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-16/0452 of 15 July 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	TURBO SMART
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	pgb - Polska Sp. z o.o. ul. Jondy 5 44-100 GLIWICE POLEN
Manufacturing plant	
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 TURBO SMART concrete screw in sizes of 5 and 6 mm is an anchor made of zinc-plated steel respectively steel with zinc flake coating and 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.

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 15 July 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow
p. p. Head of Department

beglaubigt:
Tempel

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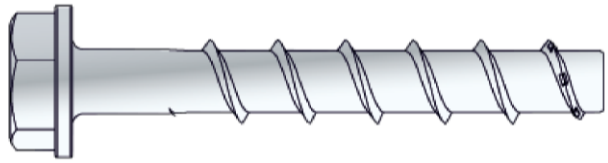
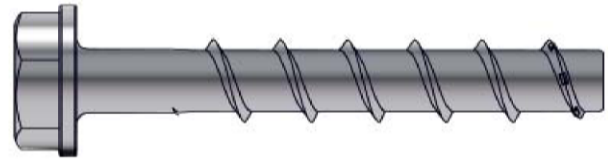
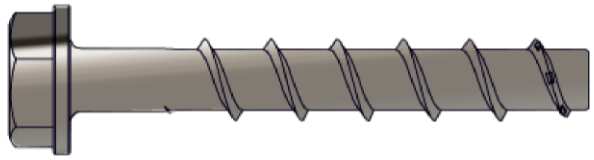
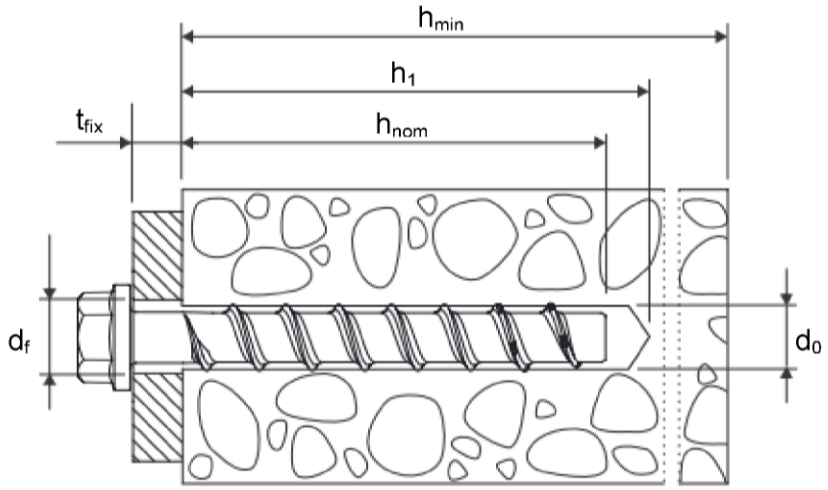
Product and installed condition

TURBO SMART concrete screw (size 5 and 6)

	Carbon steel, zinc-plated
	Carbon steel, zinc-flake coating
	Stainless steel A4 and 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

TURBO SMART concrete screw

Product description

Installed condition

Annex A 1

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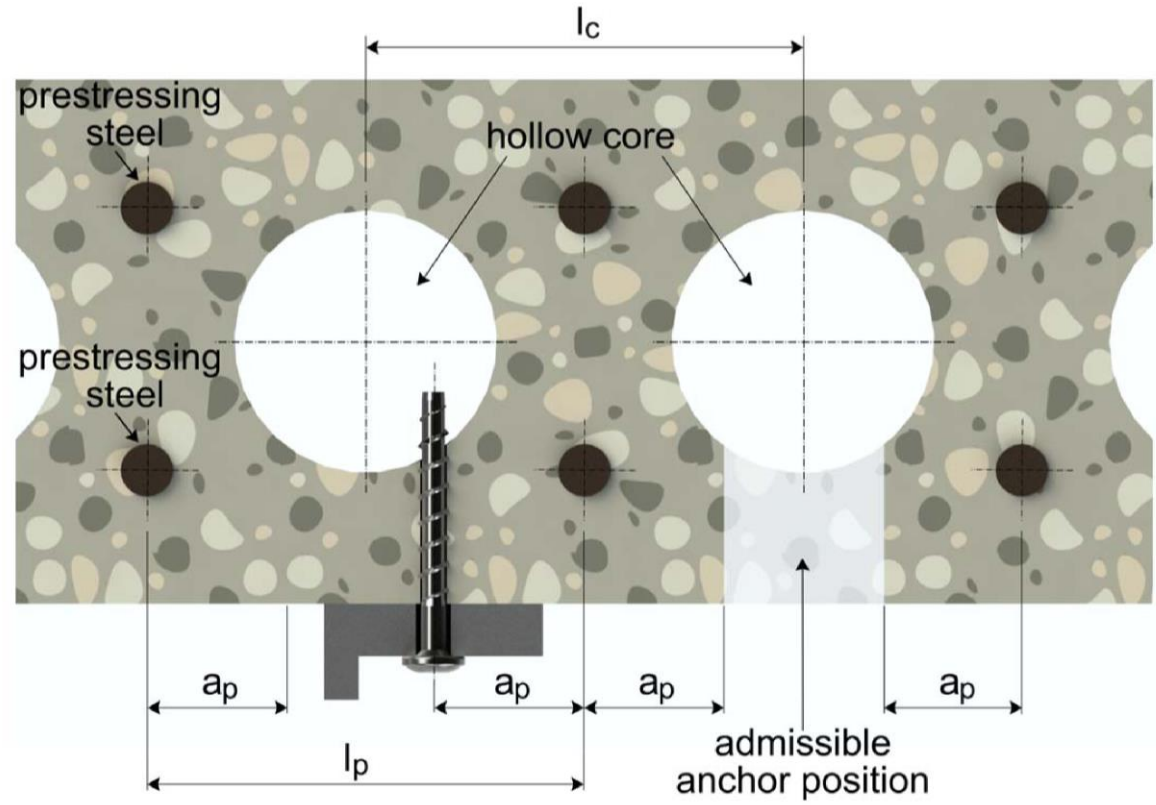
Installed condition in precast prestressed hollow core slabs



w / e ≤ 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	≥ 50 mm

TURBO SMART concrete screw

Product description
Installed condition

Annex A 2

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Table A1: materials and variants

Part	Type		Material	f_{yk}	f_{uk}	Elongation at rupture A_5
1 2 3 4 5 6 7 8 9 10 11	Concrete screw	TURBO SMART	Steel EN 10263-4 galvanized according to EN ISO 4042 or zinc-flake coating according to EN ISO 10683 (≥ 5µm)	560 N/mm²	700 N/mm²	≤ 8 %
		TURBO SMART A4	1.4401, 1.4404, 1.4571, 1.4578			
		TURBO SMART HCR	1.4529			

f_{yk} = nominal characteristic steel yield strength

f_{uk} = nominal characteristic steel ultimate strength

1		TURBO SMART S-BSZ	Concrete screw version with hexagon head with pressed-on washer
2		TURBO SMART S-BSM	Concrete screw version with hexagon head with pressed-on washer and T-drive
3		TURBO SMART S-BSH	Concrete screw version with hexagon head
4		TURBO SMART S-BSV	Concrete screw with countersunk head
5		TURBO SMART S-BSP	Concrete screw with pan head
6		TURBO SMART S-BSF	Concrete screw with large pan head
7		TURBO SMART S-BSE	Concrete screw with countersunk head and connection thread
8		TURBO SMART S-BSB	Concrete screw with hexagonal head and connection thread
9		TURBO SMART S-BSS	Concrete screw with hexagon drive and connection thread
10		TURBO SMART S-BSA	Concrete screw with connection thread and hexagon socket drive
11		TURBO SMART S-BSI	Concrete screw with internal metric thread and hexagon drive

TURBO SMART concrete screw

Product descriptions

Materials and versions

Annex A 3

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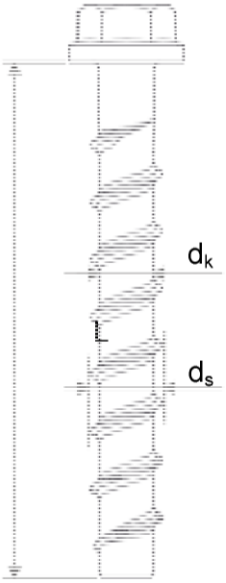
Table A2: dimensions and markings

Anchor size TURBO SMART			**5**	**6**
Length of the anchor	L ≤	[mm]	200	
Diameter of shaft	d_k	[mm]	4,0	5,1
Diameter of thread	d_s	[mm]	6,5	7,5

Marking:
TURBO SMART
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100

TURBO SMART A4
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100
Material: A4

TURBO SMART HCR
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100
Material: HCR



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

TURBO SMART concrete screw

Product descriptions
Dimensions and markings

Annex A 4

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Intended use

Anchorages subject to:

- static and quasi static loads
- Used only for multiple use for non-structural application acc. to ETAG 001, Part 6: TURBO SMART 5 and TURBO SMART 6
- Used for anchorages in prestressed hollow core slabs: TURBO SMART 6
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): TURBO SMART 6

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

Use conditions (Environmental conditions):

- The anchor may only be used in dry internal conditions: all screw types
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition no particular aggressive conditions exits: screw types made of stainless steel with marking A4
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition if particular aggressive conditions exits: screw types made of stainless steel with marking HCR
  Note: 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)

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 are designed for design method A in accordance with:
  - ETAG 001, Annex C, Edition August 2010
  - CEN/TS 1992-4:2009.
- Anchorages under fire exposure are designed in accordance with
  - EOTA Technical Report TR 020, Edition May 2004
  - 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:

- Hammer drilling only.
- 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.

TURBO SMART concrete screw	Annex B 1
Intended use Specifications	

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Table B1: Installation parameters

Anchor size TURBO SMART			**5**	**6**	
Nominal embedment depth			**h_{nom} 35 mm**	**$h_{nom,1}$ 35 mm**	**$h_{nom,2}$ 55 mm**
Nominal drill bit diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,40	6,40	
Depth of drill hole	$h_1 \geq$	[mm]	40	40	60
Nominal embedment depth	$h_{nom} \geq$	[mm]	35	35	55
Diameter of clearing hole in the fixture	$d_f \leq$	[mm]	7	8	
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.

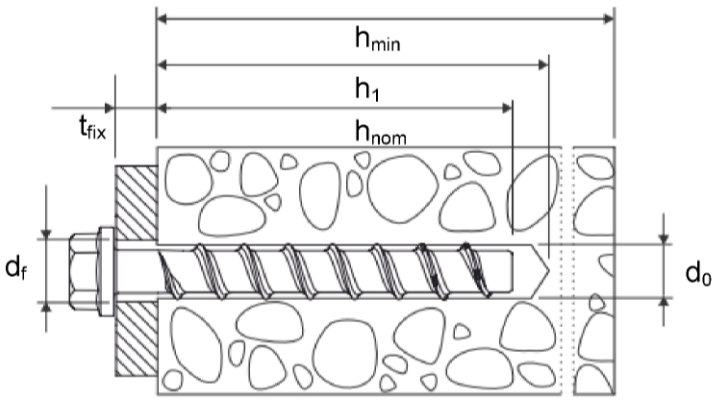

Table B2: Minimum thickness of member, minimum edge distance and minimum spacing

Anchor size TURBO SMART			**5**	**6**	
Nominal embedment depth			**h_{nom} 35 mm**	**$h_{nom,1}$ 35 mm**	**$h_{nom,2}$ 55 mm**
Minimum member thickness	h_{min}	[mm]	80	80	100
Minimum edge distance	c_{min}	[mm]	35	35	40
Minimum spacing	s_{min}	[mm]	35	35	40

TURBO SMART concrete screw

Intended use

Installation parameters

Annex B 2

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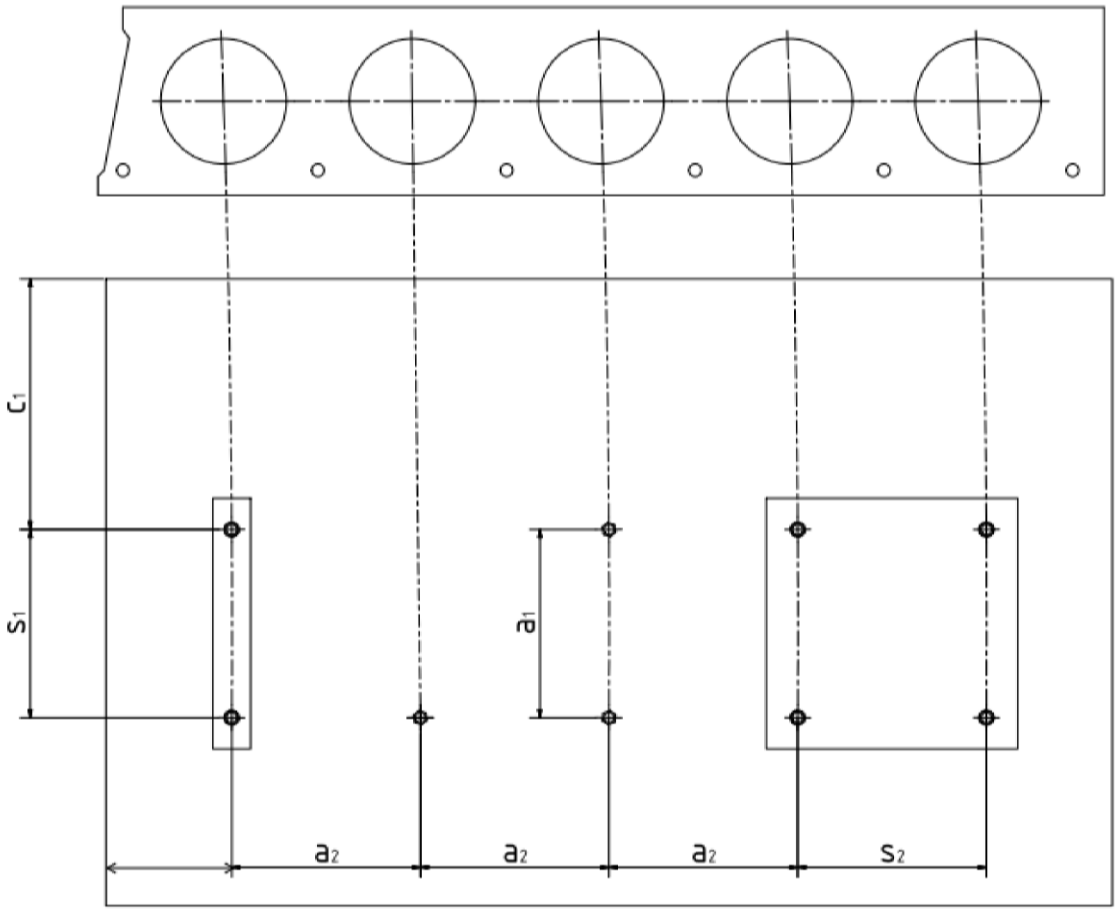
Installation parameters for anchorages in precast prestressed hollow core slabs



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

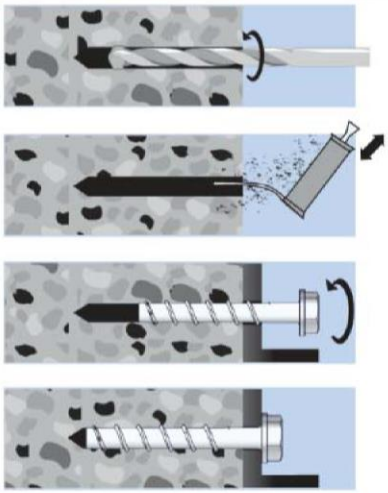
TURBO SMART concrete screw

Intended use
Installation parameters for anchorages in precast prestressed hollow slabs

Annex B 3

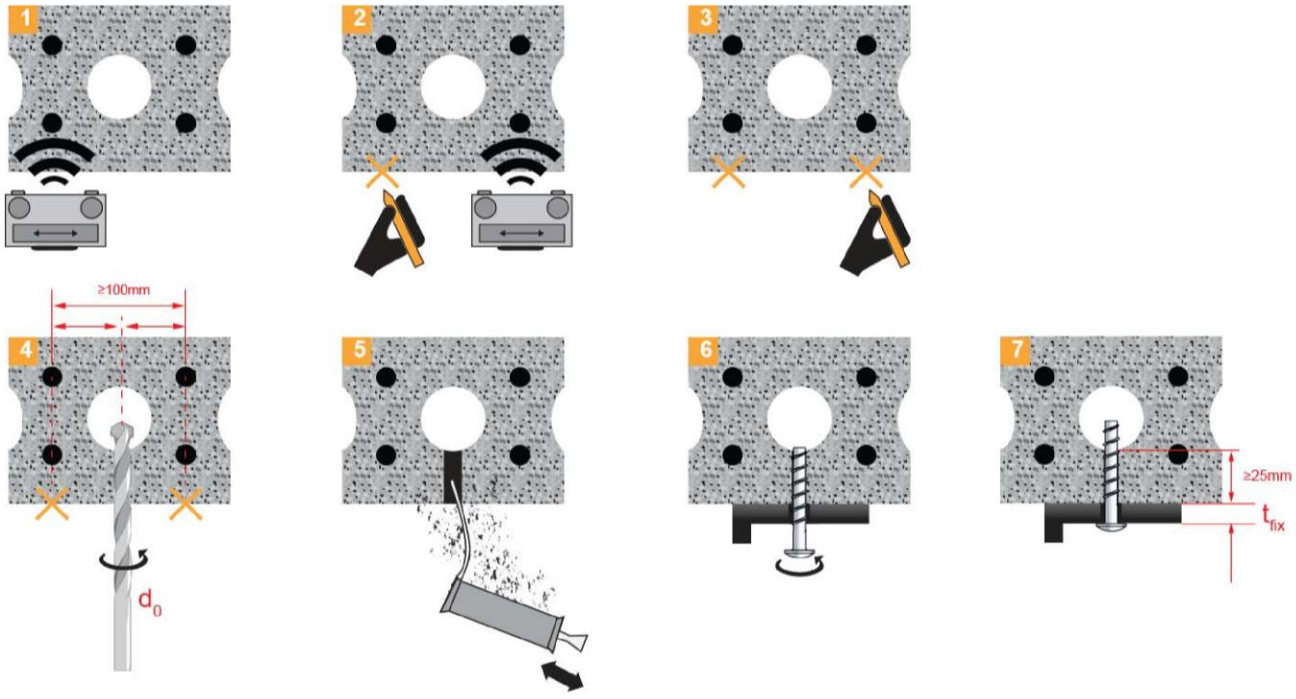
Deutsches Institut für Bautechnik DIBt

Installation instructions



1. **Drilling:**
   Choose the correct drill diameter (d_0) and drilling depth (h_1).
2. **Cleaning of the drill hole**:
   Remove drill dust by e.g. blowing.
3. **Installation:**
   Install the anchor by impact screw driver or by hand.
4. **Complete:**
   Verify that the head is pressed to the fixture.

Installation instructions for anchorages in prestressed hollow core slabs



TURBO SMART concrete screw	Annex B 4
Intended use Installation instructions	

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Table C1: Characteristic values for design method A according to ETAG 001, Annex C or according to CEN/TS 1992-4

Anchor size TURBO SMART				**5**	**6**	
Nominal embedment depth				h_{nom} **35 mm**	$h_{nom,1}$ **35 mm**	$h_{nom,2}$ **55 mm**
steel failure for tension- and shear load						
characteristic load		$N_{Rk,s}$	[kN]	8,7	14,0	
		$V_{Rk,s}$	[kN]	4,4	7,0	
		k_2 [1]	[-]	0,8	0,8	
		$M^0_{Rk,s}$	[Nm]	5,3	10,9	
pull-out failure						
characteristic tension load in cracked and uncracked concrete C20/25		$N_{Rk,p}$	[kN]	1,5	1,5	7,5
increasing factor concrete for $N_{Rk,p}$		Ψ_C	C30/37	1,22		
			C40/50	1,41		
			C50/60	1,55		
concrete cone and splitting failure						
effective anchorage depth		h_{ef}	[mm]	27	27	44
factor for	cracked	k_{cr} [1]	[-]	7,2		
	uncracked	k_{ucr} [1]	[-]	10,1		
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	spacing	$s_{cr,Sp}$	[mm]	120	120	160
	edge distance	$c_{cr,Sp}$	[mm]	60	60	80
installation safety factor		γ_2 [2] = γ_{inst} [1]	[-]	1,2	1,2	1,0
concrete pry out failure (pry-out)						
k-Factor		k [2] = k_3 [1]	[-]	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	

[1] Parameter relevant only for design according to CEN/TS 1992-4:2009

[2] Parameter relevant only for design according to ETAG 001, Annex C

TURBO SMART concrete screw

Performances

Characteristic values for design method A

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

Anchor size TURBO SMART			**6**		
Bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F^0_{Rk}	[kN]	1	2	3
Installation safety factor	γ_2 [1] = γ_{inst} [2]	[-]	1,2		

[1] Parameter relevant only for design according to ETAG 001, Annex C

[2] Parameter relevant only for design according to CEN/TS 1992-4:2009

TURBO SMART concrete screw

Performances

Characteristic values for anchorages in precast prestressed hollow core slabs

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values of resistance to fire exposure [1)]

Anchor size TURBO SMART				**6**			
				Carbon steel		**Stainless steel A4/HCR**	
Nominal embedment depth				$h_{nom,1}$ **35 mm**	$h_{nom,2}$ **55 mm**	$h_{nom,1}$ **35 mm**	$h_{nom,2}$ **55 mm**
Steel failure for tension- and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)							
Fire resistance class							
R30	Characteristic resistance	$F_{Rk,s,fi30}$	[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	Characteristic resistance	$M^0_{Rks,,fi30}$	[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		$M^0_{Rks,,fi120}$	[Nm]	0,3		0,6	
Edge distance							
R30 bis R120		$c_{cr,\,fi}$	[mm]	$2 \times h_{ef}$			
Spacing							
R30 bis R120		$s_{cr,\,fi}$	[mm]	$4 \times h_{ef}$			

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

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

TURBO SMART concrete screw

Performances

Characteristic values under fire exposure

Annex C 3