



## European Technical Approval ETA-10/0114

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	TOGE Betonschraube TSM 5 und TSM 6 <i>TOGE Concrete screw TSM 5 and TSM 6</i>
Zulassungsinhaber <i>Holder of approval</i>	TOGE-DÜBEL A. Gerhard KG Illesheimer Straße 10 90431 Nürnberg DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck  <i>Generic type and use of construction product</i>	Betonschraube in den Größen 5 und 6 zur Verwendung als Mehrfachbefestigung für nichttragende Systeme in Beton und Spannbeton-Hohlplattendecken  <i>Concrete screw size 5 and 6 for multiple use for non-structural applications in concrete and in prestressed hollow core slabs</i>
Geltungsdauer: <i>Validity:</i>	vom <i>from</i> 8 August 2012 bis <i>to</i> 12 May 2015
Herstellwerk <i>Manufacturing plant</i>	TOGE-Dübel A. Gerhard KG

Diese Zulassung umfasst  
*This Approval contains*

22 Seiten einschließlich 14 Anhänge  
*22 pages including 14 annexes*

Diese Zulassung ersetzt  
*This Approval replaces*

ETA-10/0114 mit Geltungsdauer vom 15.02.2011 bis 12.05.2015  
*ETA-10/0114 with validity from 15.02.2011 to 12.05.2015*

## I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
  - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998<sup>4</sup>, as amended by law of 31 October 2006<sup>5</sup>;*
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>;
  - Guideline for European technical approval of "Metal anchors for use in concrete - Part 6: Anchors for multiple use for non-structural applications", ETAG 001-06.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
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- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12  
<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1  
<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25  
<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812  
<sup>5</sup> *Bundesgesetzblatt Teil I 2006*, p. 2407, 2416  
<sup>6</sup> Official Journal of the European Communities L 17, 20 January 1994, p. 34

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of product and intended use

#### 1.1 Definition of the construction product

The TOGE Concrete screw TSM 5 and TSM 6 is an anchor made of zinc-plated steel respectively steel with zinc flake coating (designated as TSM-B or TSM-BC) or stainless steel (designated as TSM-BS) or high corrosion resistant steel (designated as TSM-BSH) of size 5 and 6 mm. 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.

An illustration of the product and intended use is given in Annex 1.

#### 1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for safety in use in the sense of the Essential Requirements 4 of Council Directive 89/106 EEC shall be fulfilled and failure of the fixture represents an immediate risk to human life. The anchor is to be used only for multiple use for non-structural applications. The definition of multiple use according to the Member States is given in the informative Annex 1 of ETAG 001, Part 6.

The anchor may be used for anchorages with requirements related to resistance to fire.

The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206-1:2000-12.

It may be anchored in cracked or non-cracked concrete and in bottom flanges of precast prestressed hollow core slabs according to Annex 2.

Anchor made of zinc-plated steel respectively made of steel with zinc flake coating as well as anchor made of stainless steel with reduced anchorage depth:

The TOGE Concrete screw TSM-B or TSM-BC may only be used in structures subject to dry internal conditions.

Anchor made of stainless steel:

The TOGE Concrete screw TSM-BS may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Anchor made of high corrosion resistant steel:

The TOGE Concrete screw TSM-BSH may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

The provisions made in this European technical approval are based on an assumed working life of the anchor of 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.

## **2 Characteristics of product and methods of verification**

### **2.1 Characteristics of product**

The anchor corresponds to the drawings and provisions given in the Annexes 3 and 4. The characteristic material values, dimensions and tolerances of the anchor not given in Annexes 3 and 4 shall correspond to the respective values laid down in the technical documentation<sup>7</sup> of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 2000/605/EC.

The characteristic values for the design of anchorages are given in the Annexes 7 to 10, Tables 6 to 9 for use in concrete C20/25 to C50/60 and in Annex 13, Table 10 for use in precast prestressed hollow core slabs.

The characteristic anchor values for the design of the anchorages regarding resistance to fire are given in the Annex 14, Tables 11 and 12. They are valid for use in a system that is required to provide a specific fire resistance class.

Each anchor shall be marked with the identifying mark of the producer, the anchor type, the diameter and the length of the anchor according to Annex 3.

### **2.2 Methods of verification**

The assessment of fitness of the anchor for the intended use in relation to the requirements for safety in use in the sense of the Essential Requirements 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for use in concrete", Part 1 "Anchors in general" and Part 6 "Anchors for multiple use for non-structural applications".

The assessment of the anchor for the intended use in relation to the requirements for resistance to fire has been made in accordance with the Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

<sup>7</sup>

The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

### 3 Evaluation and attestation of conformity and CE marking

#### 3.1 System of attestation of conformity

According to the decision 97/161/EG of the European Commission<sup>8</sup> the system 2(ii) (referred to as system 2+) of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer:

- (1) initial type-testing of the product;
- (2) factory production control;
- (3) testing of samples taken at the factory in accordance with a prescribed control plan.

(b) Tasks for the approved body:

- (4) certification of factory production control on the basis of:
  - initial inspection of factory and of factory production control;
  - continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

#### 3.2 Responsibilities

##### 3.2.1 Tasks of the manufacturer

###### 3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.<sup>9</sup>

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

###### 3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of the anchorages in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

<sup>8</sup> Official Journal of the European Communities L 67 of 03.02.1997

<sup>9</sup> The control plan is a confidential part of the European Technical Approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

### 3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control.

in accordance with the provisions laid down in the control plan relating to this European technical approval.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

### 3.3 CE marking

The CE marking shall be affixed on each packing of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-6),
- size.

## 4 Assumptions under which the fitness of the product for the intended use was favourably assessed

### 4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

### 4.2 Design of anchorages

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A under the responsibility of an engineer experienced in anchorages and concrete work.

The anchor is to be used only for multiple use for non-structural applications, the definition of multiple use according to the Member States is given in the informative Annex 1 of ETAG 001, Part 6.

Verifiable calculation notes and drawings are 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).

The shear load of anchor groups in one fastening point is limited to max.  $V = 25 \text{ kN}$ .

The design of anchorages under fire exposure has to consider the conditions given in the Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". The relevant characteristic values are given in Annex 5, Table 6. The design method covers anchors with a fire attack from one side only. If the fire attack is from more than one side, the design method may be taken only, if the edge distance of the anchor is  $c \geq 300 \text{ mm}$ .

Local spalling is possible at fire attack. To avoid any influence of the spalling on the anchorage, the concrete member must be designed according to EN 1992-1-2:2004. The members shall be made of concrete with quartzite additives and have to be protected from direct moisture; and the moisture content of the concrete has to be like in dry internal conditions respectively. The embedment depth of the anchor  $h_{\text{nom}}$  has to be increased for wet concrete by at least 30 mm compared to the given value in Annex 3.

#### 4.3 Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site,
- Use of the anchor only as supplied by the manufacturer,
- Anchor installation in accordance with the manufacturer's specifications and drawings,
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply,
- Check of the concrete being well compacted, e.g. without significant voids,
- Edge distances and spacing not less than the specified values without minus tolerances,
- Placing drill holes without damaging the reinforcement,
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application,
- Cleaning of the hole of drilling dust according,
- Anchor installation such that the embedment depth of the anchor in the concrete is not smaller than the value  $h_{\text{nom}}$  given in Annex 5, Tables 2 and 3,
- The fixture is fully pressed on the concrete surface without intermediate layers,
- Further turning of the anchor is not possible,
- The head of the anchor is fully supported on the fixture and is not damaged.



## 5 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to section 1 and 2 including Annexes referred to as well as sections 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

- drill bit diameter,
- thread diameter,
- minimum effective anchorage depth,
- minimum hole depth,
- maximum thickness of fixture,
- torque moment,
- information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- reference to any special installation equipment needed,
- identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

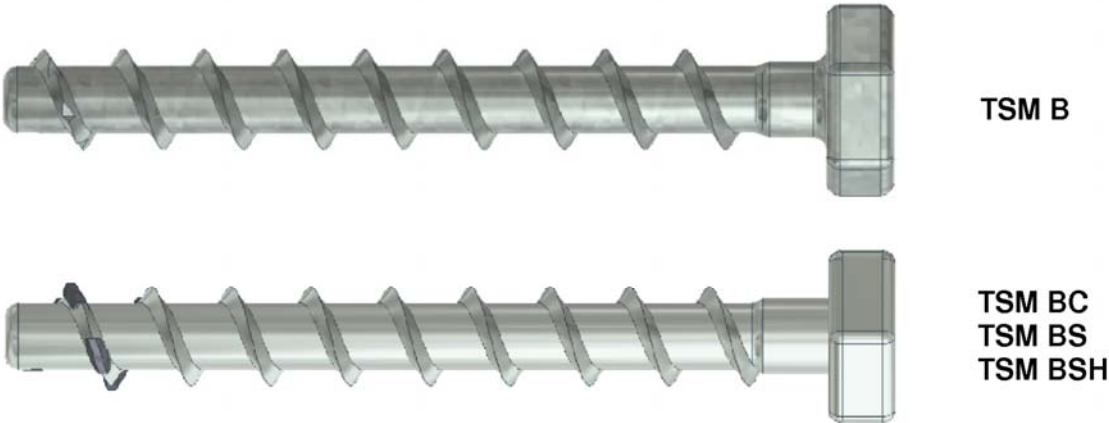
Georg Feistel  
Head of Department

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Tempel

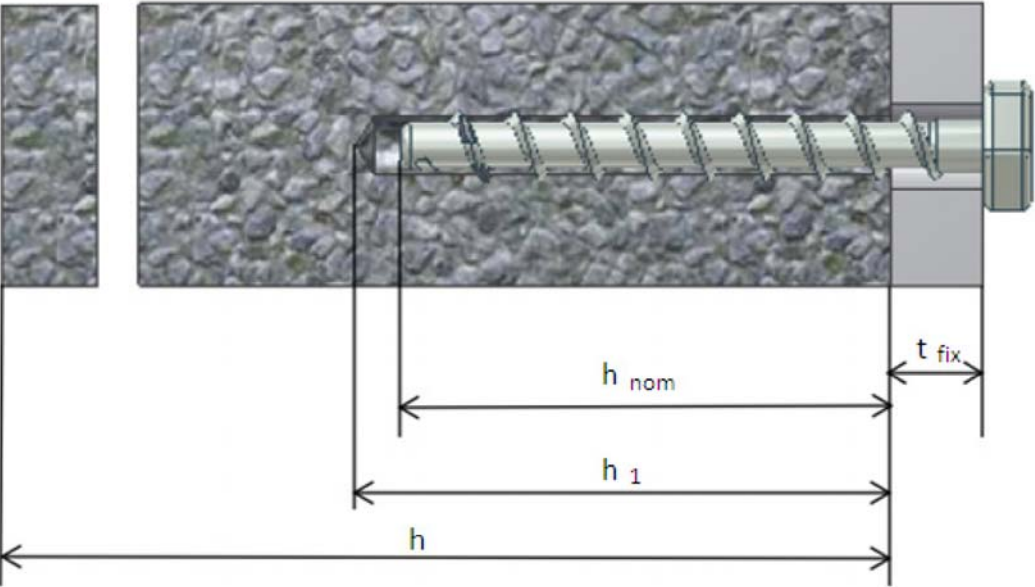


For multiple use for non-structural applications  
according to ETAG 001 Part 6 Annex 1

**Toge concrete screw TSM 5 and TSM 6**



**Intended use**



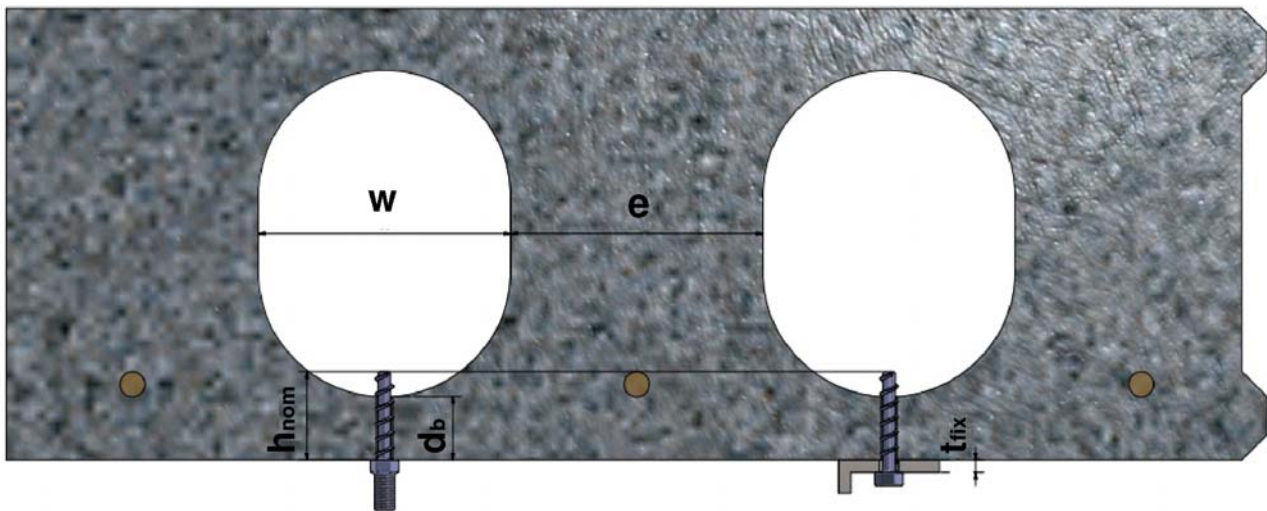
- $h_{nom}$  = Embedment depth of anchor
- $h_1$  = depth of the drill hole
- $h$  = thickness of concrete member
- $t_{fix}$  = thickness of fixture

**Toge concrete screw TSM 5 and TSM 6**

Product and Intended use

**Annex 1**

Intended use in precast prestressed hollow core slabs ( $w/e \leq 4,2$ )




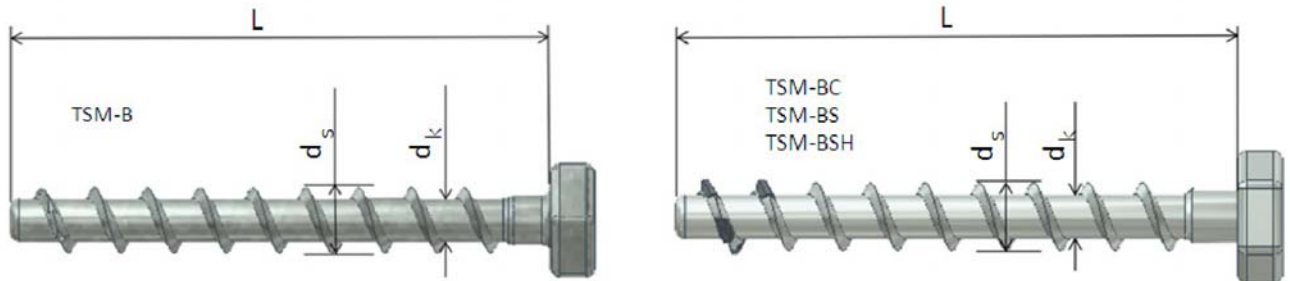
w	core width
e	web thickness
$h_{nom}$	nominal embedment depth
$d_b$	bottom flange thickness $\geq 25$ mm
$t_{fix}$	thickness of fixture

Toge concrete screw TSM 5 and TSM 6

Intended use in precast prestressed hollow core slabs

Annex 2

	<p>Anchor version with connection thread, Designation e.g. TSM-BS 6x100 M8x35</p> <p>Anchor version with hexagon head, Designation e.g. TSM-BS 6x100 SW 13 Marking Anchortype: TSM-B/TSM-BC/TSM-BS/TSM-BSH Anchorsize: 6 Length of anchor: f.e. 100 Marking "K" für <math>h_{nom} = 35</math> mm</p> <p>Anchor version with counter sunk socket head, Designation e.g. TSM-BS 6x100 SeKo VZ 30</p> <p>Anchor version with panhead, Designation e.g. TSM-BS 6x100 LiKo VZ</p> <p>Anchor version with washer and hexagon head, Designation e.g. TSM-BS 6x100 SW 10</p> <p>Anchor version with washer and hexagon head Designation e.g. TSM-BS 6x100 SW 10 VZ 30</p> <p>Anchor version with counter sunk and socket head and with connection thread, Designation e.g. TSM-BS 6x100 IM 8/10</p> <p>for <math>h_{nom} = 55</math> mm, marking on the shaft for <math>h_{nom} = 35</math> mm, marking "K"</p> <p>Anchor version with hexagon head and with connection thread, Designation e.g. TSM-BS 6x100 SW 10 M 8</p>
<p><b>Toge concrete screw TSM 5 and TSM 6</b></p>	<p><b>Annex 3</b></p>
<p>Head versions</p>	



**Table 1: Dimensions and Materials**

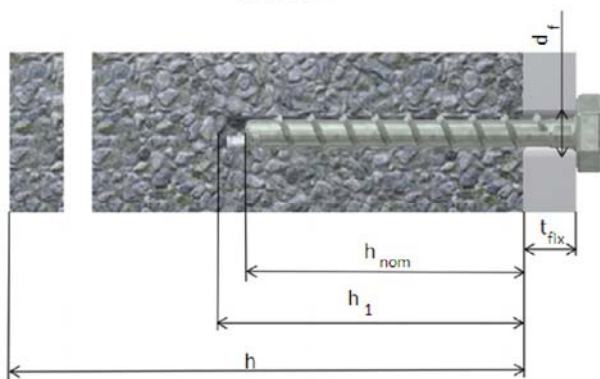
Anchors identity			TSM							
			B 5	BC 5	B 6	BC 6	BS 5	BS 6	BSH 5	BSH 6
Length of Anchor	L ≥ ≤	[mm]	40				45			
			200				200			
Diameter of shaft	d <sub>k</sub>	[mm]	4,0		5,0		4,0	5,0	4,0	5,0
Diameter of thread	d <sub>s</sub>	[mm]	6,5		7,5		6,5	7,5	6,5	7,5
Material			Steel EN 10263-4 galvanized acc. to EN ISO 4042 or zinc flake coating acc. to EN ISO 10683 (≥ 5µm)				1.4401,1.4404, 1.4571,1.4578		1.4529	

**Toge concrete screw TSM 5 and TSM 6**

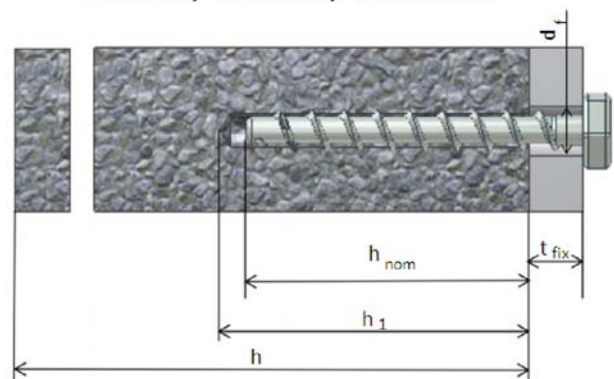
Dimensions and Materials

**Annex 4**

**TSM B**



**TSM BC, TSM BS, TSM BSH**



**Table 2: Installation data at standard embedment depth**

Anchors identity			TSM			
			B 6	BC 6	BS 6	BSH 6
Nominal bit drill diameter	$d_0$	[mm]	6			
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40			
Depth of drill hole	$h_1 \geq$	[mm]	65			
Embedment depth of anchor	$h_{nom} \geq$	[mm]	55			
Diameter of clearance hole in fixture	$d_f$	[mm]	9			

**Table 3: Installation data at reduced embedment depth**

Anchors identity			TSM							
			B 5	BC 5	BS 5	BSH 5	B 6	BC 6	BS 6	BSH 6
Nominal bit drill diameter	d <sub>0</sub>	[mm]	5,0				6,0			
Cutting diameter of drill bit	d <sub>cut</sub> ≤	[mm]	5,40				6,40			
Depth of drill hole	h <sub>1</sub> ≥	[mm]	45		50		45		50	
Embedment depth of anchor	h <sub>nom</sub> ≥	[mm]	35		40		35		40	
Diameter of clearance hole in fixture	d <sub>f</sub>	[mm]	7				9			

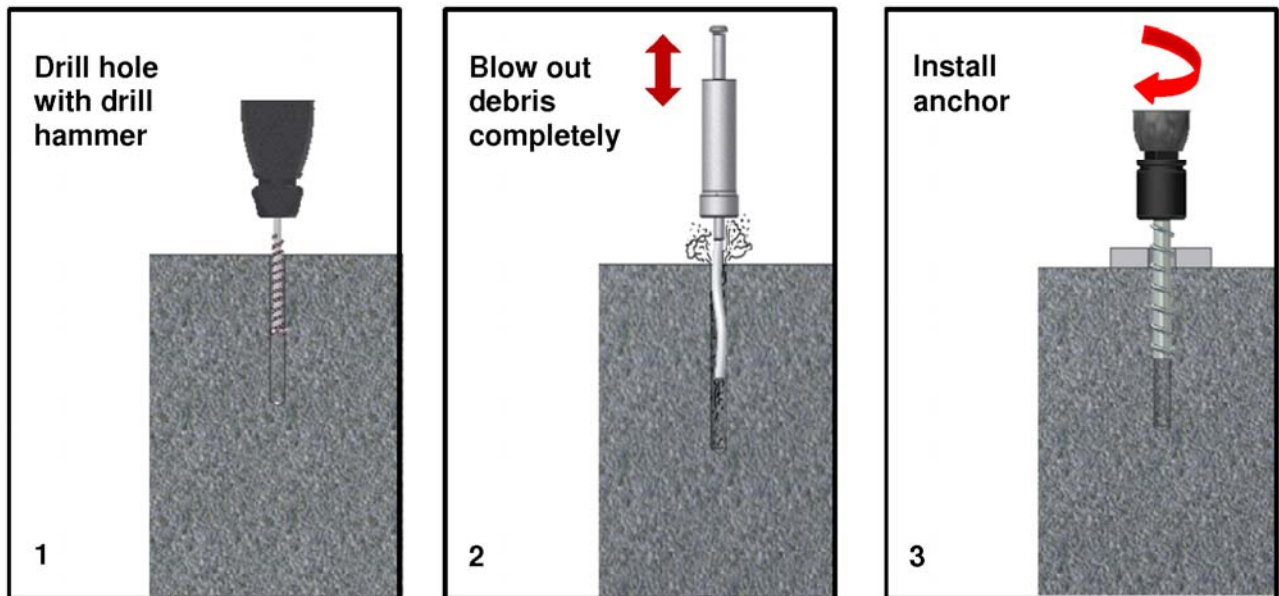
**Toge concrete screw TSM 5 and TSM 6**

Installation data

**Annex 5**



### Setting instructions



**Table 4: Minimum thickness of member and minimum spacing and edge distance at standard embedment depth**

Anchors identity			TSM			
			B 6	BC 6	BS 6	BSH 6
Minimum thickness of member	$h_{min}$	[mm]	100			
Minimum edge distance	$c_{min}$	[mm]	40			
Minimum spacing	$s_{min}$	[mm]	40			

**Table 5: Minimum thickness of member and minimum spacing and edge distance at reduced embedment depth**

Anchors identity			TSM							
			B 5	BC 5	BS 5	BSH 5	B 6	BC 6	BS 6	BSH 6
Minimum thickness of member	$h_{min}$	[mm]	80							
Minimum edge distance	$c_{min}$	[mm]	35							
Minimum spacing	$s_{min}$	[mm]	35							

### **Toge concrete screw TSM 5 and TSM 6**

Settings instructions, minimum thickness of member, minimum spacing and edge distance

### **Annex 6**

**Table 6: Design method A - characteristic values for tension load  
at standard embedment depth**

Anchors identity			TSM			
			B 6	BC 6	BS 6	BSH 6
<b>Steel failure</b>						
characteristic resistance	$N_{Rk,s}$	[kN]	13,7			
Partial safety factor	$\gamma_{Ms}^{1)}$	[ - ]	1,4			
<b>Pullout failure</b>						
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	7,5			
Increasing factors for $N_{Rk,p}$	$\Psi_C$	C30/37	1,22			
		C40/50	1,41			
		C50/60	1,55			
Partial safety factor	$\gamma_{Mp}^{1)}$	[ - ]	1,5 <sup>2)</sup>			
<b>concrete failure</b>						
Effective anchorage depth	$h_{ef}$	[mm]	44			
Spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
Edge distance	$c_{cr,N}$	[mm]	$1,5 \times h_{ef}$			
Partial safety factor	$\gamma_{Mc}^{1)}$	[ - ]	1,5 <sup>2)</sup>			
<b>Splitting</b>						
Effective anchorage depth	$h_{ef}$	[mm]	44			
Spacing	$s_{cr,sp}$	[mm]	160			
Edge distance	$c_{cr,sp}$	[mm]	80			
Partial safety factor	$\gamma_{Msp}^{1)}$	[ - ]	1,5 <sup>2)</sup>			

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The installation safety factor  $\gamma_2 = 1,0$  is included

**Toge concrete screw TSM 5 and TSM 6**

Design method A - Characteristic values for tension load at  
standard embedment depth

**Annex 7**



**Table 7: Design method A - characteristic values for tension load  
at reduced embedment depth**

Anchors identity			TSM							
			B 5	BC 5	BS 5	BSH 5	B 6	BC 6	BS 6	BSH 6
Steel failure										
characteristic resistance	N <sub>Rk,s</sub>	[kN]	8,7				13,7			
Partial safety factor	γ <sub>Ms</sub> <sup>1)</sup>	[ - ]	1,4							
Pullout failure										
Characteristic resistance in concrete C20/25	N <sub>Rk,p</sub>	[kN]	1,5							
Increasing factors for N <sub>Rk,p</sub>	ψ <sub>C</sub>	C30/37	1,22							
		C40/50	1,37							
		C50/60	1,55							
Partial safety factor	γ <sub>Mp</sub> <sup>1)</sup>	[ - ]	1,8 <sup>2)</sup>							
concrete failure										
Effective anchorage depth	h <sub>ef</sub>	[mm]	27		32		27		32	
Spacing	s <sub>cr,N</sub>	[mm]	3 x h <sub>ef</sub>							
Edge distance	c <sub>cr,N</sub>	[mm]	1,5 x h <sub>ef</sub>							
Partial safety factor	γ <sub>Mc</sub> <sup>1)</sup>	[ - ]	1,8 <sup>2)</sup>							
Splitting		[mm]								
Effective anchorage depth	h <sub>ef</sub>	[mm]	27		32		27		32	
Spacing	s <sub>cr,sp</sub>	[mm]	120							
Edge distance	c <sub>cr,sp</sub>	[ - ]	60							
Partial safety factor	γ <sub>Mc</sub> <sup>1)</sup>	[ - ]	1,8 <sup>2)</sup>							

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The installation safety factor  $\gamma_2 = 1,2$  is included

**Toge concrete screw TSM 5 and TSM 6**

**Annex 8**

Design method A - Characteristic values for tension load at reduced embedment depth

**Table 8: Design method A - characteristic values for shear load  
at standard embedment depth**

Anchors identity			TSM			
			B 6	BC 6	BS 6	BSH 6
<b>Steel failure without lever arm</b>						
Characteristic resistance	$V_{Rk,s}$	[kN]	7,0			
Partial safety factor	$\gamma_{Ms}^{1)}$	[ - ]	1,5			
<b>Steel failure with lever arm</b>						
Characteristic resistance	$M_{Rk,s}^0$	[Nm]	11,0			
Partial safety factor	$\gamma_{Ms}^{1)}$	[ - ]	1,5			
<b>Pryout failure</b>						
Factor k in ETAG 001 Annex C, equation (5.6)	k	[ - ]	1,0			
Partial safety factor	$\gamma_{Mc}^{1)}$	[ - ]	1,5 <sup>2)</sup>			
<b>Concrete edge failure</b>						
Effective length of anchor	$l_f$	[mm]	44,0			
Diameter of anchor	$d_{nom}$	[mm]	6,0			
Partial safety factor	$\gamma_{Mc}^{1)}$	[ - ]	1,5 <sup>2)</sup>			

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The installation safety factor  $\gamma_2 = 1,0$  is included

**Toge concrete screw TSM 5 and TSM 6**

**Annex 9**

Design method A - Characteristic values for shear load at standard embedment depth

**Table 9: Design method A - characteristic values for shear load  
at reduced embedment depth**

Anchors identity			TSM							
			B 5	BC 5	BS 5	BSH 5	B 6	BC 6	BS 6	BSH 5
Steel failure without lever arm										
Characteristic resistance	$V_{Rk,s}$	[kN]	4,4				6,9			
Partial safety factor	$\gamma_{Ms}^{1)}$	[ - ]	1,5				1,5			
Steel failure with lever arm										
Characteristic resistance	$M_{Rk,s}^0$	[Nm]	5,3				10,			
Partial safety factor	$\gamma_{Ms}^{1)}$	[ - ]	1,5				1,5			
Pryout failure										
Factor k in ETAG 001 Annex C, equation (5.6)	k	[ - ]	1,0				1,0			
Partial safety factor	$\gamma_{Mc}^{1)}$	[ - ]	1,5 <sup>2)</sup>				1,5 <sup>2)</sup>			
Concrete edge failure										
Effective length of anchor	$l_f$	[mm]	27		32		27		32	
Diameter of anchor	$d_{nom}$	[mm]	5,0				6,0			
Partila safety factor	$\gamma_{Mc}^{1)}$	[ - ]	1,8 <sup>2)</sup>				1,8 <sup>2)</sup>			

<sup>1)</sup> In absence of other national regulations

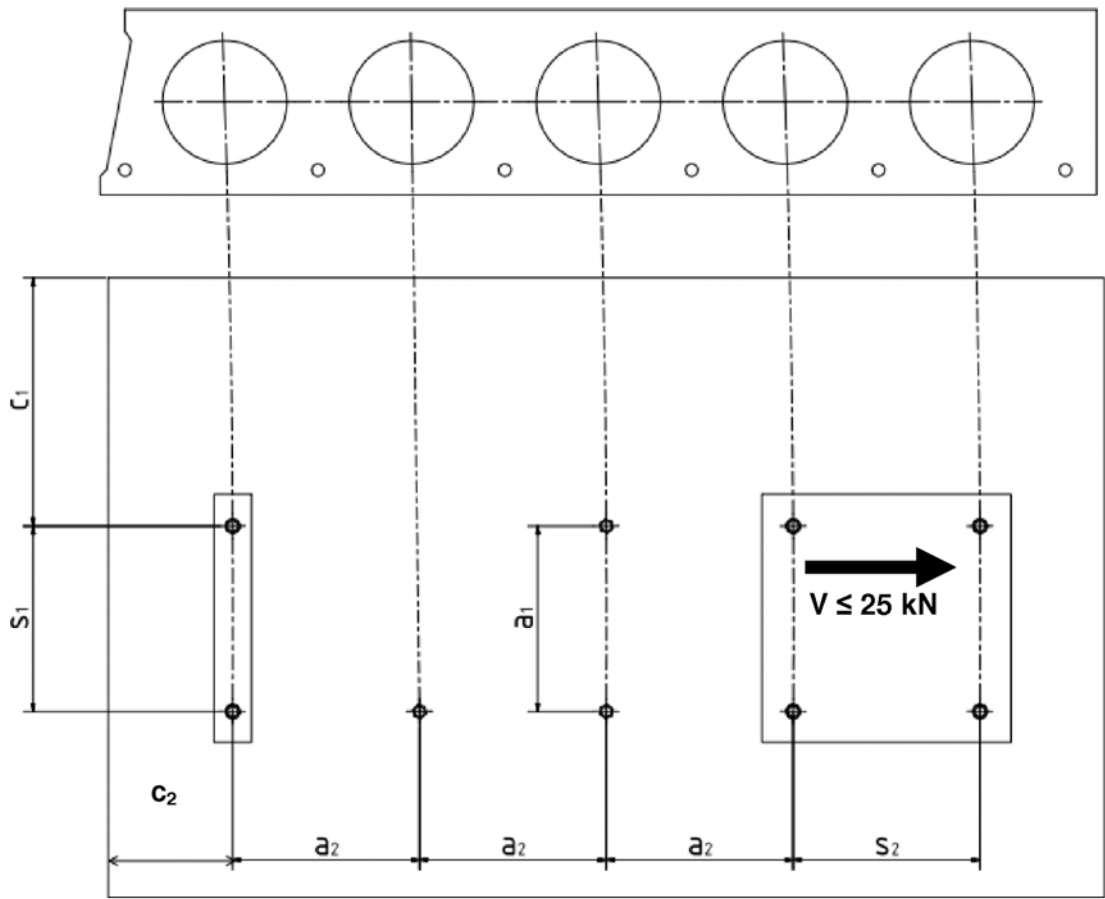
<sup>2)</sup> The installation safety factor  $\gamma_2 = 1,2$  is included

**Toge concrete screw TSM 5 and TSM 6**

**Annex 10**

Design method A - Characteristic values for shear load at reduced embedment depth

Minimum spacing and edge distance of achors and distance between anchor in precast groups in prestressed hollow core slabs



$C_1, C_2$  edge distance  
 $S_1, S_2$  anchor spacing  
 $a_1, a_2$  distance between anchor groups

Minimum edge distance	$C_{min}$	$\geq 100 \text{ mm}$
Minimum anchor spacing	$S_{min}$	$\geq 100 \text{ mm}$
Minimum distance between anchor groups	$a_{min}$	$\geq 100 \text{ mm}$

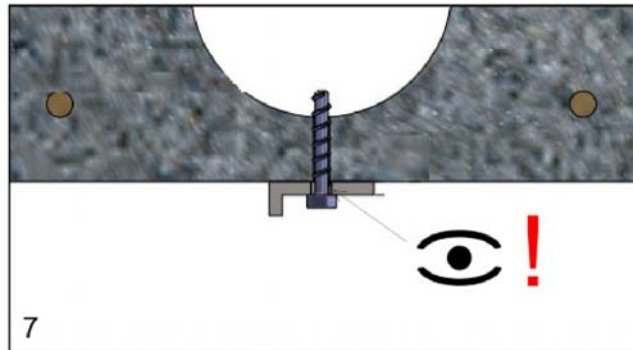
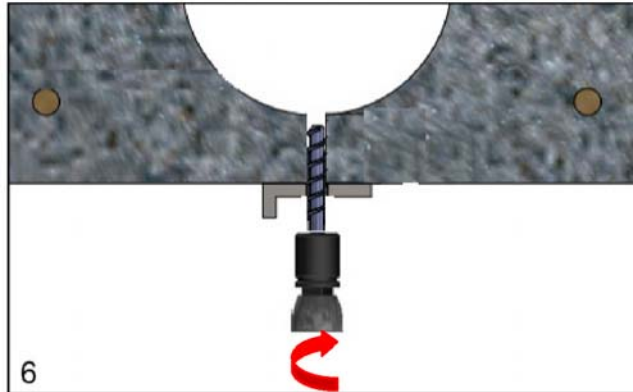
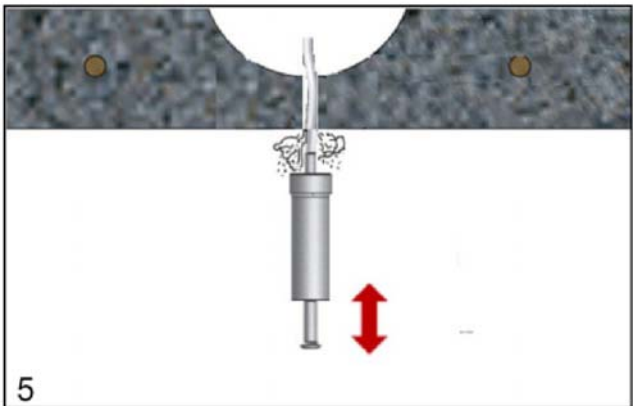
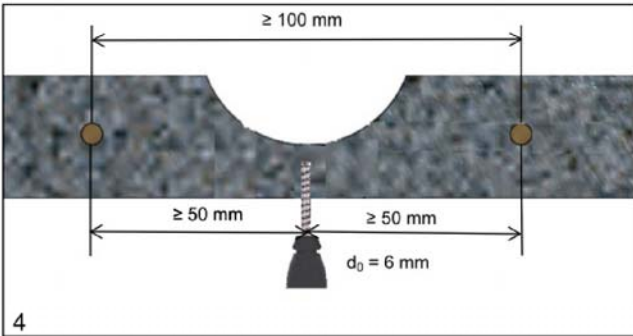
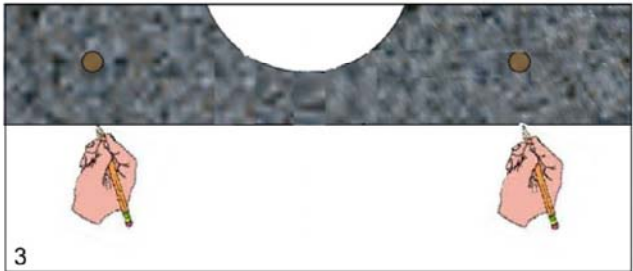
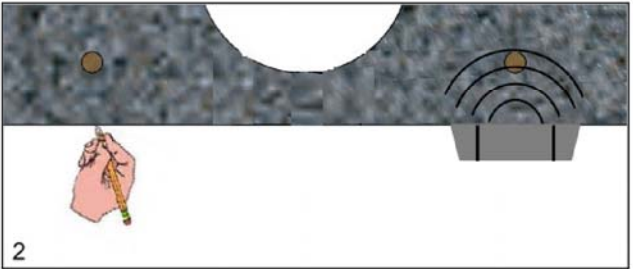
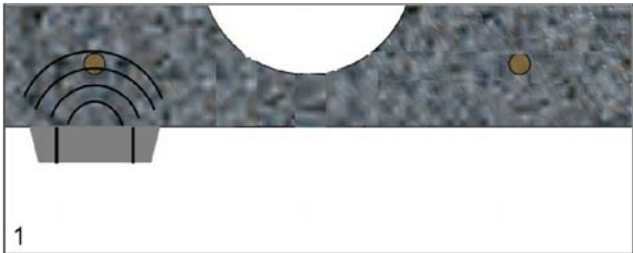
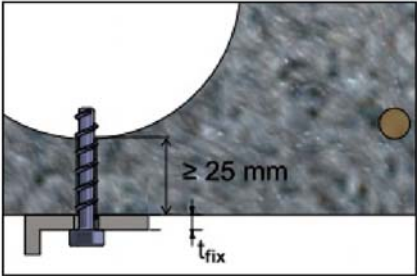
The maximum shear load of an anchor groups is restricted to max.  $V = 25 \text{ kN}$

Toge concrete screw TSM 5 and TSM 6

Annex 11

Minimum spacing and adge distance of achors and distance between anchor in precast groups in prestressed hollow core slabs

Setting instructions in precast prestressed hollow core slabs

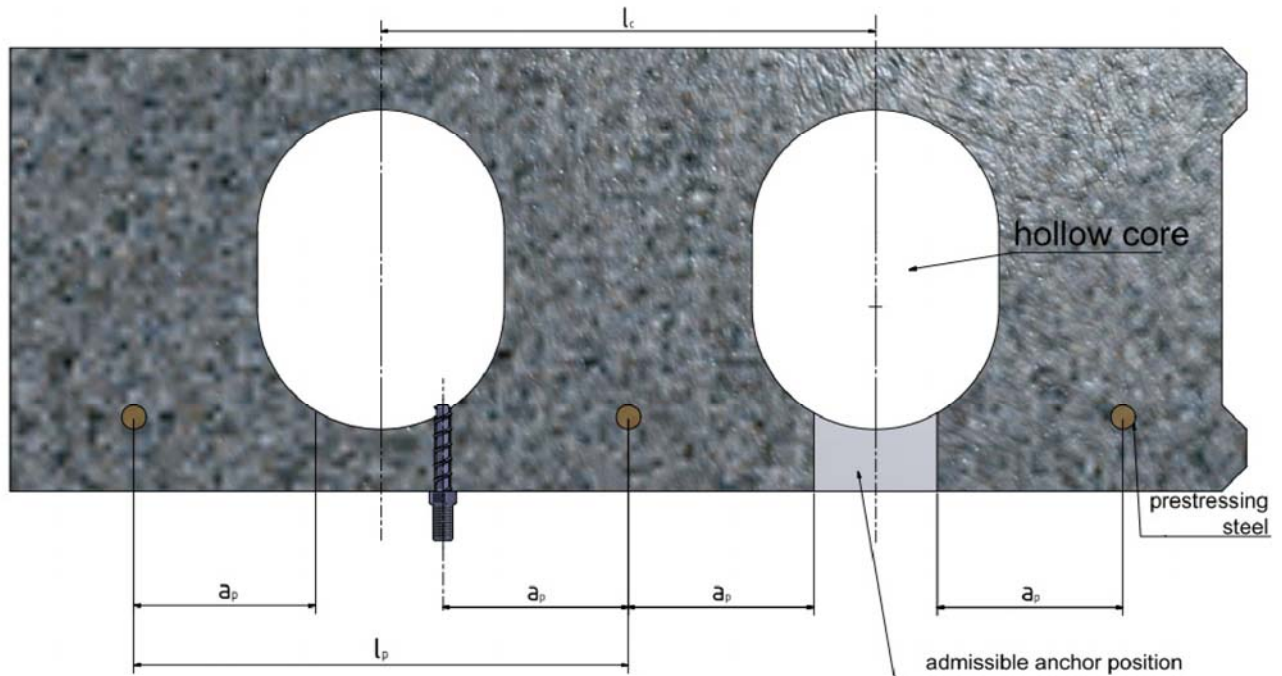


Toge concrete screw TSM 5 and TSM 6

Annex 12

Setting instructions in precast prestressed hollow core slabs

### Admissible anchor positions in precast prestressed hollow core slabs



core distance	$l_c$	$\geq 100 \text{ mm}$
prestressing steel	$l_p$	$\geq 100 \text{ mm}$
distance between anchor position and prestressing steel	$a_p$	$\geq 50 \text{ mm}$

**Table 10: Characteristic values of resistance in precast prestressed hollow core slabs**  
**C 30/37 to C 50/60**

Anchors identity			TSM		
			B 6, BC 6, BS 6, BSH 6		
Bottom flange thickness	d <sub>b</sub>	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F <sup>0</sup> <sub>Rk</sub>	[kN]	1	2	3
Partial safety factor	γ <sub>m</sub> <sup>1)</sup>	[ - ]	1,8 <sup>2)</sup>		

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The installation factor  $\gamma_2 = 1,2$  is included

#### Toge concrete screw TSM 5 and TSM 6

#### Annex 13

Admissible anchor positions and characteristic values of  
resistance in precast prestressed in hollow care slabs



**Table 11: Characteristic values under fire exposure in concrete C 20/25 to C 50/60 in any load direction without lever arm at standard embedment depth – design method B**

Fire resistance class	Anchors identity	TSM	
		B 6 BC 6	BS 6 BSH 6
R 30	Characteristic resistance $F_{Rk,fi30}^0$ <sup>2)</sup>	0,9	1,2
R 60	Characteristic resistance $F_{Rk,fi60}^0$ <sup>2)</sup>	0,8	1,2
R 90	Characteristic resistance $F_{Rk,fi90}^0$ <sup>2)</sup>	0,6	1,2
R 120	Characteristic resistance $F_{Rk,fi120}^0$ <sup>2)</sup>	0,4	0,8
R 30 bis R 120	Spacing $s_{cr,fi}$	120	
	Edge distance $c_{cr,fi}$	60	

**Table 12: Characteristic values under fire exposure in concrete C 20/25 to C 50/60 in any load direction without lever arm at reduced embedment depth – design method B**

Fire resistance class	Anchors identity	TSM	
		B 6 BC 6	BS 6 BSH 6
R 30	Characteristic resistance $F_{Rk,fi30}^0$ <sup>2)</sup>	0,4	0,4
R 60	Characteristic resistance $F_{Rk,fi60}^0$ <sup>2)</sup>	0,4	0,4
R 90	Characteristic resistance $F_{Rk,fi90}^0$ <sup>2)</sup>	0,4	0,4
R 120	Characteristic resistance $F_{Rk,fi120}^0$ <sup>2)</sup>	0,30	0,30
R 30 bis R 120	Spacing $s_{cr,fi}$	120	
	Edge distance $c_{cr,fi}$	60	

<sup>1)</sup> In case of fire attack from more than one side, the edge distance shall be  $\geq 300$  mm

<sup>2)</sup> In absence of other national regulations the partial safety factor for resistance under fire exposure  $\gamma_{M,fi} = 1,0$  is recommended.

For use in wet concrete the embedment depth  $h_{nom}$  has to be increased by at least 30 mm compared to the value given in Annex 3.

**Toge concrete screw TSM 5 and TSM 6**

Characteristic values under fire exposure

**Annex 14**