Deutsches Institut für Bautechnik

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

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European Technical Assessment ETA-16/0128 of 27 September 2024

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	Fasteners for use in concrete for redundant non-structural systems
Manufacturer	Adolf Würth GmbH & Co. KG Reinhold-Würth-Straße 12-17 74653 Künzelsau DEUTSCHLAND
Manufacturing plant	Werk 9
This European Technical Assessment contains	16 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	EAD 330747-00-0601
This version replaces	ETA-16/0128 issued on 6 April 2018

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Specific Part

1 Technical description of the product

The WÜRTH concrete screw W-BS of sizes 5 and 6 mm is an anchor made of galvanised steel respectively steel with zinc flake coating and of 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.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable EAD

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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 3

3.2 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B2, Annex C 1 and C 2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1 and C 2
Durability	See Annex B1

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

In accordance with European Assessment Document EAD No. 330747-00-0601, 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 27 September 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

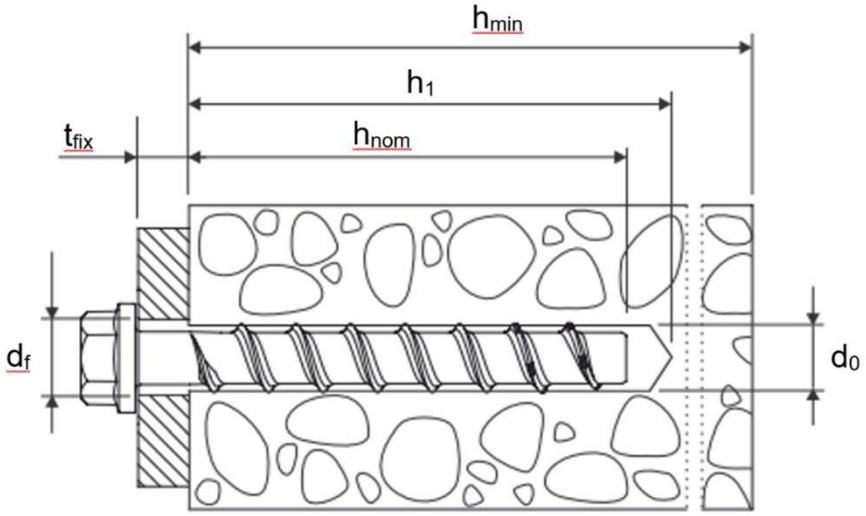
Deutsches Institut für Bautechnik DIBt

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 hole diameter
t_{fix} = thickness of fixture
d_f = clearance hole diameter

h_{min} = minimum thickness of member
h_{nom} = nominal embedment depth
h_1 = drill hole depth
h_{ef} = effective embedment depth

WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex A1
Product description Product and installed condition	

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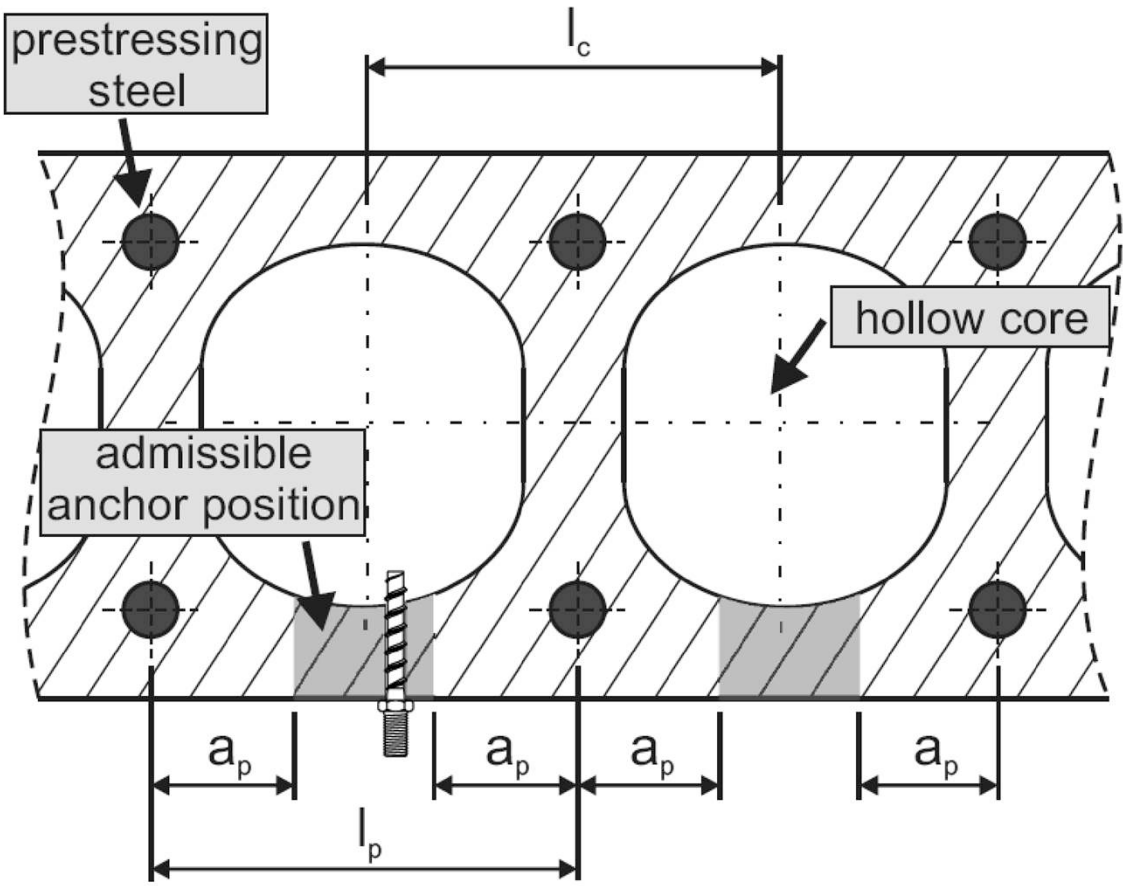
Installed condition in precast prestressed hollow core slabs



Important ratio: $\frac{w}{e} \leq 4,2$

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 ≥ 50mm

WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex A2
Product description Installed condition in precast prestressed hollow core slabs	

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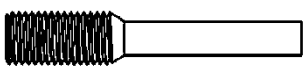
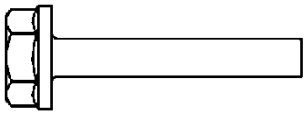
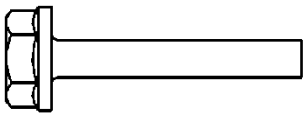



1. Type with metric connection threat and hexagon socket e.g. W-BS 6x105 M10 WS5

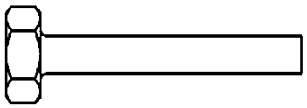

2. Type with metric connection threat and hexagon drive e.g. W-BS 6x105 M10 WS7



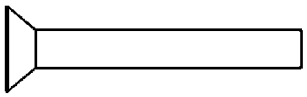

3. Type with washer and hexagon head e.g. W-BS 6x80 WS13



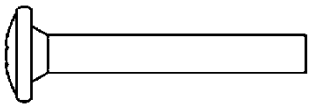

4. Type with washer, hexagon head and TX drive e.g. W-BS 8x80 Type H WS13 TX40



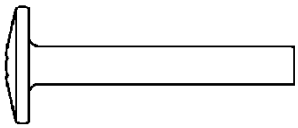
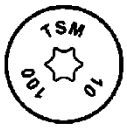

5. Type with hexagon head e.g. W-BS 6x80 WS13



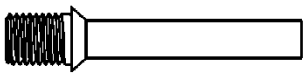

6. Type with countersunk head and TX drive e.g. W-BS 6x80 TX40



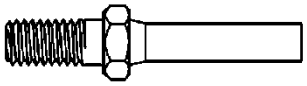

7. Type with pan head and TX drive e.g. W-BS 6x80 TX 40

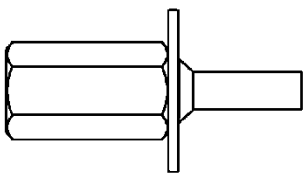
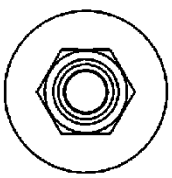
8. Type with large pan head and TX drive e.g. W-BS 6x80 TX 40




9. Type with countersunk head and connection thread e.g. W-BS 6x55 M8




10. Type with hexagon drive and connection thread e.g. W-BS 6x55 M8 WS10

11. Type with internal thread and hexagon drive e.g. W-BS 6x55 M8/10

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

Product description
Types

Annex A3

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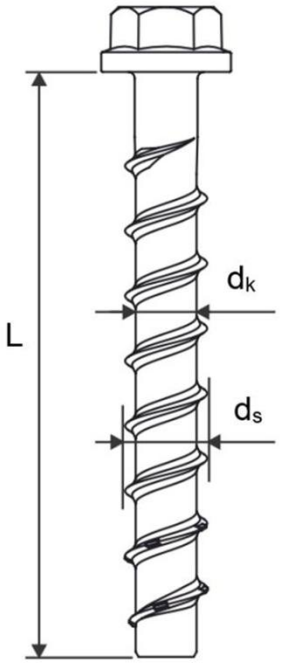
Table 1: Material

Part	Product name	Material
all types	W-BS/S	- Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 - Zinc flake coating according to EN ISO 10683:2018 (≥5µm)
	W-B/A4	1.4401; 1.4404; 1.4571; 1.4578
	W-BS/HCR	1.4529

Part	Product name	Nominal characteristic steel		Rupture elongation A_5 [%]
		Yield strength f_{yk} [N/mm²]	Ultimate strength f_{uk} [N/mm²]	
all types	W-BS/S	560	700	≤ 8
	W-BS/A4			
	W-BS/HCR			

Table 2: Dimensions

Anchor size			W-BS 5	W-BS 6
Screw length	≤ L	[mm]	200	
Core diameter	d_k	[mm]	4,0	5,1
Thread outer diameter	d_s	[mm]	6,5	7,5



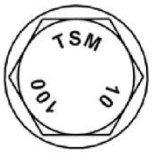
Marking:

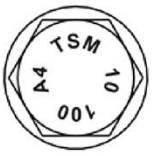
W-BS/S
Screw type: W-BS or TSM
Screw size: e.g. 10
Screw length: e.g. 100

W-BS/A4
Screw type: W-BS or TSM
Screw size: e.g. 10
Screw length: e.g. 100
Material: A4

W-BS/HCR
Screw type: W-BS or TSM
Screw size: e.g. 10
Screw length: e.g. 100
Material: HCR

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





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

Product description
Material, Dimensions and markings

Annex A4

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Specification of Intended use

Anchorages subject to:

- static and quasi static loads
- Used only for multiple use for non-structural application according to EN 1992-4:2018
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): W-BS 5 W-BS 6
- Used for anchorages in prestressed hollow core slabs: W-BS 6

Base materials:

- Reinforced and unreinforced concrete without fibers according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and uncracked concrete.

Use conditions (Environmental conditions):

- Concrete screws subject to dry internal conditions: all screw types.
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 + A1:2015
  - Stainless steel according to Annex A4, screw with marking A4: CRC III
  - High corrosion resistant steel according to Annex A4, screw with marking HCR: CRC V

Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are to be 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 are designed according to EN 1992-4:2018 and EOTA Technical Report TR 055, Version February 2018.
- The design for shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters d_f of clearance hole in the fixture in Annex B2, Table 3.

Installation:

- Hammer drilling or hollow drilling.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: new drilling must be drilled at a minimum distance of twice the depth of aborted hole or closer, if the aborted hole is filled with high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- After installation further turning of the anchor must not be possible. The head of the anchor is supported in the fixture and is not damaged.

WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex B1
Intended use Specification	

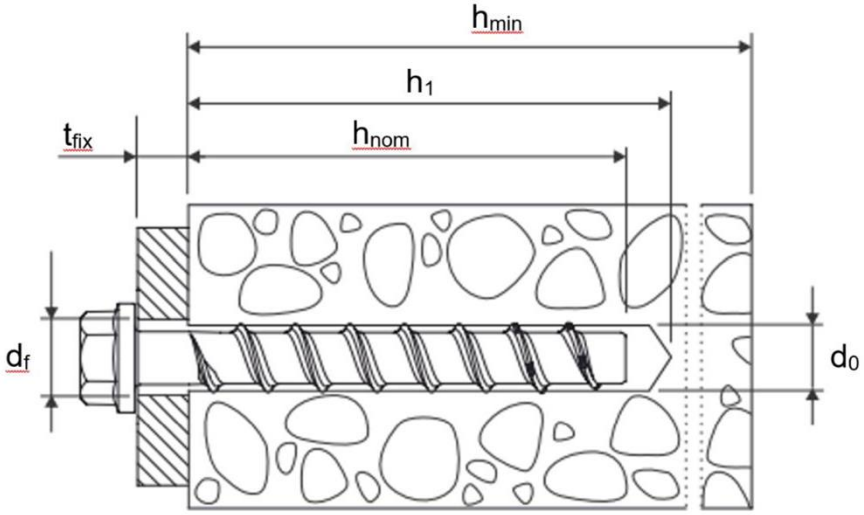
Deutsches Institut für Bautechnik DIBt

Table 3: Installation parameters

W-BS concrete screw size			W-BS 5	W-BS 6	
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Nominal drill hole diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,40	6,40	
Drill hole depth	$h_0 \geq$	[mm]	40	40	60
Clearance hole diameter	$d_f \leq$	[mm]	7	8	
Installation torque (version with connection thread)	$T_{inst} \leq$	[Nm]	8	10	
Recommended torque impact screw driver		[Nm]	Max. torque according to manufacturer's instructions		
			110	160	

Table 4: Minimum thickness of member, minimum edge distance and minimum spacing

W-BS concrete screw size			W-BS 5	W-BS 6	
Nominal embedment depth		h_{nom1}	h_{nom1}	h_{nom1}	h_{nom2}
		[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



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

Intended use
Installation parameters

Annex B2

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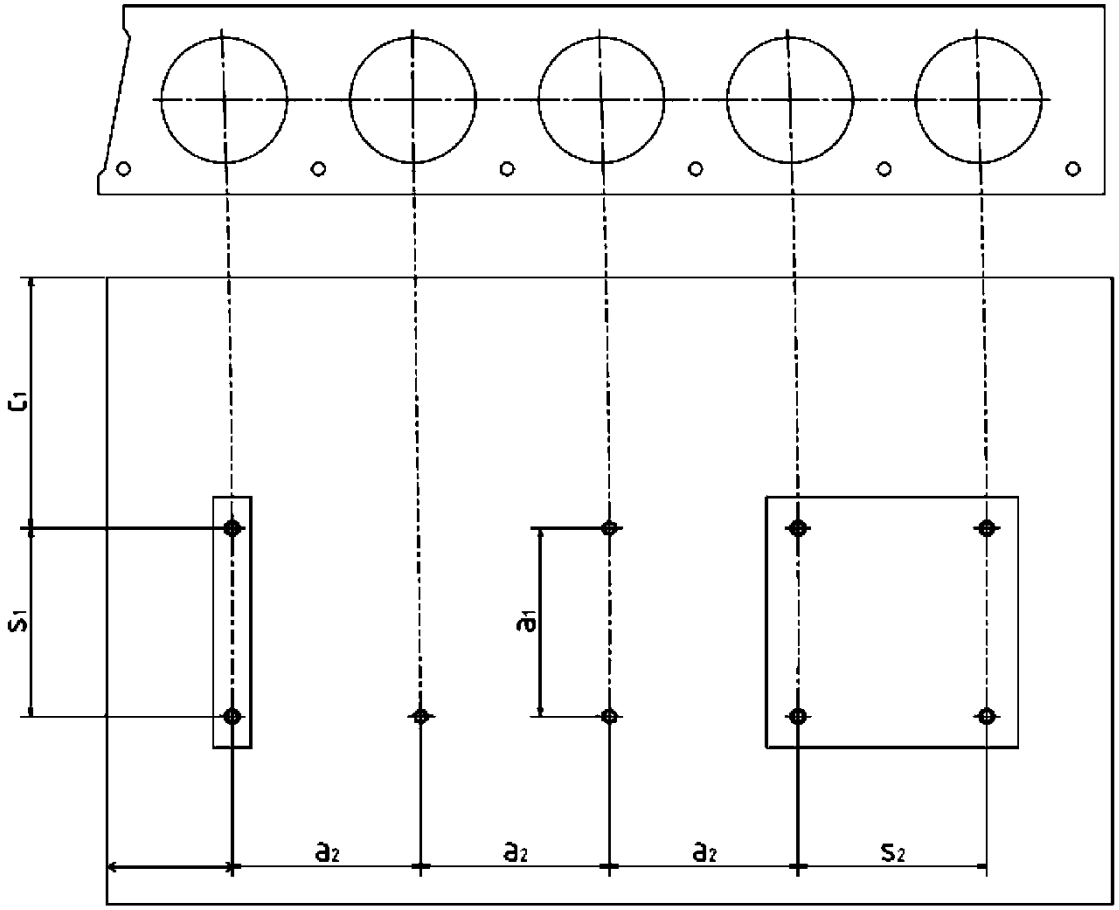
Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2 = edge distance

s_1, s_2 = anchor spacing

a_1, a_2 = distance between anchor groups

c_{min} = minimum edge distance ≥ 100 mm

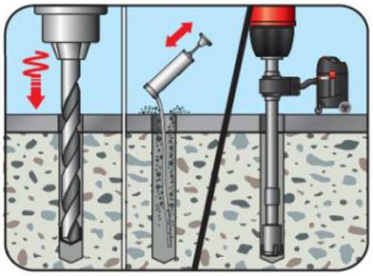
s_{min} = minimum anchor spacing ≥ 100 mm

a_{min} = minimum distance between anchor groups ≥ 100 mm

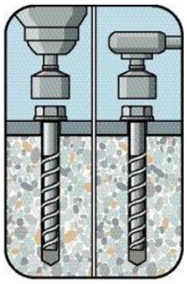
WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex B3
Intended use Installation parameters for anchorages in precast prestressed hollow slabs	

Deutsches Institut für Bautechnik DIBt

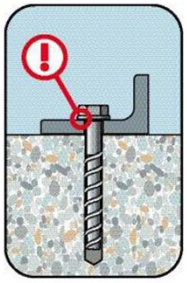
Installations Instructions



Hammer drilling: Create hammer drilled drill hole to the required depth. Clean the drill hole.
Hollow drill bit system: Create hollow drilled drill hole to the required depth. The hollow drilling system removes the dust and cleans the bore hole.



Set the screw and Install it by hand or using an impact screw driver. Consider $T_{imp,max}$ and T_{inst}



Installation is successful when the head of the anchor is fully supported and in contact with the fixture without damaging it.

WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	Annex B4
Intended use Installation instructions	

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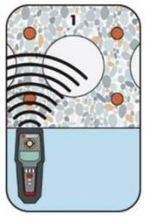
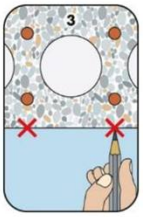
Installation instructions for anchorages in prestressed hollow core slabs

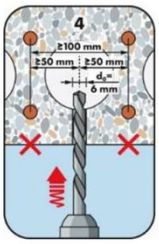


Locate the prestressing steel

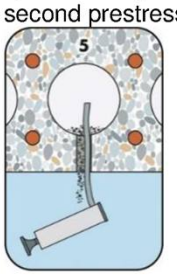
Mark the prestressing steel and locate the second prestressing steel



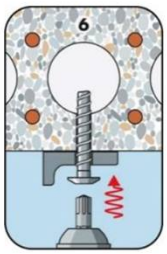
Mark the prestressing steel



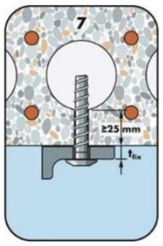
Drill the hole keep an eye on the distance



Clean the drill hole



Turn the screw in



WÜRTH concrete screw W-BS/S, W-BS/A4, W-BS/HCR	**Annex B5**
Intended use Installation instructions	

Deutsches Institut für Bautechnik DIBt

Table 5: Characteristic values for static and quasi-static loading

W-BS concrete screw size				W-BS 5	W-BS 6	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
			[mm]	35	35	55
Steel failure for tension and shear loading						
Characteristic tension load		$N_{Rk,s}$	[kN]	8,7	14,0	
Partial factor		$\gamma_{Ms,N}$	[-]	1,5		
Characteristic shear load		$V_{Rk,s}$	[kN]	4,4	7,0	
Partial factor		$\gamma_{Ms,V}$	[-]	1,25		
Ductility factor		k_7	[-]	0,8		
Characteristic bending load		$M^0_{Rk,s}$	[Nm]	5,3	10,9	
Pull-out failure						
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
	uncracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
Increasing factor for $N_{Rk,p\,p} = N_{Rk,p(C20/25)} * \psi_c$	C25/30	Ψ_c	[-]	1,12		
	C30/37			1,22		
	C40/50			1,41		
	C50/60			1,58		
Concrete failure: Splitting failure, concrete cone failure and pry-out failure						
Effective embedment depth		h_{ef}	[mm]	27	27	44
k-factor	cracked	$k_1 = k_{cr}$	[-]	7,7		
	uncracked	$k_1 = k_{ucr}$	[-]	11,0		
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	resistance	$N^0_{Rk,Sp}$	[kN]	$\min(N^0_{Rk,c}; N_{Rk,p})$		
	spacing	$s_{cr,Sp}$	[mm]	120	120	160
	edge distance	$c_{cr,Sp}$	[mm]	60	60	80
Factor for pry-out failure		k_8	[-]	1,0		
Installation factor		γ_{inst}	[-]	1,2	1,0	1,0
Concrete edge failure						
Effective length in concrete		$l_f = h_{ef}$	[mm]	27	27	44
Nominal outer diameter of screw		d_{nom}	[mm]	5	6	

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

Performances
Characteristic values for static and quasi-static loading

Annex C1

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Table 6: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

W-BS concrete screw size			W-BS 6		
Bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F^0_{Rk}	[kN]	1	2	3
Edge distance	c_{cr}	[mm]	100		
Spacing	s_{cr}	[mm]	200		
Installation factor	γ_{inst}	[-]	1,0		

Table 7: Limiting distances for application in precast prestressed hollow core slabs

Distances for application in precast prestressed hollow core slabs			
Minimum edge distance	c_{min}	[mm]	≥ 100
Minimum anchor spacing	s_{min}	[mm]	≥ 100
Minimum distance between anchor groups	a_{min}	[mm]	≥ 100
Distance of core	l_c	[mm]	≥ 100
Distance of prestressing steel	l_p	[mm]	≥ 100
Distance between anchor position and prestressing steel	a_p	[mm]	≥ 50

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Table 8: Fire exposure – characteristic values of resistance [1)]

W-BS concrete screw size				W-BS 5	W-BS 6			
Material				W-BS/S	W-BS/S		W-BS A4/HCR	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
			[mm]	35	35	55	35	55
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)								
Characteristic Resistance	R30	$F_{Rk,s,fi30}$	[kN]	0,8	0,9		1,2	
	R60	$F_{Rk,s,fi60}$	[kN]	0,6	0,8		1,2	
	R90	$F_{Rk,s,fi90}$	[kN]	0,4	0,6		1,2	
	R120	$F_{Rk,s,fi120}$	[kN]	0,3	0,4		0,8	
	R30	$M^0_{Rk,s,fi30}$	[Nm]	0,5	0,7		0,9	
	R60	$M^0_{Rk,s,fi60}$	[Nm]	0,4	0,6		0,9	
	R90	$M^0_{Rk,s,fi90}$	[Nm]	0,2	0,5		0,9	
	R120	$M^0_{Rk,s,fi120}$	[Nm]	0,2	0,3		0,6	
Pull-out failure								
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,375	0,75	1,875	0,75	1,875
	R120	$N_{Rk,p,fi}$	[kN]	0,3	0,6	1,5	0,6	1,5
Concrete cone failure								
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,65	0,65	2,21	0,65	2,21
	R120	$N^0_{Rk,c,fi}$	[kN]	0,52	0,52	1,76	0,52	1,76
Edge distance								
R30 - R120		$c_{cr,fi}$	[mm]	$2 \times h_{ef}$				
In case of fire attack from more than one side, the minimum edge distance shall be ≥300mm.								
Spacing								
R30 - R120		$s_{cr,fi}$	[mm]	$4 \times h_{ef}$				
Pry-out failure								
R30 - R120		k_8	[-]	1,0				
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.								

[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 C3