Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA

www.eota.eu

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

European Technical Assessment ETA-15/0040 of 14 April 2015

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	Hexstone screw anchor Thunderbolt / Ankerbolt
Product family to which the construction product belongs	Screw anchor of the sizes 8, 10, 12, 14 and 16 for use in cracked and non-cracked concrete.
Manufacturer	Hexstone Limited Opal Way Stone Business Park, Stone Staffordshire ST 15 0SW . GROSSBRITANNIEN
Manufacturing plant	Factory 516 Taiwan
This European Technical Assessment contains	15 pages including 3 annexes
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 3: "Undercut anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction has to be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission according to Article 25 Paragraph 3 of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The Hexstone screw anchor Thunderbolt / Ankerbolt is an anchor made of galvanised steel of sizes 8, 10, 12, 14 and 16. 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 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)

Essential characteristic	Performance
Characteristic resistance for static and quasi static action under tension load	See Annex C1 / C2
Characteristic resistance for static and quasi static action and displacement under shear load	See Annex C3
Displacements	See Annex C6

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 C4 – C5

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

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

3.5 Protection against noise (BWR 5)

Not applicable.

3.6 Energy economy and heat retention (BWR 6)

Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

The sustainable use of natural resources was not investigated.

3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

According to Decision of the Commission of 24 June 1996 (96/582/EC) (OJ L 254 of 08.10.96 p. 62-65), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete (heavy-duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	—	1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

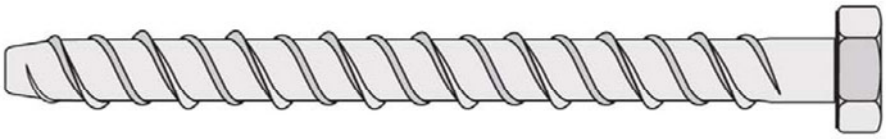
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 14 April 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

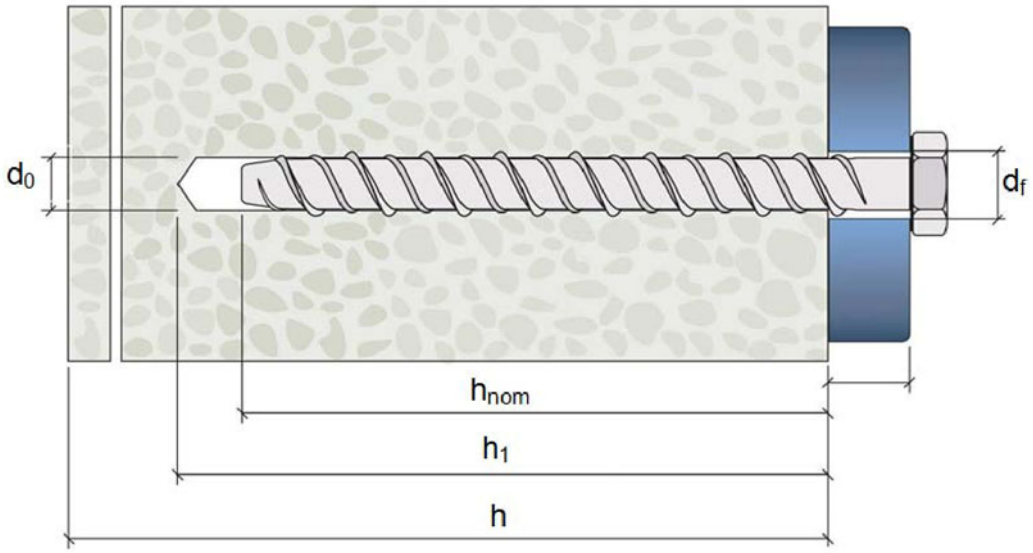
beglaubigt:
Lange

Hexstone Concrete Screw THUNDERBOLT / ANKERBOLT:

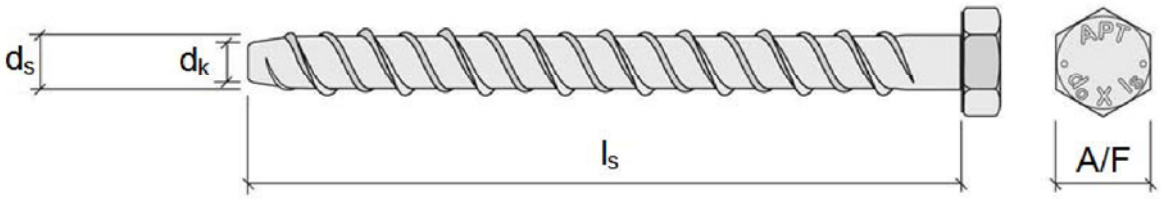


Intended use

Concrete strength classes C20/25 to C50/60



Hexstone screw anchor Thunderbolt / Ankerbolt	Annex A1
Product description Product and intended use	



Marking

- Identifying mark of producer
- Nominal drill hole diameter
- Nominal anchor length

Table A1: Materials

Designation	Material
Concrete Screw	Carbon steel, heat treated and zinc plated

Table A2: Dimensions

Anchor size			8	10	12	14	16
Nominal anchor length	l_s	[mm]	80...150	100...150	100...200	130...200	150...200
Outside diameter of thread	d_s	[mm]	9,8	11,9	14,1	16,3	18,7
Core diameter	d_k	[mm]	7,5	9,5	11,4	13,4	15,3
Width across flats	A/F	[mm]	15	17	19	24	27

Hexstone screw anchor Thunderbolt / Ankerbolt

Product description
Designation of anchor parts, materials and dimensions

Annex A2

Deutsches Institut für Bautechnik DIBt

Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads: all sizes.
- Fire exposure: all sizes.

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Non-cracked concrete and cracked concrete: all sizes.

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions.

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 in accordance with:
  - CEN/TS 1992-4:2009, design method A
- Anchorages under fire exposure are designed in accordance with:
  - CEN/TS 1992-4:2009, Annex D

  It must be ensured that local spalling of the concrete cover does not occur

Installation:
- Hole drilling by rotary hammer drilling mode: all sizes.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- 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.
- After installation further turning of the anchor must not be possible.
- The head of the anchor must be supported on the fixture and is not damaged.

Hexstone screw anchor Thunderbolt / Ankerbolt	**Annex B1**
Intended Use Specifications	

Deutsches Institut für Bautechnik DIBt

Table B1: Installation parameters

Anchor size			8	10	12	14	16
Overall anchor embedment depth	h_{nom}	[mm]	75	85	95	110	120
Effective anchorage depth	h_{ef}	[mm]	55	62	69	79	86
Nominal drill hole diameter	d_0	[mm]	8	10	12	14	16
Drill hole depth	h_0	[mm]	90	100	110	130	145
Outside diameter of the anchor	d_{nom}	[mm]	10	12	14	16	18
Clearance hole in the fixture	d_f	[mm]	12	14	16	18	20
Setting torque	T_{inst}	[Nm]	40	60	80	90	100

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

Anchor size			8	10	12	14	16
Minimum thickness of concrete member	h_{min}	[mm]	120	125	140	170	190
Minimum spacing	s_{min}	[mm]	50	60	70	80	90
Minimum edge distance	c_{min}	[mm]	50	60	70	80	90

In case of fire attack from more than one side: $c_{min} \geq 300$ mm

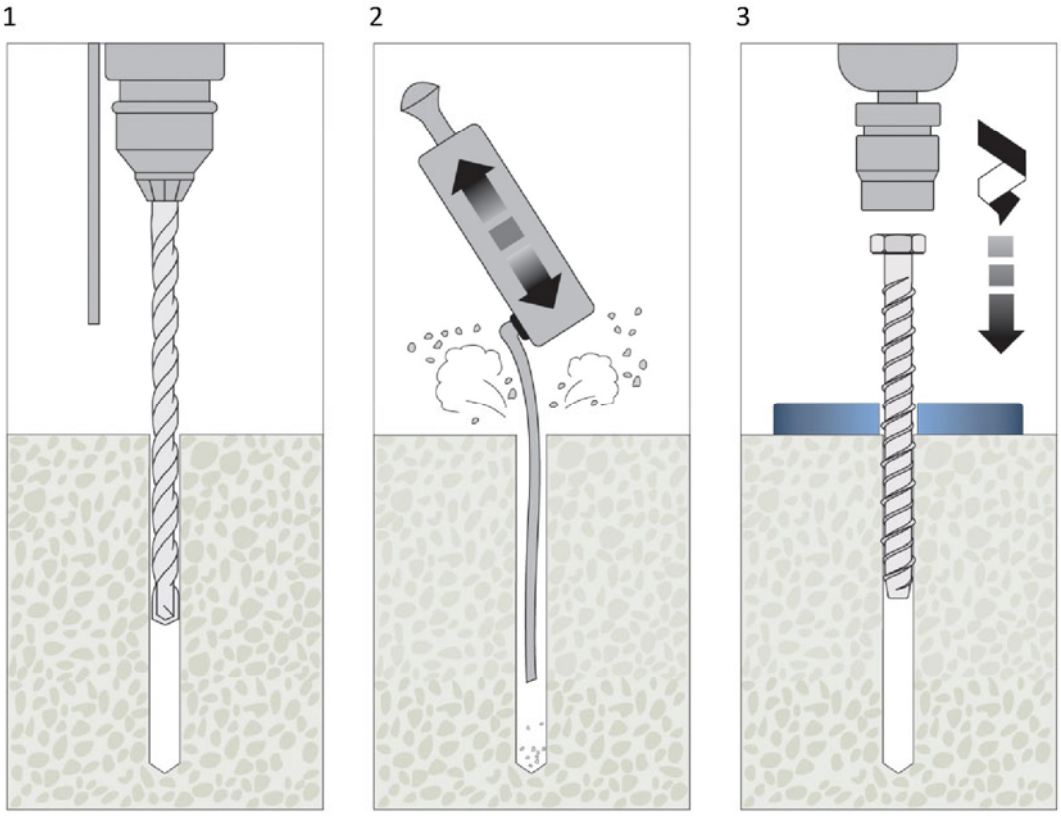
Hexstone screw anchor Thunderbolt / Ankerbolt

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

Annex B2

Deutsches Institut für Bautechnik DIBt

Installation instructions



1. Drill hole to correct diameter and depth using rotary hammer drilling machine
2. Remove dust from hole by blowing 3 times
3. Install anchor using electrical impact screwdriver Bosch GDS18E or Makita 6905H. Other electrical screwdrivers of equivalent force and performance may be used.

Hexstone screw anchor Thunderbolt / Ankerbolt	**Annex B3**
Intended Use Installation instructions	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of resistance under tension loads in non-cracked concrete (Design method A according to CEN/TS 1992-4)

Anchor size			**8**	**10**	**12**	**14**	**16**
Installation safety factor	γ_{inst}	[-]	1,2				
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	44,2	70,1	101,2	140,0	183,9
Partial safety factor	γ_{MS} [1)]	[-]	1,4				
Pullout failure							
Characteristic resistance	$N_{Rk,P}$	[kN]	12	16	20	35	40
Increasing factor for $N_{Rk,P}$	Ψ_C	C30/37	1,17			1,22	
		C40/50	1,32			1,41	
		C50/60	1,42			1,55	
Factor in CEN/TS 1992-4-4:2009, 6.2.1.4	k_{ucr}	[-]	10,1				
Concrete cone failure							
Effective anchoring depth	h_{ef}	[mm]	55	62	69	79	86
Spacing	$s_{cr,N}$	[mm]	3 h_{ef}				
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}				
Splitting failure							
Spacing	$s_{cr,sp}$	[mm]	176	190	214	250	260
Edge distance	$c_{cr,sp}$	[mm]	88	95	107	125	130

[1)] In absence of other national regulations.

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Characteristic values of resistance under tension loads in non-cracked concrete (Design method A according to CEN/TS 1992-4)

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of resistance under tension loads in cracked concrete (Design method A according to CEN/TS 1992-4)

Anchor size			**8**	**10**	**12**	**14**	**16**
Installation safety factor	γ_{inst}	[-]	1,2				
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	44,2	70,1	101,2	140,0	183,9
Partial safety factor	γ_{MS} [1)]	[-]	1,4				
Pullout failure							
Characteristic resistance	$N_{Rk,P}$	[kN]	7,5	12	16	20	25
Increasing factor for $N_{Rk,P}$		C30/37	1,17			1,22	
	Ψ_C	C40/50	1,32			1,41	
		C50/60	1,42			1,55	
Factor in CEN/TS 1992-4-4:2009, 6.2.1.4	k_{cr}	[-]	7,1				
Concrete cone failure							
Effective anchoring depth	h_{ef}	[mm]	55	62	69	79	86
Spacing	$s_{cr,N}$	[mm]	3 h_{ef}				
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}				
Splitting failure							
Spacing	$s_{cr,sp}$	[mm]	176	190	214	250	260
Edge distance	$c_{cr,sp}$	[mm]	88	95	107	125	130

[1)] In absence of other national regulations.

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Characteristic values of resistance under tension loads in cracked concrete (Design method A according to CEN/TS 1992-4)

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values of resistance under shear loads in cracked or non-cracked concrete (Design method A according to CEN/TS 1992-4)

Anchor size			8	10	12	14	16
Steel failure without level arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	28,5	46,4	57,2	80,4	84,4
Partial safety factor	γ_{MS} [1)]	[-]	1,5				
Steel failure with level arm							
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	40	80	138	224	338
Partial safety factor	γ_{MS} [1)]	[-]	1,5				
Concrete pry out failure							
Factor in equation (16) of CEN/TS 1992-4-4, 6.2.2.3	k_3	[mm]	1,0	2,0			
Concrete edge failure							
Effective length of anchor in shear loading	l_f	[mm]	55	62	69	79	86
Effective external diameter of anchor	d_{nom}	[mm]	10	12	14	16	18

[1)] In absence of other national regulations.

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Characteristic values of resistance under shear loads in cracked or non-cracked concrete (Design method A according to CEN/TS 1992-4)

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic values for tension load under fire exposure in cracked or non-cracked concrete C20/25 to C50/60 (Design according to TR 020 / CEN/TS 1992-4 , Annex D)

Anchor size				8	10	12	14	16
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,4	1,1	2,0	2,8	3,7
	R60	$N_{Rk,s,fi\ fi}$	[kN]	0,4	0,9	1,5	2,1	2,8
	R90	$N_{Rk,s,fi}$	[kN]	0,3	0,7	1,3	1,8	2,4
	R120	$N_{Rk,s,fi}$	[kN]	0,2	0,6	1,0	1,4	1,8
Pullout failure								
Characteristic resistance	R30 R60 R90	$N_{Rk,p,fi}$	[kN]	1,9	3,0	4,0	5,0	6,3
	R120	$N_{Rk,p,fi}$	[kN]	1,5	2,4	3,2	4,0	5,0
Concrete cone failure								
Characteristic resistance	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]	4,0	5,4	7,1	10,0	12,3
	R120	$N^0_{Rk,c,fi}$	[kN]	3,2	4,4	5,7	8,0	9,9
Characteristic spacing		$s_{cr,N}$	[mm]	$4 \times h_{ef}$				
Edge distance		$c_{cr,N}$	[mm]	$2 \times h_{ef}$				

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Characteristic values for tension load under fire exposure in cracked and non-cracked concrete C20/25 to C50/60 (Design according to TR 020 / CEN/TS 1992-4 , Annex D)

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C5: Characteristic values for shear load under fire exposure in cracked or non-cracked concrete C20/25 to C50/60 (Design according to TR 020 / CEN/TS 1992-4, Annex D)

Anchor size				8	10	12	14	16
Steel failure without level arm								
Characteristic resistance	R30	$V^0_{Rk,s,fi}$	[kN]	0,4	1,1	2,0	2,8	3,7
	R60	$V^0_{Rk,s,fi\ fi}$	[kN]	0,4	0,9	1,5	2,1	2,8
	R90	$V^0_{Rk,s,fi}$	[kN]	0,3	0,7	1,3	1,8	2,4
	R120	$V^0_{Rk,s,fi}$	[kN]	0,2	0,6	1,0	1,4	1,8
Steel failure with level arm								
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,5	3,4	5,6	8,4
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,4	1,3	2,6	4,2	6,3
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,3	1,0	2,2	3,6	5,5
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,2	0,8	1,7	2,8	4,2
Concrete pryout failure								
Factor in equation (D.6, D.7) of CEN/TS 1992-4-1 Annex D, D.3.3.2		k	[-]	1,0	2,0			
Characteristic resistance	R30 R60 R90	$V^0_{Rk,cp,fi}$	[kN]	4,0	10,9	14,2	20,0	24,7
	R120	$V^0_{Rk,cp,fi}$	[kN]	3,2	8,7	11,4	16,0	19,8
Concrete edge failure								

The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:

$V^0_{Rk,c,fi} = 0{,}25 \times V^0_{Rk,c}$ ($\leq$ R90) $\qquad V^0_{Rk,c,fi} = 0{,}20 \times V^0_{Rk,c}$ ($\leq$ R120)

With $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.

- The characteristic resistance for concrete pryout failure and concrete edge failure can be designed according to TR 020 / CEN/TS 1992-4

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Characteristic values for shear load under fire exposure in cracked or non-cracked concrete C20/25 to C50/60 (Design according to TR 020 / CEN/TS 1992-4, Annex D)

Annex C5

Deutsches Institut für Bautechnik DIBt

Table C6: Displacements under tension load

Anchor size			8	10	12	14	16
Tension load	N	[kN]	4,8	6,3	7,9	13,9	15,9
Displacement	δ_{N0}	[mm]	0,17	0,21	0,23	0,73	0,46
	$\delta_{N\infty}$	[mm]	1,75	1,88	1,82	1,54	0,96

Table C7: Displacements under shear load

Anchor size			8	10	12	14	16
Shear load	V	[kN]	11,3	18,4	22,7	31,9	33,5
Displacement	δ_{V0}	[mm]	1,61	1,53	1,94	2,74	2,66
	$\delta_{V\infty}$	[mm]	2,42	2,30	2,92	4,10	3,99

Hexstone screw anchor Thunderbolt / Ankerbolt

Performances
Displacements

Annex C6