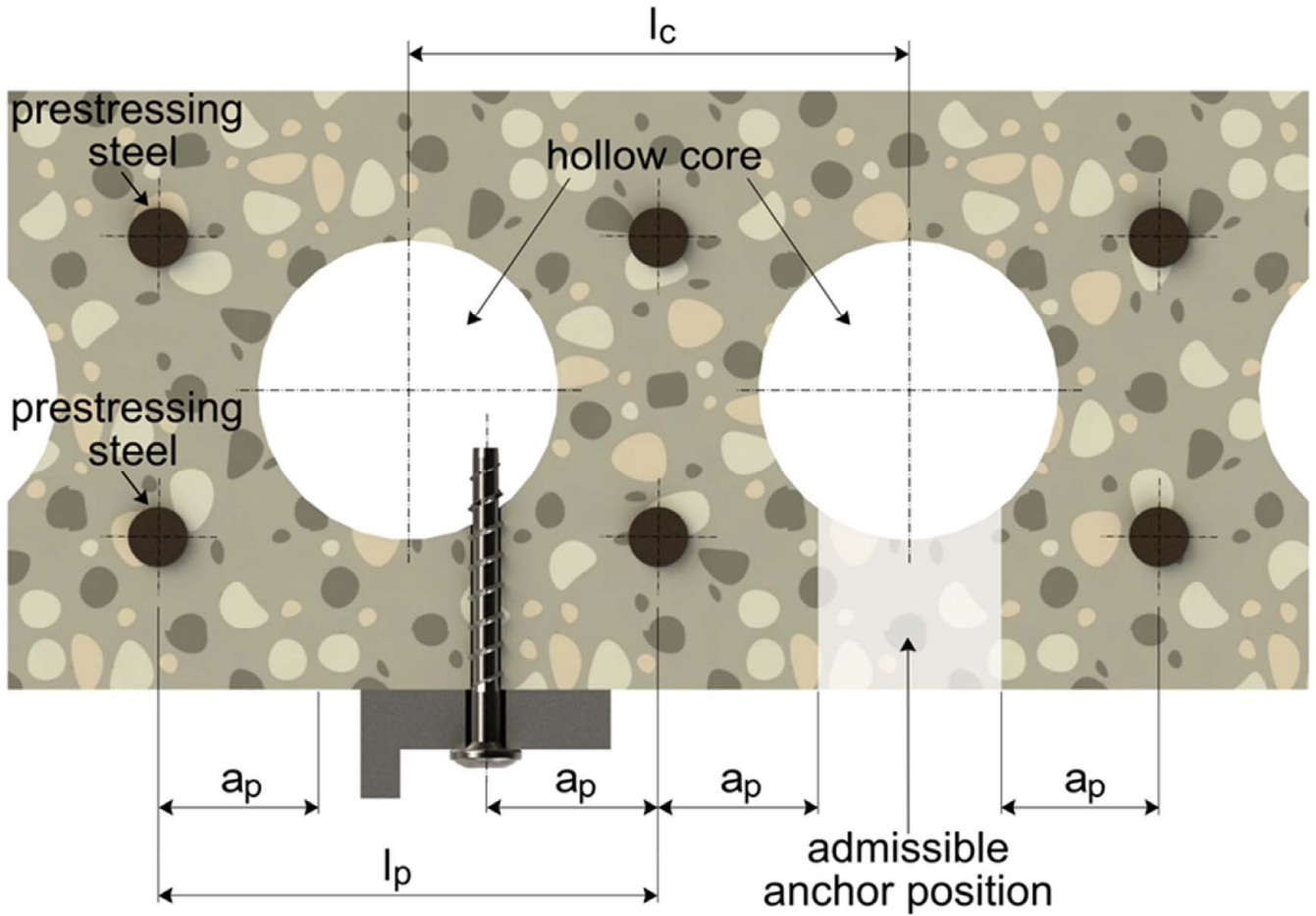
$h_{min}$  = minimum thickness of member  
 $h_{nom}$  = nominal embedment depth  
 $h_0$  = drill hole depth  
 $h_{ef}$  = effective embedment depth

TOX screw anchor Sumo Max 1

**Product description**  
Product in installed condition

**Annex A1**

## 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  $\geq 100$  mm

$l_p$  = prestressing steel  $\geq 100$  mm

$a_p$  = distance between anchor position and prestressing steel  $\geq 50$ mm

TOX screw anchor Sumo Max 1

**Product description**

Installed condition in precast prestressed hollow core slabs

**Annex A2**





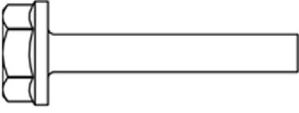

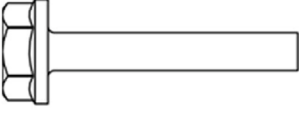

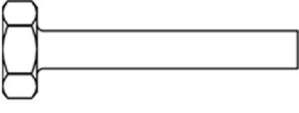

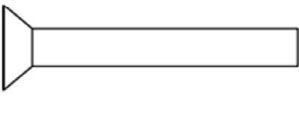

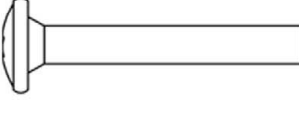



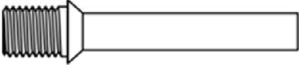



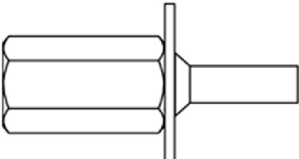

		1. Configuration with metric connection thread and hexagon socket e.g. TSM 8x105 M10 SW5
		2. Configuration with metric connection thread and hexagon drive e.g. TSM 8x105 M10 SW7
		3. Configuration with washer and hexagon head e.g. TSM 8x80 SW13 VZ 40
		4. Configuration with washer, hexagon head and 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
<b>TOX screw anchor Sumo Max 1</b>		<b>Annex A3</b>
<b>Product description</b> Screw types		

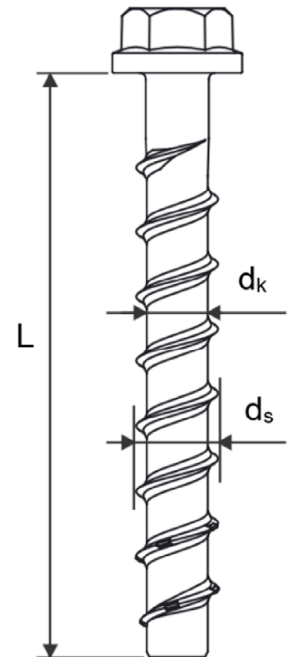
Table 1: Material

Part	Product name	Material
all types	TSM	- Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 - Zinc flake coating according to EN ISO 10683:2018 ( $\geq 5\mu\text{m}$ )
	TSM A4	1.4401; 1.4404; 1.4571; 1.4578
	TSM HCR	1.4529

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	560	700	$\leq 8$
	TSM A4			
	TSM HCR			

Table 2: Dimensions

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



**Marking:**

**TSM**

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

**TSM A4**

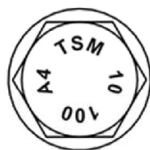
Screw type: TSM  
Screw size: 10  
Screw length: 100  
Material: A4

**TSM HCR**

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

**Marking "k" or "x"**

for anchors with connection thread and  $h_{nom} = 35\text{mm}$



TOX screw anchor Sumo Max 1

**Product description**  
Material, Dimensions and markings

**Annex A4**



## Specification of Intended use

### Anchorage 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 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.

TOX screw anchor Sumo Max 1

Intended use  
Specification

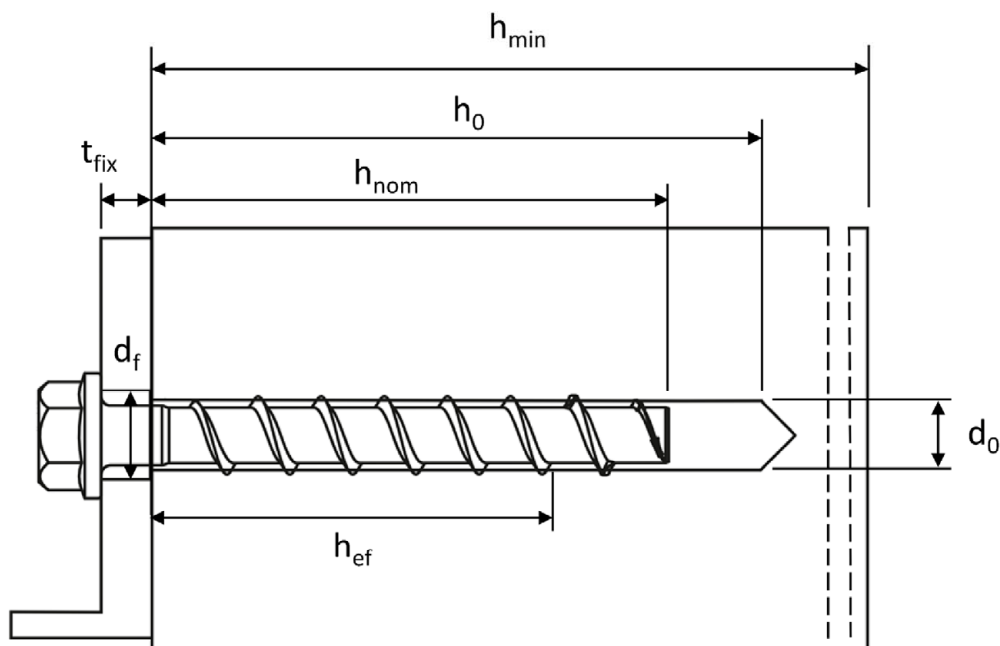
Annex B1

Table 3: Installation parameters

TSM screw anchor 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 screw anchor 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

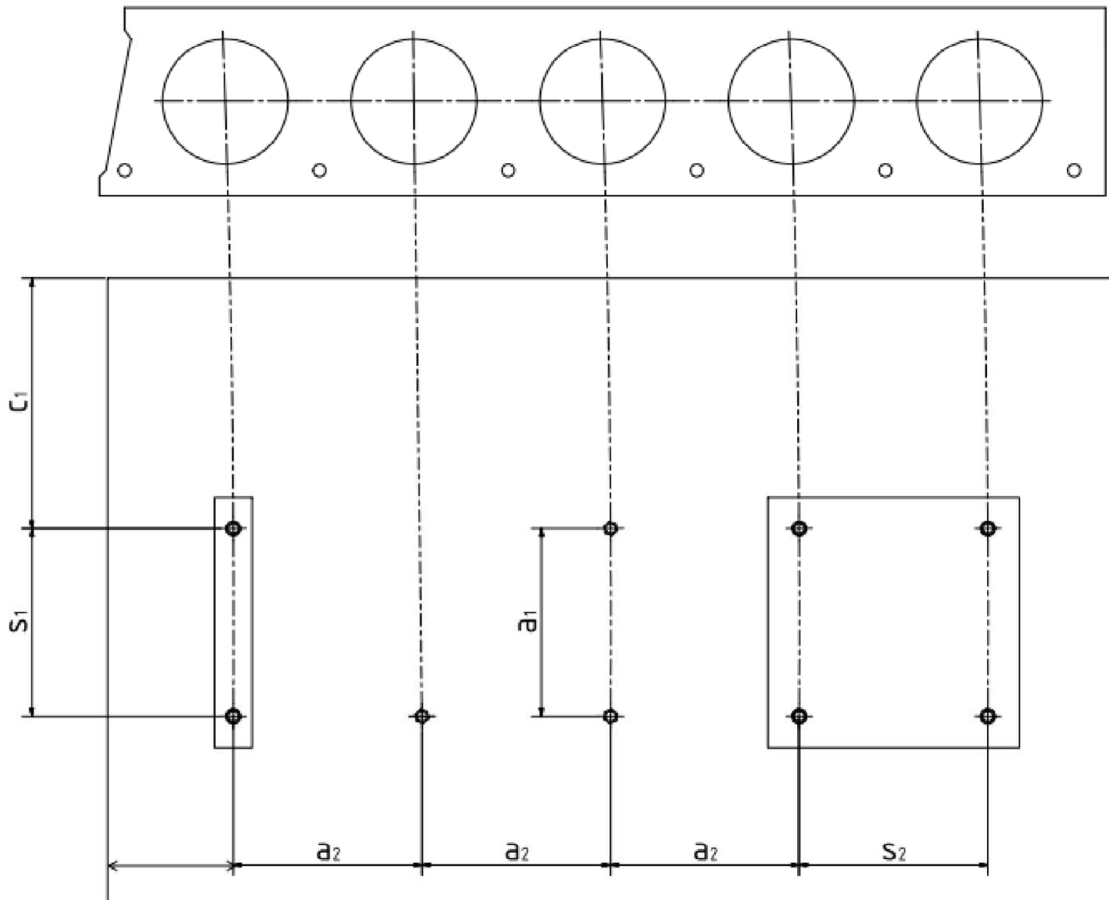


TOX screw anchor Sumo Max 1

Intended use  
Installation parameters

Annex B2

### 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  $\geq 100$  mm

$s_{min}$  = minimum anchor spacing  $\geq 100$  mm

$a_{min}$  = minimum distance between anchor groups  $\geq 100$  mm

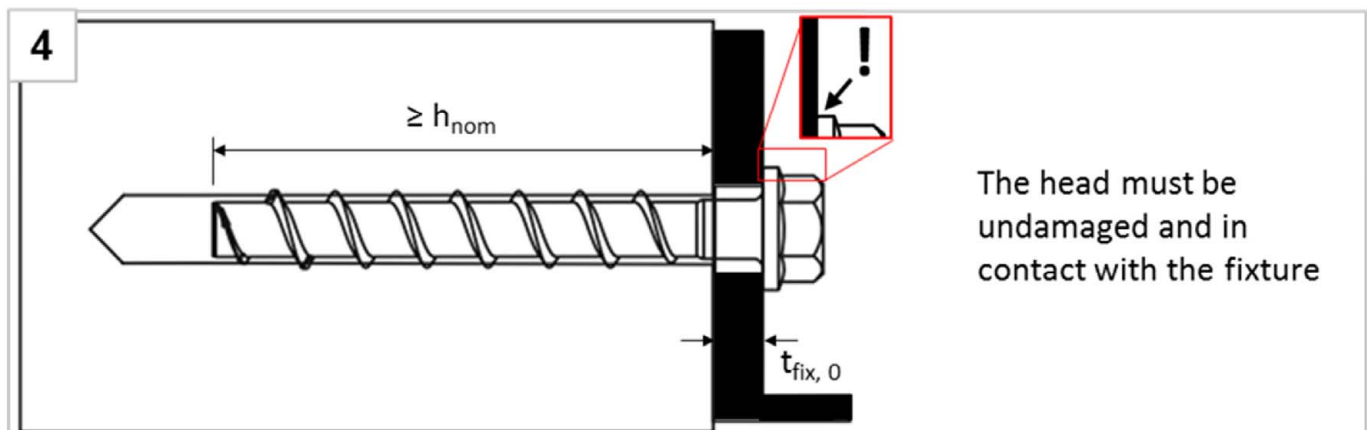
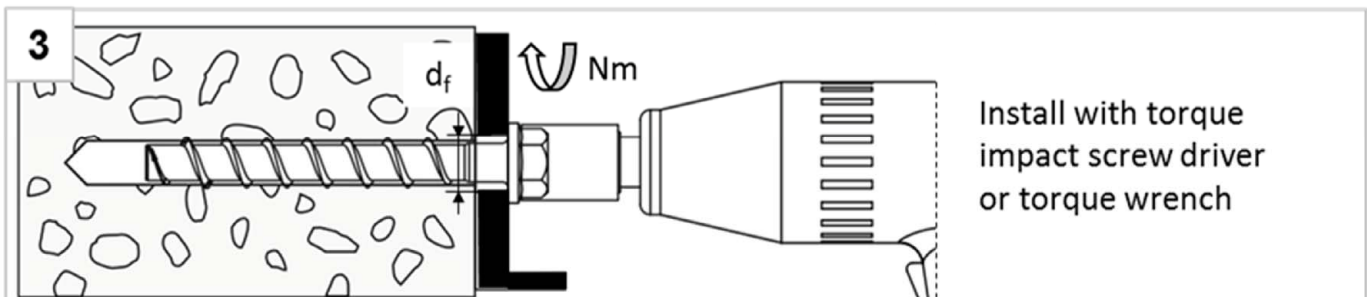
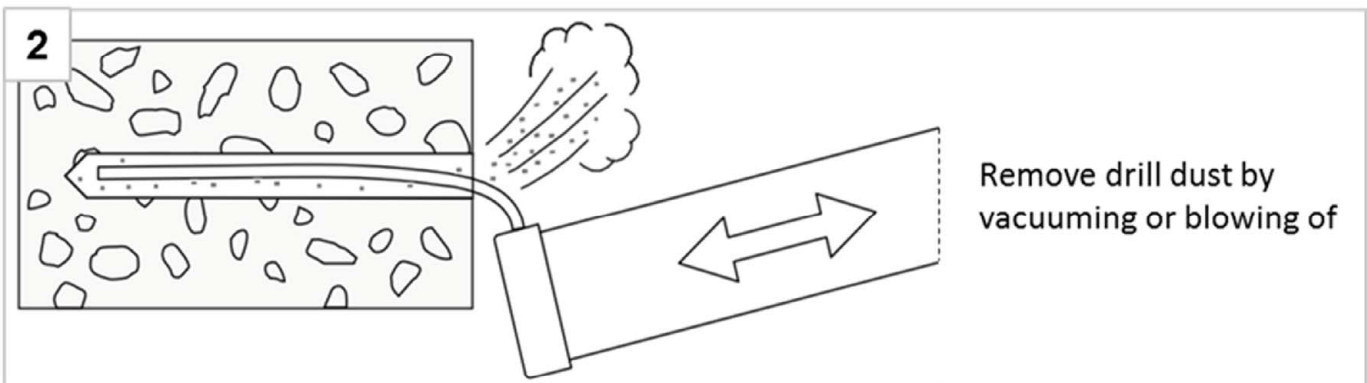
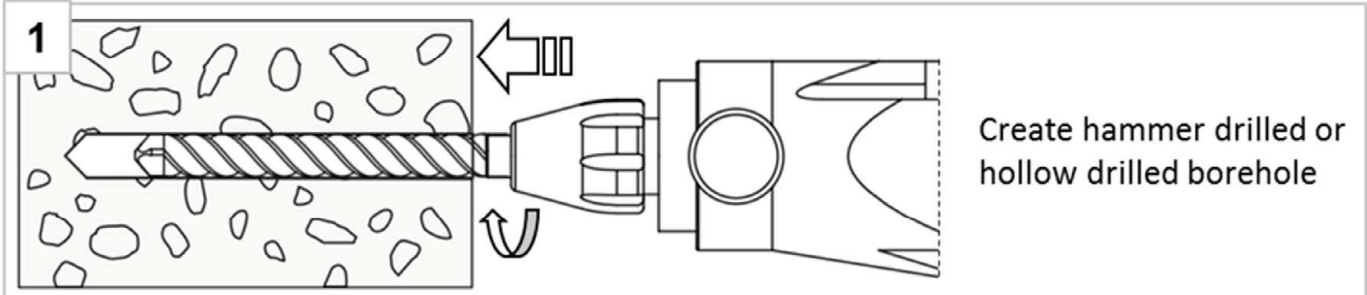
**TOX screw anchor Sumo Max 1**

**Intended use**

Installation parameters for anchorages in precast prestressed hollow slabs

**Annex B3**

## Installation Instructions

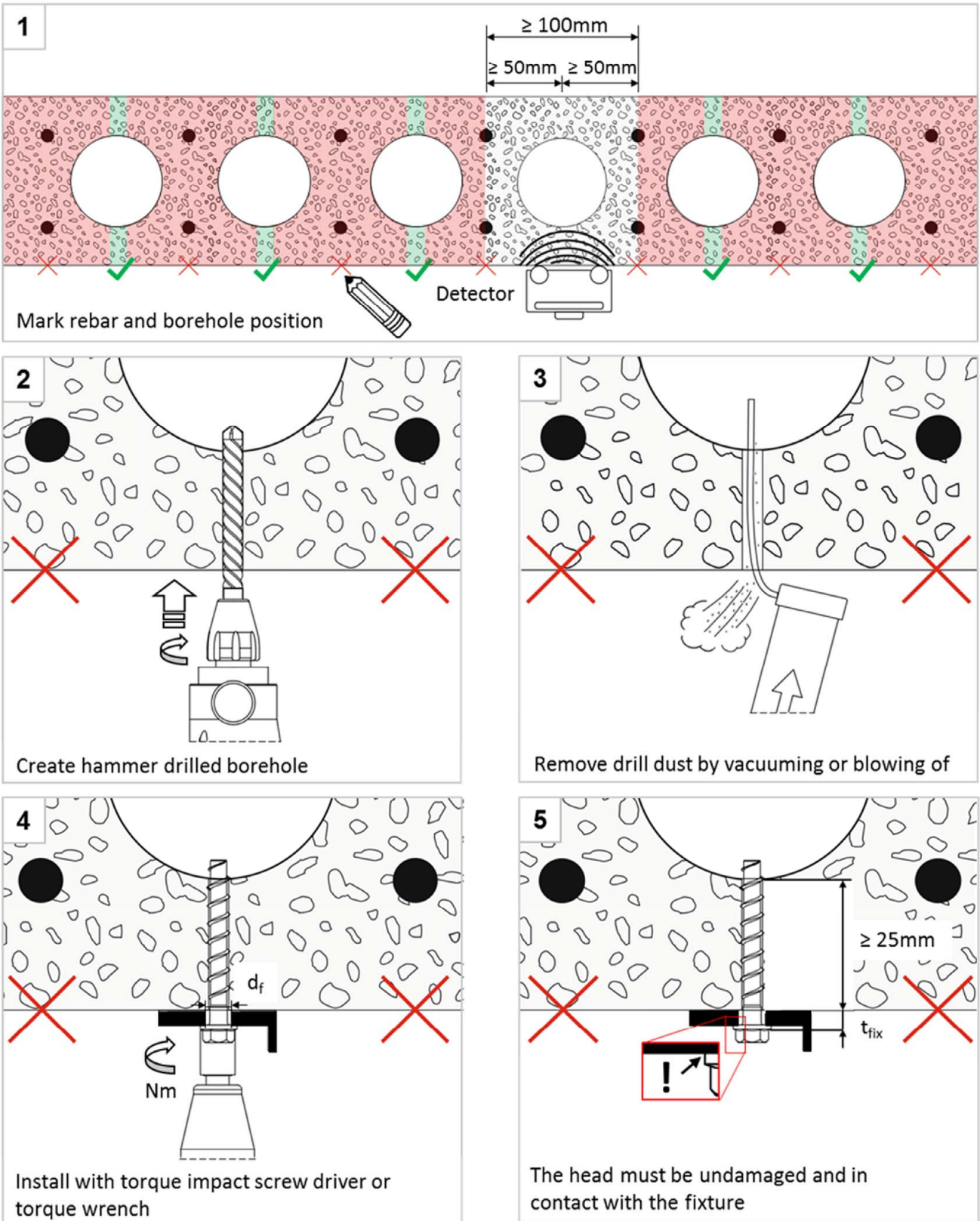


TOX screw anchor Sumo Max 1

**Intended use**  
Installation instructions

**Annex B4**

## Installation Instructions for anchorages in prestressed hollow slabs



TOX screw anchor Sumo Max 1

**Intended use**

Installation instructions for anchorages in prestressed hollow slabs

**Annex B5**

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

TSM screw anchor size			TSM 5	TSM 6		
Nominal embedment depth	$h_{nom}$		$h_{nom1}$	$h_{nom1}$	$h_{nom2}$	
	[mm]		35	35	55	
<b>Steel failure for tension and shear loading</b>						
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		
<b>Pull-out failure</b>						
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 $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	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]	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	$\gamma_{inst}$	[-]	1,2	1,0	1,0	
<b>Concrete edge failure</b>						
Effective length in concrete	$l_f = h_{ef}$	[mm]	27	27	44	
Nominal outer diameter of screw	$d_{nom}$	[mm]	5	6		
<b>TOX screw anchor Sumo Max 1</b>					<b>Annex C1</b>	
<b>Performances</b> Characteristic values for static and quasi-static loading						

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

TSM screw anchor size			TSM 6		
Bottom flange thickness	$d_b$	[mm]	$\geq 25$	$\geq 30$	$\geq 35$
Characteristic resistance	$F_{Rk}^0$	[kN]	1	2	3
Edge distance	$c_{cr}$	[mm]	100		
Spacing	$s_{cr}$	[mm]	200		
Installation factor	$\gamma_{inst}$	[-]	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]	$\geq 100$		
Minimum anchor spacing	$s_{min}$	[mm]	$\geq 100$		
Minimum distance between anchor groups	$a_{min}$	[mm]	$\geq 100$		
Distance of core	$l_c$	[mm]	$\geq 100$		
Distance of prestressing steel	$l_p$	[mm]	$\geq 100$		
Distance between anchor position and prestressing steel	$a_p$	[mm]	$\geq 50$		

TOX screw anchor Sumo Max 1

**Performances**

Characteristic values and limiting distances in precast prestressed hollow core slabs

**Annex C2**

Table 8: Fire exposure – characteristic values of resistance <sup>1)</sup>

TSM screw anchor size				TSM 6			
Material				TSM		TSM A4/HCR	
Nominal embedment depth		$h_{nom}$		$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$
		[mm]		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]	0,9		1,2	
	R60	$F_{Rk,s,fi60}$	[kN]	0,8		1,2	
	R90	$F_{Rk,s,fi90}$	[kN]	0,6		1,2	
	R120	$F_{Rk,s,fi120}$	[kN]	0,4		0,8	
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,7		0,9	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,6		0,9	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,5		0,9	
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,3		0,6	
Pull-out failure							
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,75	1,875	0,75	1,875
	R120	$N_{Rk,p,fi}$	[kN]	0,6	1,5	0,6	1,5
Concrete cone failure							
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,86	2,76	0,86	2,76
	R120	$N^0_{Rk,c,fi}$	[kN]	0,68	2,21	0,68	2,21
Edge distance							
R30 - R120		$C_{cr,fi}$	[mm]	2 x $h_{ef}$			
In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm.							
Spacing							
R30 - R120		$S_{cr,fi}$	[mm]	4 x $h_{ef}$			
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.							

<sup>1)</sup> Not for application in prestressed hollow core slabs

TOX screw anchor Sumo Max 1

**Performances**  
Characteristic values under fire exposure

**Annex C3**