Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment ETA-14/0475 of 19 December 2014

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	Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR
Product family to which the construction product belongs	Concrete screw made of galvanised steel and stainless steel of sizes 8, 10, 12 and 14 for use in concrete
Manufacturer	Adolf Würth GmbH & Co. KG Reinhold-Würth-Straße 12-17 74653 Künzelsau DEUTSCHLAND
Manufacturing plant	Werk 9
This European Technical Assessment contains	14 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 3: "Undercut anchors", April 2013, 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 Würth Concrete screw W-BS in size of 8, 10, 12 and 14 is an anchor made of zinc-plated steel respectively steel with zinc flake coating (W-BS/S) or made of stainless steel (W-BS/A4, W-BS/HCR). 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)

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 and C 2
Displacements under tension and shear loads	See Annex C 3

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 4

3.3 Hygiene, health and the environment (BWR 3)

Not applicable.

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(s)	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 19 December 2014 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Tempel

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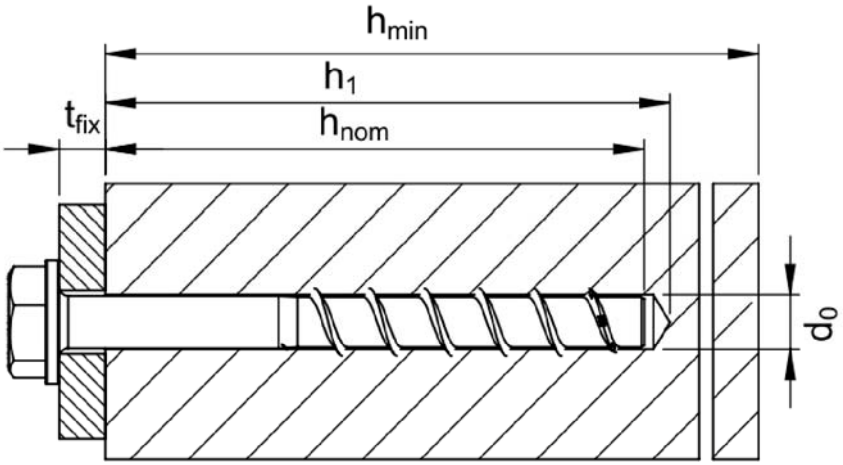
product and installed condition

Würth concrete screw W-BS

W-BS/S

W-BS/A4
W-BS/HCR



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

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex A 1
Product description Installed condition	

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Table A1: materials and variants

part	name	Material
1, 2, 3, 4 ,5, 6,	Screw anchor	W-BS/S: Steel EN 10263-4 galvanized acc. to EN ISO 4042 or zinc flake coating acc. to EN ISO 10683 (≥ 5µm) W-BS/A4: 1.4401, 1.4404, 1.4571, 1.4578 W-BS/HCR: 1.4529

			B/BC	BS/BSH
nominal characteristic steel yield strength	f_{yk}	[N/mm²]	600	700
nominal characteristic steel ultimate strength	f_{uk}	[N/mm²]	700	800

1) Anchor version with connection thread

2) Anchor version with washer, hexagon head and TORX

3) Anchor version with washer, hexagon head and

4) Anchor version with hexagon head

5) Anchor version with countersunk head

6) Anchor version with pan head

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Product description

Material and screw types

Annex A 2

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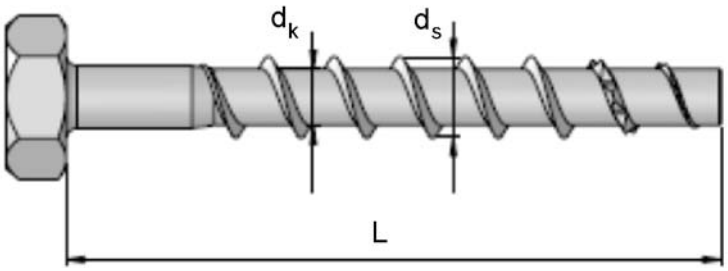
Table A2: dimensions and markings

Anchorsize			8	10	12	14
Nominal embedment depth			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
Length of the anchor	L ≤	[mm]	300			
Diameter of shaft	d_k	[mm]	6.8	8.8	10.8	12.8
Diameter of thread	d_s	[mm]	10.6	12.6	14.6	16.6



Marking:

Anchor type: TSM B, TSM BC, TSM BS, TSM BSH
Anchor size: 10
Length of the anchor: 100

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Product descriptions

Dimensions and markings

Annex A 3

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Intended use

Anchorages subject to:

- static and quasi static loads,
- Used for anchorages with requirements related to resistance of fire.

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 non-cracked 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 if no particular aggressive conditions exits: screw types made of stainless steel with marking BS,
- 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 BSH.

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 designed in accordance with:
  - ETAG 001, Annex C, Edition August 2010 or
  - CEN/TS 1992-4:2009,
- 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).

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.

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex B 1
Intended use Specifications	

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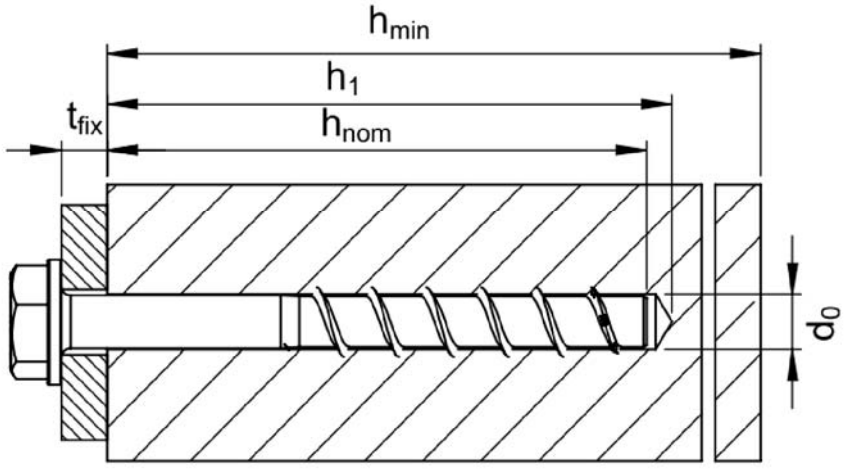
Table B1: Installation parameters

Anchorsize			8	10	12	14
Nominal embedment depth			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
nominal drill bit diameter	d_0	[mm]	8	10	12	14
cutting diameter opf drill bit	$d_{cut} \leq$	[mm]	8.45	10.45	12.50	14.50
depth of drill hole	$h_1 \geq$	[mm]	75	95	110	135
nominal embedment depth	$h_{nom} \geq$	[mm]	65	85	100	125
diameter of clearing hole in the fixture	$d_f \geq$	[mm]	12	14	16	18

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

Anchorsize			8	10	12	14
Nominal embedmenth depth			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
minimum thickness of member	h_{min}	[mm]	120	130	150	200
minimum edge distance	c_{min}	[mm]	50	70	80	100
minimum spacing	s_{min}	[mm]	50	70	80	100



Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

Installation parameters

Annex B 2

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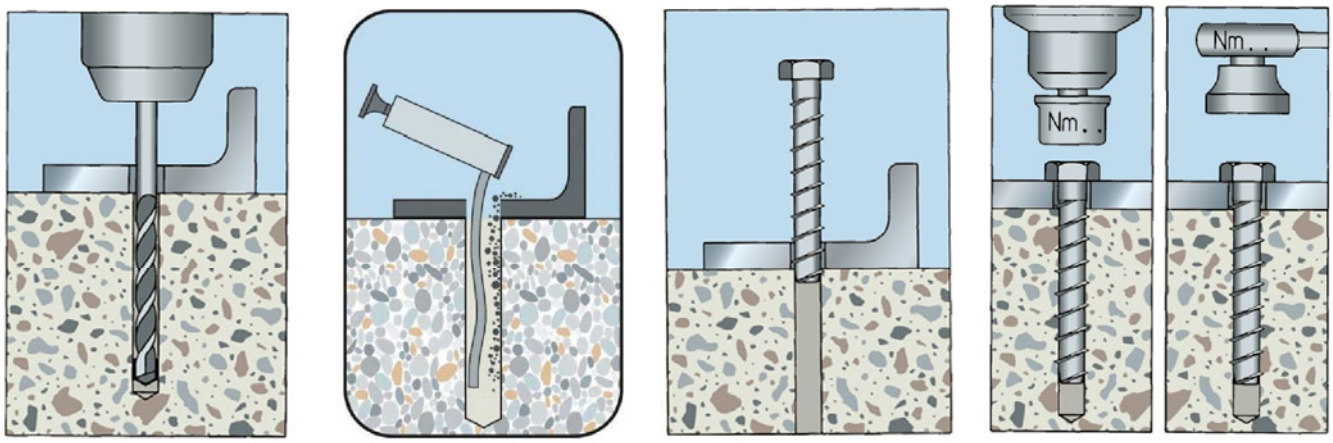
Installation instructions



Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

Installation instructions

Annex B 3

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

Anchorsize				**8**	**10**	**12**	**14**
Nominal embedment depth				h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
steel failure for tension- and sear load							
characteristic load		$N_{Rk,s}$	[kN]	25.0	42.0	64.0	103.0
		$V_{Rk,s}$	[kN]	18.0	34.0	42.0	64.0
		$M^0_{Rk,s}$	[Nm]	26.0	56.0	123.0	200.0
Poll-out failure							
characteristic tension load in cracked concrete C20/25		$N_{Rk,p}$	[kN]	9	16	Pull-out Failure is not decisive	Pull-out Failure is not decisive
characteristic tension load in non-cracked concrete C20/25		$N_{Rk,p}$	[kN]	12	Pull-out Failure is not decisive	Pull-out Failure is not decisive	Pull-out Failure is not decisive
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]	51	68	80	100
factor for	cracked	k_{cr} [1]	[-]	7.2			
	non cracked	k_{ucr} [1]	[-]	10.1			
concrete cone failure	spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
	edge distance	$c_{cr,N}$	[mm]	$1.5 \times h_{ef}$			
splitting failure	spacing	$s_{cr,Sp}$		$3 \times h_{ef}$			
	edge distance	$c_{cr,Sp}$		$1.5 \times h_{ef}$			
installation safety factor		γ_2 [1] = γ_{inst} [2]	[-]	1,0 [2]			
concrete pry out failure (pry-out)							
k-Factor		k [1] = k_3 [2]	[-]	1.0	2.0		
concrete edge failure							
effective length of anchor		$l_f = h_{ef}$	[mm]	51	68	80	100
outside diameter of anchor		d_{nom}	[-]	8	10	12	14

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

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

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Characteristic values for W-BS/S for design method A

Annex C 1

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Table C2: Characteristic values for design method A according to ETAG 001, Annex C or CEN TS 1992-4 for W-BS/A4 and W-BS/HCR

Anchorsize				**8**	**10**	**12**	**14**
Nominal embedment depth				h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
steel failure for tension- and sear load							
characteristic load		$N_{Rk,s}$	[kN]	29.0	48.0	73.0	103.0
		$V_{Rk,s}$	[kN]	21.0	40.0	49.0	64.0
		$M^0_{Rk,s}$	[Nm]	29.0	64.0	141.0	229.0
Poll-out failure							
characteristic tension load in cracked concrete C20/25		$N_{Rk,p}$	[kN]	9	16	Pull-out Failure is not decisive	Pull-out Failure is not decisive
characteristic tension load in non-cracked concrete C20/25		$N_{Rk,p}$	[kN]	12	Pull-out Failure is not decisive	Pull-out Failure is not decisive	Pull-out Failure is not decisive
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]	51	68	80	100
factor for	cracked	k_{cr} [1]	[-]	7.2			
	non cracked	k_{ucr} [1]	[-]	10.1			
concrete cone failure	spacing	$s_{cr,N}$	[mm]	$3 \times h_{ef}$			
	edge distance	$c_{cr,N}$	[mm]	$1.5 \times h_{ef}$			
splitting failure	spacing	$s_{cr,Sp}$		$3 \times h_{ef}$			
	edge distance	$c_{cr,Sp}$		$1.5 \times h_{ef}$			
installation safety factor		γ_2 [1] = γ_{inst} [2]	[-]	$1,0^{2)}$			
concrete pry out failure (pry-out)							
k-Factor		k [1] = k_3 [2]	[-]	1.0	2.0		
concrete edge failure							
effective length of anchor		$l_f = h_{ef}$	[mm]	51	68	80	100
outside diameter of anchor		d_{nom}	[-]	8	10	12	14

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

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

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Characteristic values for W-BS/A4 and W-BS/HCR for design method A

Annex C 2

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Table C3: Displacements under tension load

anchor identity			8	10	12	14
			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
tension load	N	[mm]	4.3	7.6	11,1	15,9
displacement	δ_{N0}	[mm]	0.5			
	δ_{∞}	[mm]	1.0			

Table C4 : Displacements under shear load for W-BS/S

anchor identity			8	10	12	14
			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
shear load	V	[mm]	8.6	16.2	20.0	30.5
displacement	δ_{V0}	[mm]	2.7	2.7	4.0	3.1
	δ_{∞}	[mm]	4.1	4.3	6.0	4.7

Table C5 : Displacements under shear load for W-BS/A4 and W-BS/HCR

anchor identity			8	10	12	14
			h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
shear load	V	[mm]	10.0	19.1	23.2	30.5
displacement	δ_{V0}	[mm]	2.9	3.5	4.1	4.6
	δ_{∞}	[mm]	4.4	5.3	6.2	7.0

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Displacements under tension- and shear loads

Annex C 3

Deutsches Institut für Bautechnik DIBt

Table C6: Characteristic values of resistance to fire exposure for W-BS/S

Anchorsize					**8**	**10**	**12**	**14**
Nominal embedment depth					h_{nom} = 65 mm	h_{nom} = 85 mm	h_{nom} = 100 mm	h_{nom} = 125 mm
fire resistance class								
R 30	characteristic resistance	$F_{Rk,fi30}$	[kN]		2.3	4.0	6.3	9.8
R 60	characteristic resistance	$F_{Rk,fi60}$	[kN]		1.7	3.3	5.8	8.1
R 90	characteristic resistance	$F_{Rk,fi90}$	[kN]		1.1	2.2	4.2	5.9
R 120	characteristic resistance	$F_{Rk,fi120}$	[kN]		0.8	1.7	3.4	4.8
R 30 bis R 120	spacing	$s_{cr,fi}$	[mm]		4 h_{ef}			
	edge distance	$c_{cr,fi}$			2 h_{ef}			

Table C7: Characteristic values of resistance to fire exposure for W-BS/A4 and W-BS/HCR

Anchorsize				**TSM 8**		**TSM 10**		**TSM 12**	**TSM 14**
Nominal embedment depth				h_{nom} = 65 mm		h_{nom} = 85 mm		h_{nom} = 100 mm	h_{nom} = 125 mm
fire resistance class									
R 30	characteristic resistance	$F_{Rk,fi30}$	[kN]	2.3[1)]	2.3[2)]	4.0[1)]	4.0[2)]	6.3	9.8
R 60	characteristic resistance	$F_{Rk,fi60}$	[kN]	1.7[1)]	2.3[2)]	3.3[1)]	4.0[2)]	5.8	8.1
R 90	characteristic resistance	$F_{Rk,fi90}$	[kN]	1.1[1)]	2.3[2)]	2.2[1)]	4.0[2)]	4.2	5.9
R 120	characteristic resistance	$F_{Rk,fi120}$	[kN]	0.8[1)]	1.8[2)]	1.7[1)]	3.2[2)]	3.4	4.8
R 30 bis R 120	spacing	$s_{cr,fi}$	[mm]	4 h_{ef}					
	edge distance	$c_{cr,fi}$		2 h_{ef}					

[1)] For anchor version with hexagon head, pan head and counter sunk socket head

[2)] For anchor version with connection thread

Würth concrete screw W-BS/S, W-BS/A4, W-BS/HCR

Annex C 4

Performances

Characteristic values of resistance to fire exposure