

**Approval body for construction products
and types of construction**

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

**ETA-16/0128
of 23 October 2017**

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 5 and W-BS 6

Product family
to which the construction product belongs

Concrete screw size 5 and 6 mm for multiple use for non-
structural applications in concrete and in prestressed
hollow core slabs

Manufacturer

Adolf Würth GmbH & Co. KG
Reinhold-Würth-Straße 12-17
74653 Künzelsau
DEUTSCHLAND

Manufacturing plant

Herstellwerk W9

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

ETAG 001 Part 6: "Anchors for multiple use for non-
structural applications", August 2010,
used as EAD according to Article 66 Paragraph 3 of
Regulation (EU) No 305/2011.

This version replaces

ETA-16/0128 issued on 10 May 2016

European Technical Assessment

ETA-16/0128

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Specific Part

1 Technical description of the product

The Würth concrete screw W-BS 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	Anchorage 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 23 October 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

product and installed condition

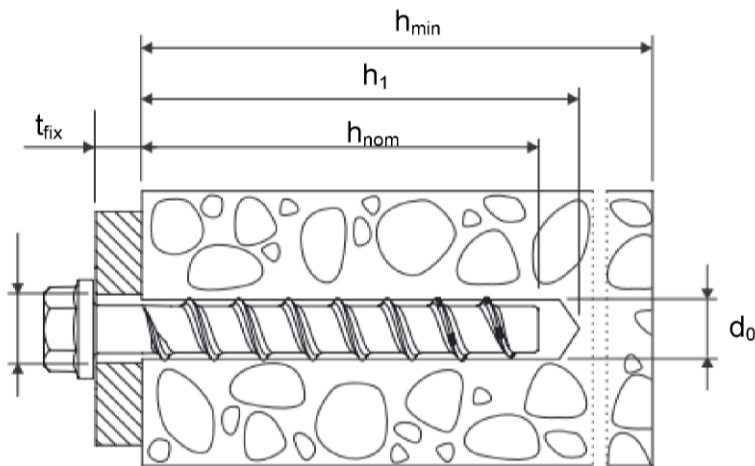
Concrete Screw W-BS 5 and W-BS 6



steel, zinc plated



stainless steel A4 and HCR



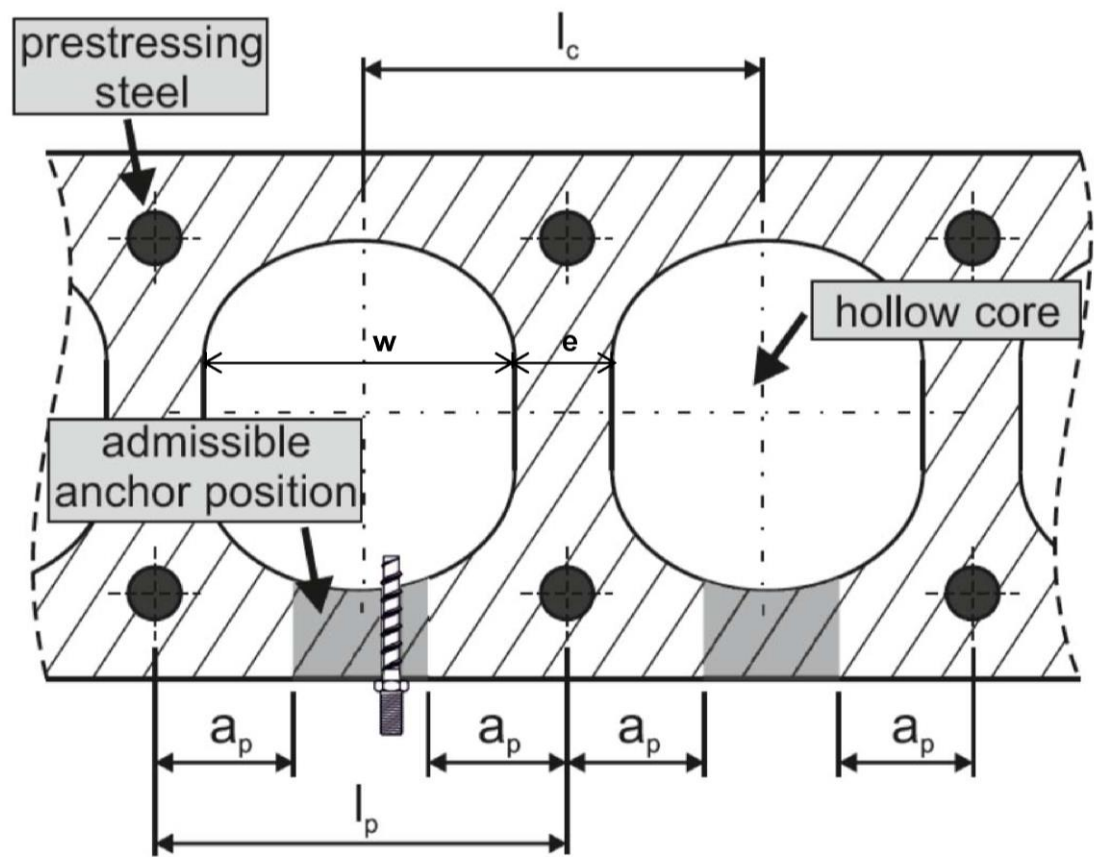
- d_0 = nominal drill bit diameter
- h_{nom} = nominal anchorage depth
- h_1 = depth of the drill hole
- h_{min} = minimum thickness of member
- t_{fix} = thickness of fixture

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Product description
Installed condition

Annex A 1

installed condition in prestressed hollow core slabs



$w / e \leq 4,2$

w core width
e web thickness





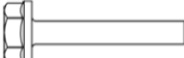

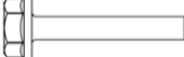

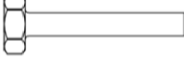

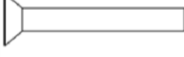

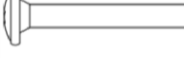





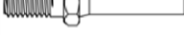



core distance	l_c	$\geq 100 \text{ mm}$
prestressing steel	l_p	$\geq 100 \text{ mm}$
distance between anchor position and prestressing steel	a_p	$\geq 50 \text{ mm}$

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Product description
Installed condition

Annex A 2

Table A1: Materials and variants

part	name	Material			
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Concrete screw	W-BS/S	Steel EN 10263-4 galvanized acc. To EN ISO 4042 or zinc flake coating acc. to EN ISO 10683 ($\geq 5\mu\text{m}$)		
		W-BS/A4	1.4401, 1.4404, 1.4571, 1.4578		
		W-BS/HCR	1.4529		
					W-BS/S, W-BS/A4, W-BS/HCR
		nominal characteristic steel yield strength	f_{yk}	[N/mm ²]	560
		nominal characteristic steel ultimate strength	f_{uk}	[N/mm ²]	700
		elongation at rupture	A_5	[%]	≤ 8
		1)	Anchor version with connection thread and hexagon socket e.g. W-BS 8x105 M10 SW5		
		2)	Anchor version with connection thread and hexagon drive e.g. W-BS 8x105 M10 SW7		
		3)	Anchor version with washer, hexagon head e.g. W-BS 8x80 SW13 TX40		
		4)	Anchor version with washer and hexagon head and TORX e.g. W-BS 8x80 SW13 TX40		
		5)	Anchor version with washer, hexagon head e.g. W-BS 8x80 SW13		
		6)	Anchor version with countersunk head e.g. W-BS 8x80 TX40		
		7)	Anchor version with pan head e.g. W-BS 8x80 TX40		
		8)	Anchor version with large pan head e.g. W-BS 8x80 TX40		
		9)	Anchor version with countersunk head and connection thread e.g. W-BS 6x55 AG M8		
		10)	Anchor version with hexagon drive and connection thread e.g. W-BS 6x55 M8 SW10		
		11)	Anchor version with internal thread and hexagon drive e.g. W-BS 6x55 IM M8/10		


Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Product descriptions
Materials and variants

Annex A 3


Table A2: Dimensions and markings

Anchor size			W-BS 5	W-BS 6
Length of the anchor	$L \leq$	[mm]	200	
Diameter of shaft	d_k	[mm]	4.0	5.1
Diameter of thread	d_s	[mm]	6.5	7.5




Marking
W-BS/S
Description:
Anchor size:
Length of the anchor:

W-BS or TSM
e.g. 10
e.g. 100




W-BS/A4
Description:
Anchor size:
Length of the anchor:
Material:

W-BS or TSM
e.g. 10
e.g. 100
A4

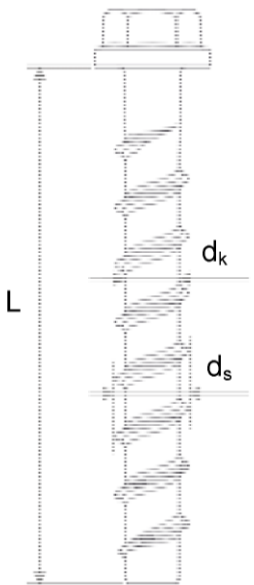


W-BS/HCR
Description:
Anchor size:
Length of the anchor:
Material:

W-BS or TSM
e.g. 10
e.g. 100
HCR



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



Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Product descriptions

Dimensions and markings

Annex A 4

Intended use

Anchorage subject to:

- static and quasi static loads
- Used only for multiple use for non structural application acc. to ETAG 001, Part 6: W-BS 5, W-BS 6
- Used for anchorages in prestressed hollow core slabs: W-BS 6
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): W-BS 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 exists: 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 exists: 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.
- 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 d_f of the clearance hole is larger than given 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.
- The drill hole may be filled with injection mortar WIT-BS

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

Specifications

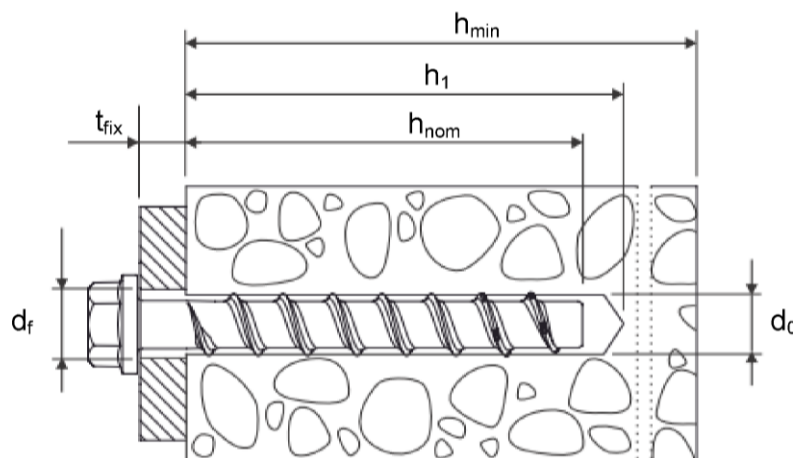
Annex B 1

Table B1: Installation parameters

Anchor size			W-BS 5	W-BS 6	
Nominal embedment depth			$h_{nom} = 35 \text{ mm}$	$h_{nom} = 35 \text{ mm}$	$h_{nom} = 55 \text{ mm}$
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 version with connection thread	$T_{inst} \leq$	Nm	8	10	
Maximum nominal torque for installation with an impact screwdriver	[Nm]	Max. torque according to manufacturer's instructions			
		140	150		

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

Anchor size			W-BS 5	W-BS 6	
Nominal embedment depth			$h_{nom} = 35 \text{ mm}$	$h_{nom} = 35 \text{ mm}$	$h_{nom} = 55 \text{ mm}$
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



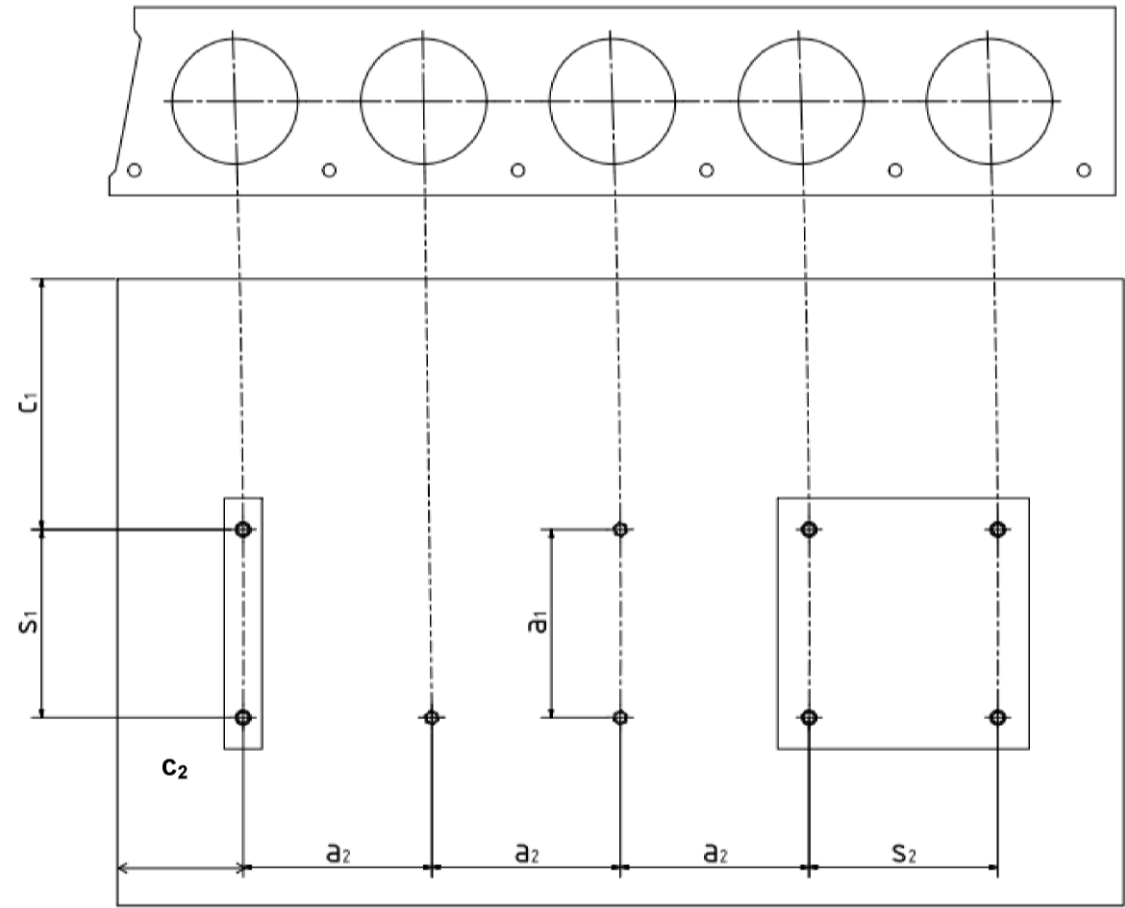
Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

Installation parameters

Annex B 2

Installation parameters for anchorages 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}	$\geq 100 \text{ mm}$

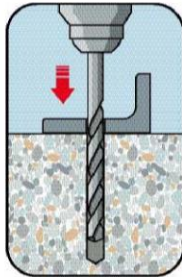
Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

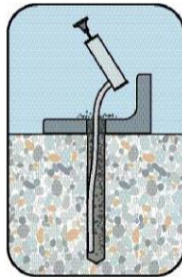
Installation parameters for anchorages in prestressed hollow core slabs

Annex B 3

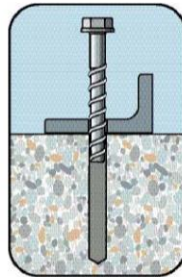
Installation instructions for concrete



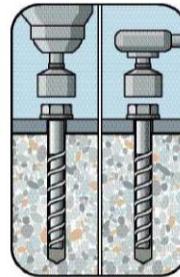
Create drill hole



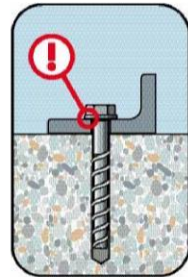
Clean the bore hole



Set the screw

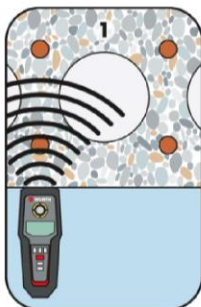


Install the screw

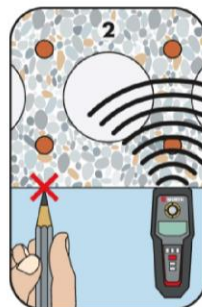


Installation was successful when the head of the anchor is fully supported on the fixture and it is not damaged

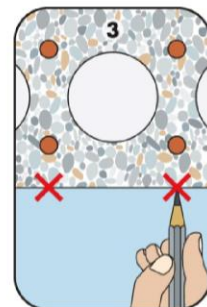
Installation instructions for anchorages in prestressed hollow core slabs



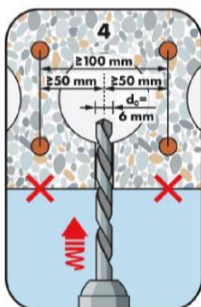
Locate the prestressing steel



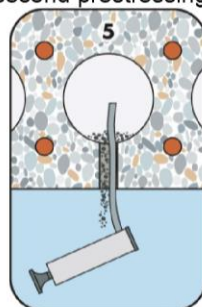
Mark the prestressing steel and locate the second prestressing steel



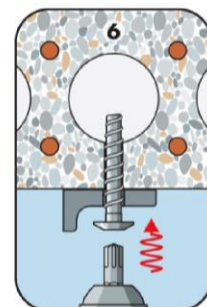
Mark the prestressing steel



Drill the hole keep an eye on the distance



Clean the drill hole



Turn the screw in

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Intended use

Installation parameters / installation instruction

Annex B 4

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

Anchor size			W-BS 5	W-BS 6	
Nominal embedment depth			$h_{nom} = 35 \text{ mm}$	$h_{nom} = 35 \text{ mm}$	$h_{nom} = 55 \text{ mm}$
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]	$3 \times h_{ef}$	
	edge distance	$c_{cr,N}$	[mm]	$1.5 \times h_{ef}$	
splitting failure	spacing	$s_{cr,Sp}$	[mm]	120	120
	edge distance	$c_{cr,Sp}$	[mm]	60	60
installation safety factor	$\gamma_2^{2)}) = \gamma_{inst}^{1)}$	[-]	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}	[-]	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

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Characteristic values for design method A

Annex C 1

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

Anchor size			W-BS 6		
bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
characteristic resistance	F_{Rk}^0	[kN]	1	2	3
installation safety factor	$\gamma_2^{1)} = \gamma_{inst}^{2)}$	[-]	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

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Characteristic values for anchorages in prestressed hollow core slabs

Annex C 2

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

Anchor size				W-BS 6			
				W-BS/S		W-BS/A4, W-BS/HCR	
Nominal embedment depth				h _{nom} = 35 mm		h _{nom} = 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 x h _{ef}			
spacing							
R30 bis R120		S _{Cr, fi}	[mm]	4 x 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

Würth Concrete Screw W-BS/S, W-BS/A4, W-BS/HCR

Performances

Characteristic values under fire exposure

Annex C 3