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-16/0439 of 8 August 2016

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	Concrete screw BSZ
Product family to which the construction product belongs	Concrete screw of size 5 and 6 mm for multiple use for non-structural applications in concrete and in prestressed hollow core slabs
Manufacturer	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach DEUTSCHLAND
Manufacturing plant	MKT Werk 5, D
This European Technical Assessment contains	15 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	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 6: "Anchors for multiple use for non-structural applications", August 2010, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The concrete screw BSZ in sizes of 5 and 6 mm is an anchor made of galvanised steel respectively steel with zinc flake coating, made of stainless or high corrosion resistant 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.

Product and product description is 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)

The essential characteristics regarding mechanical resistance and stability are included under the Basic Works Requirement Safety in use.

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C 3

3.3 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance for tension and shear loads as well as bending moments in concrete	See Annex C 1 and C 2
Edge distances and spacing	See Annex C 1

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 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 8 August 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

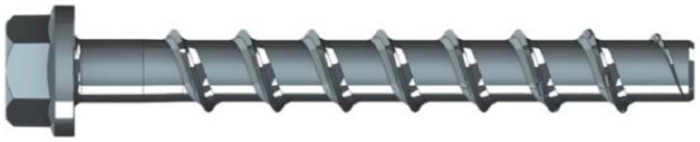
beglaubigt:
Tempel

Deutsches Institut für Bautechnik

DIBt

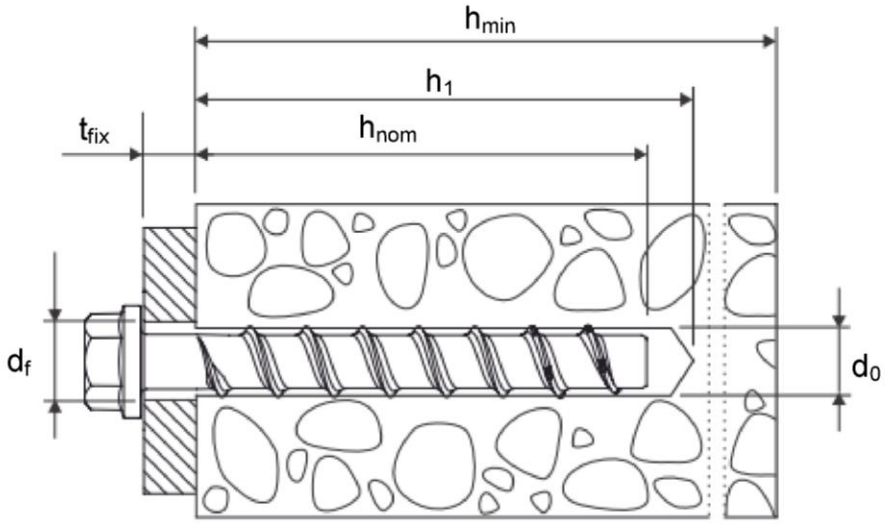
Product and installation situation

Concrete Screw BSZ



BSZ zinc plated

BSZ A4
BSZ HCR



d_0	=	nominal drill bit diameter
h_{nom}	=	nominal anchorage depth
h_1	=	depth of the drill hole
h_{min}	=	minimum thickness of member
t_{fix}	=	thickness of fixture
d_f	=	diameter of clearance hole in the fixture

Concrete Screw BSZ	Annex A1
Product description Product and installation situation	

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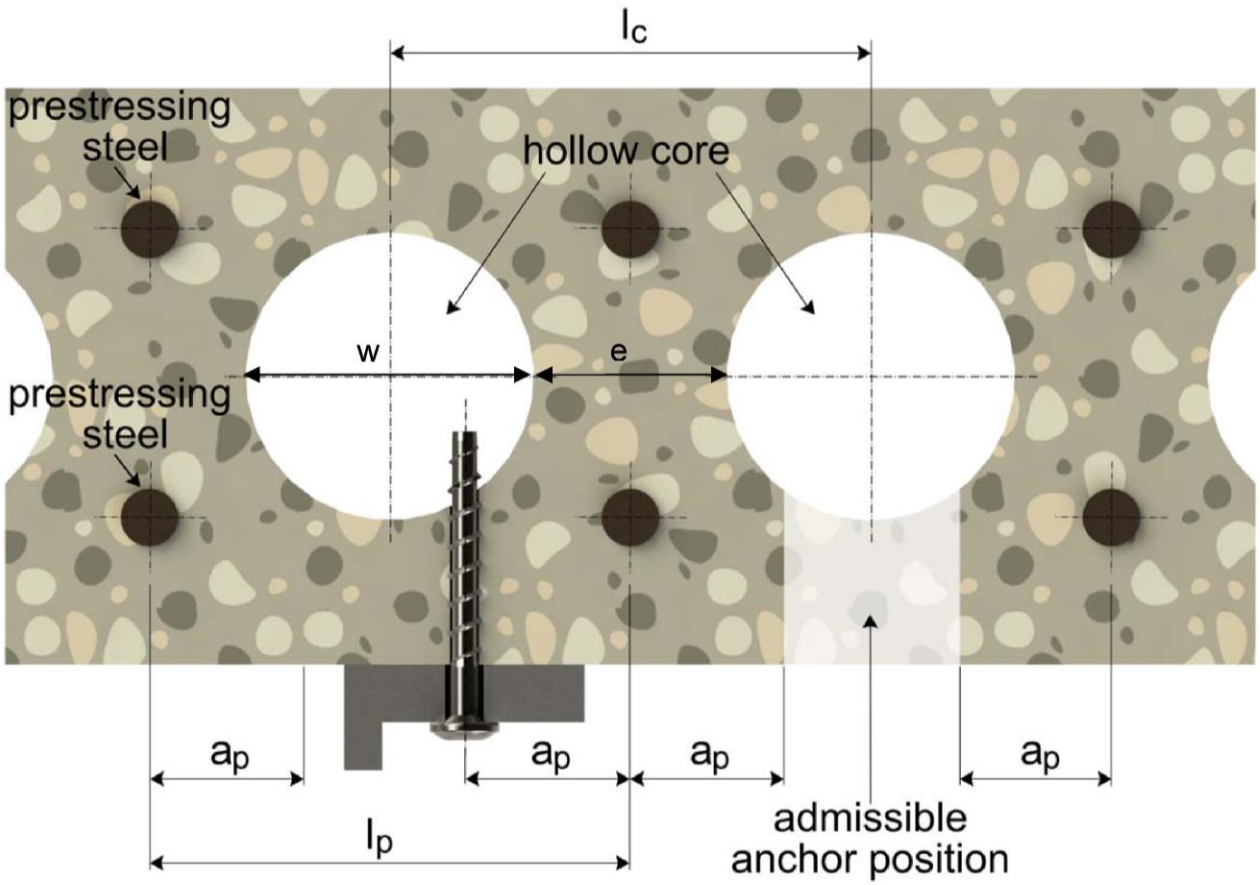
Installation situation in precast hollow core slabs



w / e ≤ 4,2

w	core width
e	web thickness

Core distance	l_c	≥ 100 mm
Prestressing steel	l_p	≥ 100 mm
Distance between anchor position and prestressing steel	a_p	≥ 50 mm

Concrete Screw BSZ	Annex A2
Product description Installation situation	

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Table A1: Anchor types and description

	Anchor type	BSZ -	Description
1		BI	Anchor version with metric connection thread and hexagon socked
2		B	Anchor version with metric connection thread and hexagon drive
3		SU…TX	Anchor version with hexagon head, pressed-on washer and TORX drive
4		SU	Anchor version with hexagon head and pressed-on washer
5		S	Anchor version with hexagon head
6		SK	Anchor version with countersunk head and TORX drive
7		LK	Anchor version with pan head and TORX drive
8		GLK	Anchor version with large pan head and TORX drive
9		BSK	Anchor version with countersunk head and metric connection thread
10		BS	Anchor version with hexagon drive and metric connection thread
11		M	Anchor version with internal thread and hexagon drive

Concrete Screw BSZ

Product description
Anchor types and description

Annex A3

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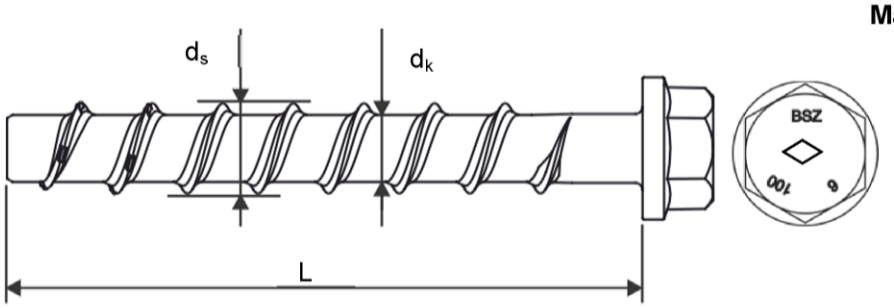
Table A2: Dimensions

Anchor size				BSZ 5	BSZ 6
Length of the anchor		L ≤	[mm]	200	
Thread	Core diameter	d_k	[mm]	4,0	5,1
	Outside diameter	d_s	[mm]	6,5	7,5



Marking e.g.: ◇ BSZ 6 100
or TSM 6 100

◇ BSZ *or* TSM	Trade name (optional with manufacturer identification ◇)
6	Anchor size
100	Length of anchor
A4	additional marking of stainless steel
HCR	additional marking of high corrosion resistant steel
„k“ *or* „x“	for anchors with connection thread and h_{nom} = 35 mm

Table A3: Materials

Version	Steel, zinc plated BSZ	Stainless steel BSZ A4	High corrosion resistant steel BSZ HCR
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
Nominal characteristic steel yield strength f_{yk}	560 N/mm²		
Nominal characteristic steel ultimate strength f_{uk}	700 N/mm²		
Elongation at fracture A_s	≤ 8%		

Concrete Screw BSZ

Product description
Dimensions, marking and materials

Annex A4

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Intended use

Anchorages subject to:

- static and quasi static loads,
- use only for multiple use for non-structural application according to ETAG 001, Part 6
- BSZ 6 can also be used for anchorages with requirements related to resistance of fire (not for use in in precast prestressed hollow core slabs)

Base materials:

- Reinforced and unreinforced concrete according to EN 206-1:2000-12,
- Strength classes C20/25 to C50/60 according to EN 206-1:2000-12,
- Cracked and uncracked concrete
- BSZ 6 can also be used in precast prestressed hollow core slabs

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc plated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure including industrial and marine environment or exposure to permanently damp internal condition, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist
  (high corrosion resistant steel)

  Note: Particular aggressive conditions are e.g. permanent, alternation immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where deicing materials are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- 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, etc.).
- Anchorages under static or quasi-static actions for multiple use for non-structural applications are designed in accordance with:
  - ETAG 001, Annex C, design method A, Edition August 2010 or
  - CEN/TS 1992-4:2009, design method A.
- Anchorages under static or quasi-static actions for precast prestressed hollow core slabs:
  - ETAG 001, Annex C, design method C, Edition August 2010.
- Anchorages under fire exposure are designed in accordance with:
  - EOTA Technical Report TR 020, Edition May 2004 or
  - CEN/TS 1992-4:2009, Annex D
    (It must be ensured that local spalling of the concrete cover does not occur)
- The design method according to ETAG 001, Annex C also applies for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.
- The design method according to CEN/TS 1992-4 applies for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.
- In CEN/TS 1992-4-1, section 5.2.3.1 the 3. indent will be replaced as follow: only the most unfavorable anchors of an anchor group take up shear loads, if diameter of the clearance hole d_f is larger than given in CEN/TS 1992-4-1, Table 1.
- The condition according to CEN/TS 1992-4-1, Section 5.2.3.3, no. 3) is also fulfilled for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.

Installation:

- Making of drill hole by hammer drilling,
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site,
- After installation further turning of the anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.

Concrete Screw BSZ	**Annex B1**
Intended use Specifications	

Deutsches Institut für Bautechnik DIBt

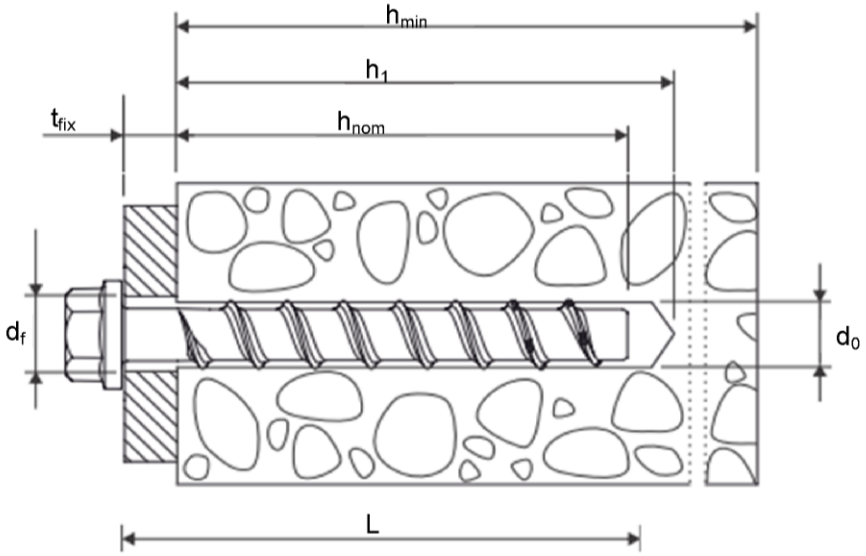
Table B1: Installation parameters

Anchor size			BSZ 5	BSZ 6	
Nominal embedment depth	h_{nom}	[mm]	35	35	55
Nominal drill bit diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,4	6,4	
Depth of drill hole	$h_1 \geq$	[mm]	40	40	60
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	8	
Max. Installation torque for screws with metric connection thread	$T_{inst} \leq$	[Nm]	8	10	
Tangential impact screw driver [1)]	$T_{imp,max}$	[Nm]	140	160	

[1)] Installation with tangential impact screw driver, with maximum power output $T_{imp,max}$ acc. to manufacturers instructions is possible.

Table B2: **Minimum thickness of member, minimum edge distance and minimum spacing** for anchorages in solid concrete

Anchor size			BSZ 5	BSZ 6	
Nominal embedment depth	h_{nom}	[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



Concrete Screw BSZ

Intended use
Installation parameters
Minimum thickness of concrete member, minimum spacing and edge distance

Annex B2

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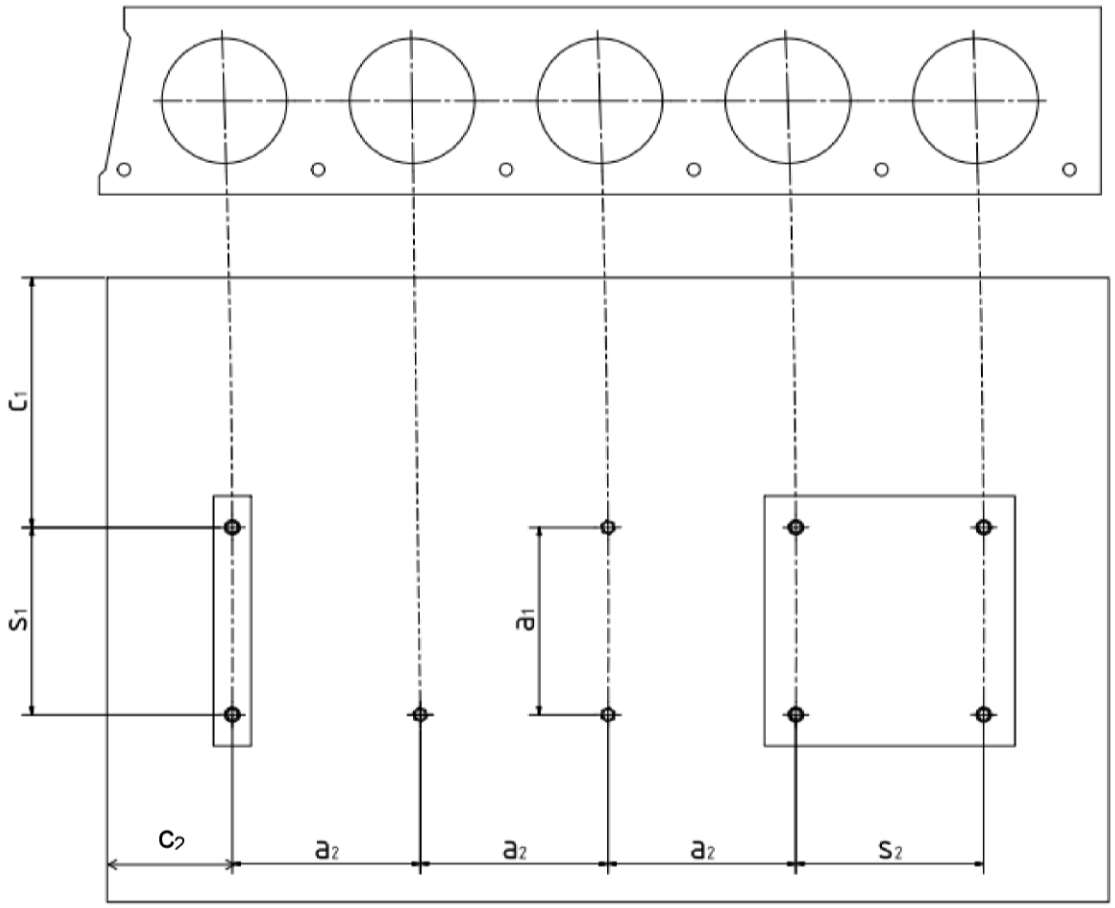
Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2	edge distance
s_1, s_2	anchor spacing
a_1, a_2	distance between anchor groups

Minimum edge distance	c_{min}	≥ 100 mm
Minimum anchor spacing	s_{min}	≥ 100 mm
Minimum distance between anchor groups	a_{min}	≥ 100 mm

Concrete Screw BSZ	**Annex B3**
Intended use Installation parameters for anchorages in precast prestressed hollow core slabs	

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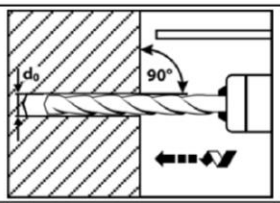
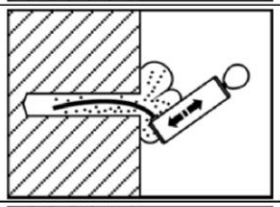
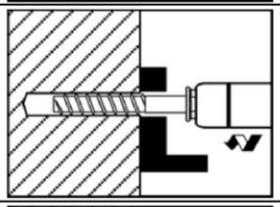
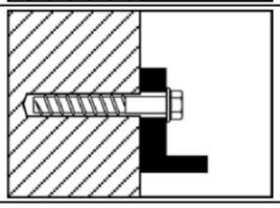
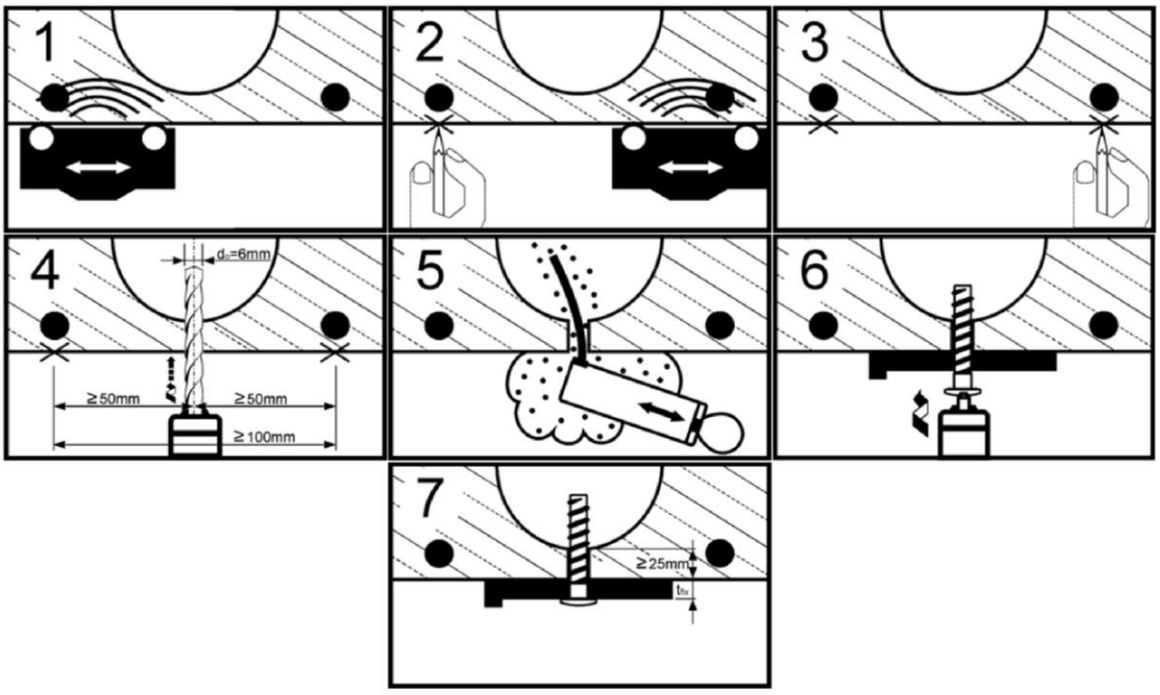
Installation instructions

1		Drill hole perpendicular to concrete surface.
2		Blow out dust or alternatively vacuum clean down to the bottom of the hole.
3		Screw in anchor, e.g. with tangential impact screw driver.
4		After installation, the head of the anchor is supported on the fixture.

Installation instructions for anchorages in precast prestressed hollow core slabs



Concrete Screw BSZ

Intended use
Installation instructions

Annex B4

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Table C1: Characteristic values for **tension loads**

Anchor size				**BSZ 5**	**BSZ 6**	
Nominal embedment depth		h_{nom}	[mm]	35	35	55
Installation safety factor		$\gamma_2 = \gamma_{inst}$	[-]	1,2	1,2	1,0
Steel failure						
Characteristic tension resistance		$N_{Rk,s}$	[kN]	8,7	14,0	
Pull-out						
Characteristic resistance in cracked and uncracked concrete C20/25		$N_{Rk,p}$	[kN]	1,5	1,5	7,5
Increasing factor for $N_{Rk,p}$ for concrete strength > C20/25		Ψ_C	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$		
Concrete cone failure						
Effective anchorage depth		h_{ef}	[mm]	27	27	44
Spacing (Edge distance)		$s_{cr,N}$ ($c_{cr,N}$)	[mm]	3 h_{ef} (1,5 h_{ef})		
Factor for concrete (according CEN/TS 1992-4)	cracked	k_{cr}	[-]	7,2		
	uncracked	k_{ucr}	[-]	10,1		
Splitting						
Spacing		$s_{cr,sp}$	[mm]	120	120	160
Edge distance		$c_{cr,sp}$	[mm]	60	60	80

Table C2: Characteristic values for **shear loads**

Anchor size			**BSZ 5**	**BSZ 6**	
Nominal embedment depth	h_{nom}	[mm]	35	35	55
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0	1,0	
Steel failure without lever arm					
Characteristic shear resistance	$V_{Rk,s}$	[kN]	4,4	7,0	
Factor of ductility acc. to CEN/TS 1992-4	k_2	[-]	0,8	0,8	
Steel failure with lever arm					
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	5,3	10,9	
Concrete pry-out failure					
Factor k acc. to ETAG 001, Annex C or k_3 acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	1,0	1,0	
Concrete edge failure					
Effective length of anchor	$l_f = h_{ef}$	[mm]	27	27	44
Outside diameter of anchor	d_{nom}	[mm]	5	6	

Concrete Screw BSZ

Performance
Characteristic values for **tension and shear loads**

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values of resistance in **precast prestressed hollow core slabs** C30/37 to C50/60

Anchor size			**BSZ 6**		
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2		
Flange thickness	$\mathbf{d_b}$	**[mm]**	**≥ 25**	**≥ 30**	**≥ 35**
Characteristic resistance for all directions	F_{Rk}	[kN]	1	2	3
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	10,9		
Edge distance	$c_{cr} = c_{min}$	[mm]	100		
Spacing	$s_{cr} = s_{min}$	[mm]	100		

Concrete Screw BSZ

Performance
Characteristic values of resistance in **precast prestressed hollow core slabs**

Annex C2

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Table C4: Characteristic values of resistance under **fire exposure** [1)]

Anchor size				**BSZ 6**			
				Steel, zinc plated		**Stainless steel A4 / HCR**	
Nominal embedment depth		h_{nom}	[mm]	35	55	35	55
Steel failure (tension and shear resistance)							
Characteristic resistance	R30	$N_{Rk,s,fi}$ = $V_{Rk,s,fi}$	[kN]	0,9		1,2	
	R60			0,8		1,2	
	R90			0,6		1,2	
	R120			0,4		0,8	
Steel failure with lever arm							
Characteristic bending moment	R30	$M^0_{Rk,s,fi}$	[Nm]	0,7		0,9	
	R60			0,6		0,9	
	R90			0,5		0,9	
	R120			0,3		0,6	
Spacing		$s_{cr,fi}$	[mm]	$4\ h_{ef}$			
Edge distance		$c_{cr,fi}$	[mm]	$2\ h_{ef}$			

[1)] The values are not for use in precast prestressed hollow core slabs

The characteristic resistance for pull-out, concrete cone failure, concrete pry-out and concrete edge failure shall be calculated according to TR 020 / CEN/TS 1992-4.

Concrete Screw BSZ

Performance
Characteristic values of resistance under **fire exposure**

Annex C3