

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-20/0768**  
**of 25 November 2020**

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

WDB-08, WDB-10, WDB-12

Product family  
to which the construction product belongs

Mechanical fasteners for use in concrete

Manufacturer

Klimas Sp. z o.o.  
Kuznica Kiedrzynska  
ul. Wincentego Witosa 135/137  
42-233 MYKANÓW  
POLEN

Manufacturing plant

Plant 4

This European Technical Assessment  
contains

18 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 330232-00-0601, Edition 10/2016

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**Specific Part**

**1 Technical description of the product**

The WDB-08, WDB-10, WDB-12 is an anchor made of galvanized or stainless steel in of sizes 8, 10 and 12. 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 concrete screw 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 concrete screw 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 to tension load (static and quasi-static loading)	see Annex B 3 and C 1
Characteristic resistance to shear load (static and quasi-static loading)	see Annex C 2
Displacements (static and quasi-static loading)	see Annex C 3
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed
Durability	See Annex B 1

**3.2 Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 4 and C 5

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

In accordance with European Assessment Documents EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

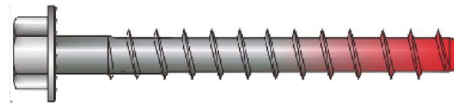
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 25 November 2020 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Baderschneider

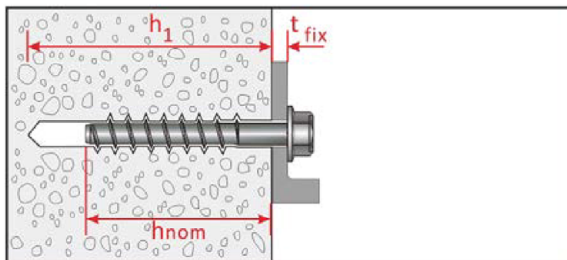
**Product in the installed condition**



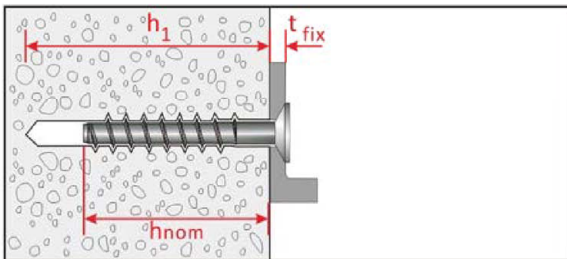
Steel 10B21



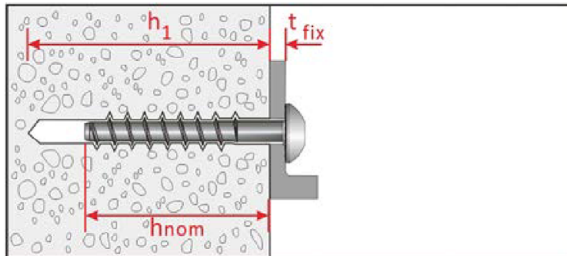
Stainless steel A4



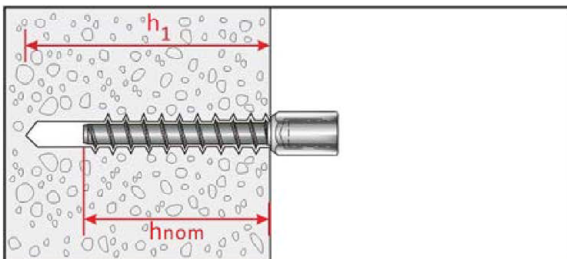
Hexagon Head : WDB-LS, WDB-LSF  
10B21 (WDB8, WDB10, WDB12)  
A4 (WDB8, WDB10, WDB12)



Countersunk Head : WDB-LP  
10B21 (WDB8, WDB10)  
A4 (WDB8, WDB10)



Pan Head : WDB-LG  
10B21 (WDB8, WDB10)  
A4 (WDB8, WDB10)



Hanger Bolt : WDB-GW  
A4 (WDB10-M12)



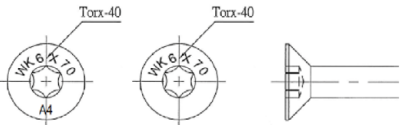
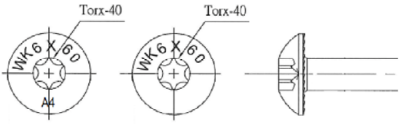
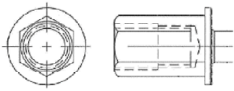
**WDB-08, WDB-10, WDB-12**

**Product description**  
Installed condition

**Annex A1**

**Table A1: Materials and screw types**

Name	Material										
Screw fastener	Head marking	material									
	WDB	Steel 10B21 acc. to SAE-J403 zinc coating: electroplated ( $> 5 \mu\text{m}$ ) or mechanical plated ( $> 30 \mu\text{m}$ ) (only head type -LS and -LSF)									
	WDB A4	Stainless steel 1.4401, 1.4404 (both A4)									
Anchor size / head types				WDB 8			WDB 10			WDB 12	
				-LS -LSF -LP -LG	-LS -LSF -LP -LG	-LP -LG	-LS -LSF -LP -LG	-LS -LSF -LP -LG	-LP -LG	-LS -LSF -LP -LG	
Material				10B21	A4			10B21	A4		
Characteristic yield strength	$f_{yk}$	N/mm <sup>2</sup>	780	640	432	750	640	432	750	640	
Characteristic tensile strength	$f_{uk}$	N/mm <sup>2</sup>	870	800	540	850	800	540	850	800	
Elongation at rupture	$A_s$	[%]	$\leq 8$								

	<p>Hexagon washer head</p> <p>1) WDB-LS size 8,10,12 (10B21 steel) 2) WDB-LS A4 size 8,10,12 (stainless A4)</p>
	<p>Hexagon washer head</p> <p>3) WDB-LSF size 8,10,12 (10B21 steel) 4) WDB-LSF A4 size 8,10,12 (stainless A4)</p>
	<p>Countersunk head</p> <p>5) WDB-LP size 8,10 (10B21 steel) 6) WDB-LP A4 size 8,10 (stainless A4)</p>
	<p>Pan head</p> <p>7) WDB-LG size 8,10 (10B21 steel) 8) WDB-LG A4 size 8,10 (stainless A4)</p>
	<p>Hanger Bolt head</p> <p>9) WDB-GW A4 size 10 with M12 internal thread (stainless A4)</p>

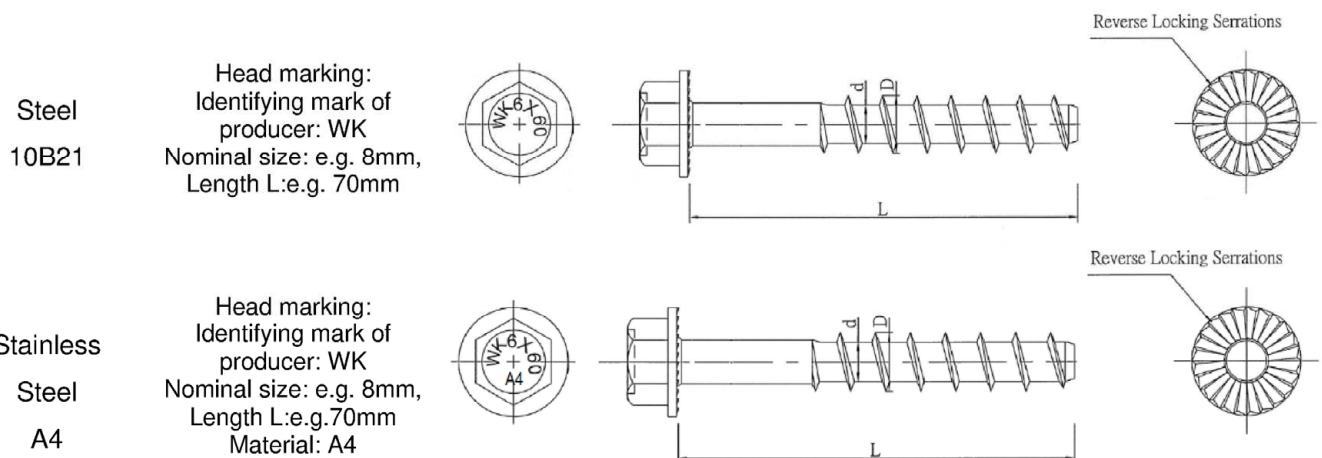
**WDB-08, WDB-10, WDB-12**

**Product description**  
Materials and screw types

**Annex A2**

**Table A2: Dimensions and markings**

Fastener size			WDB 8				WDB 10				WDB 12	
Head type			LS, LSF, LG		LP		LS, LSF, LG, GW		LP		LS, LSF	
Material			10B21	A4	10B21	A4	10B21	A4	10B21	A4	10B21	A4
Embedment depth	$h_{nom}$	[mm]	65	85	65	85	75	100	75	100	95	120
Length of fastener	min L	[mm]	70	90	75	95	80	105	85	110	100	125
	max L	[mm]	150				150				150	
Thread diameter	D	[mm]	9,9				12,5				14,3	
Shaft diameter	d	[mm]	7,4				9,4				11,3	
Thread pitch	p	[mm]	5,8				7,7				8,1	



**WDB-08, WDB-10, WDB-12**

**Product description**  
Dimensions and markings

**Annex A3**

## Specifications of Intended use

### Anchorage subject to:

- Static and quasi-static loads: All sizes.
- Fire exposure: All sizes

### Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013,
- Strength classes C20/25 to C50/60 according to EN 206:2013,
- Uncracked or cracked concrete: all sizes.

### Use conditions (Environmental conditions)

- Anchorages subject to dry internal conditions. (zinc plated steel and stainless steel)
- Anchorages subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist. (Stainless steel)

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere or indoor swimming pools or atmosphere with extreme 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 are designed in accordance with EN 1992-4:2018 and Technical Report TR 055.

### Installation:

- Hammer drilling only.
- 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 shall not be possible.
- The head of the anchor must be fully engaged on the fixture and show no signs of damage.

**WDB-08, WDB-10, WDB-12**

**Intended Use  
Specifications**

**Annex B1**



**Table B1: Installation parameters (Steel 10B21)**

Fastener size			WDB 8			WDB 10			WDB 12
Head type			LS LSF	LP	LG	LS LSF	LP	LG	LS LSF
<b>Material</b>			<b>Steel 10B21</b>						
Diameter of drill bit	d <sub>0</sub>	[mm]	8			10			12
Embedment depth	h <sub>nom</sub>	[mm]	65			75			95
Min. hole depth in concrete	h <sub>1</sub> ≥	[mm]	75			85			105
Effective embedment depth	h <sub>ef</sub>	[mm]	50,6			58,1			75,4
Clearance hole in the fixture	d <sub>f</sub>	[mm]	11			13			15
Thickness of fixture	t <sub>fix</sub>	[mm]	5-85	10-85	5-85	5-75	10-75	5-75	5-55
Installation torque	T <sub>inst</sub>	[Nm]	40	- <sup>1)</sup>	- <sup>1)</sup>	60	- <sup>1)</sup>	- <sup>1)</sup>	80
Wrench size (types: LS, LSF)	WS	[mm]	13	-	-	17	-	-	19
Torx size (types: LP, LG)	TX	-	-	45		-	50		-
Max. power output, machine setting	T <sub>max</sub> ≤	[Nm]	185	120	120	350	120	120	350

1) For the installation of the LP and LG head types only impact screw driver can be used.

**Table B2: Installation parameters (Stainless Steel A4)**

Fastener size			WDB 8			WDB 10			WDB 12	
Head type			LS LSF	LP	LG	LS LSF	GW	LP	LG	LS LSF
<b>Material</b>			<b>Stainless A4</b>							
Diameter of drill bit	d <sub>0</sub>	[mm]	8			10			12	
Embedment depth	h <sub>nom</sub>	[mm]	85			100			120	
Min. hole depth in concrete	h <sub>1</sub> ≥	[mm]	95			110			130	
Effective embedment depth	h <sub>ef</sub>	[mm]	51,9			58,7			75,6	
Clearance hole	d <sub>f</sub>	[mm]	11			13			15	
Thickness of fixture	t <sub>fix</sub>	[mm]	5-65	10-65	5-65	5-50	5-50	10-50	5-50	5-30
Installation torque	T <sub>inst</sub>	[Nm]	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>
Wrench size (types: LS, LSF, GW)	WS	[mm]	13	-	-	17	19	-	-	19
Torx size (types: LP, LG)	TX	-	-	45		-	-	50		-
Max. torque moment, machine setting	T <sub>max</sub> ≤	[Nm]	120	120	120	185	185	185	185	185

1) For the installation of the LP and LG head types only impact screw driver can be used.

**WDB-08, WDB-10, WDB-12**

**Intended Use**  
Installation parameters

**Annex B2**

**Table B3: Minimum thickness of member, Minimum spacing and edge distance**

Fastener size			WDB 8		WDB 10		WDB 12	
Head type			LS, LSF, LP, LG		LS, LSF, LP, LG, GW		LS,LSF	
Material			10B21	A4	10B21	A4	10B21	A4
Minimum member thickness	$h_{min}$	[mm]	110	125	130	140	160	170
Minimum edge distance	$c_{min}$	[mm]	50	50	60	60	70	70
Minimum spacing	$s_{min}$	[mm]	50	50	60	60	70	70

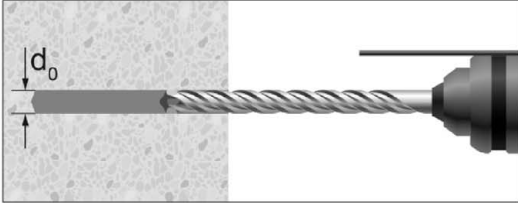
**WDB-08, WDB-10, WDB-12**

**Intended Use**

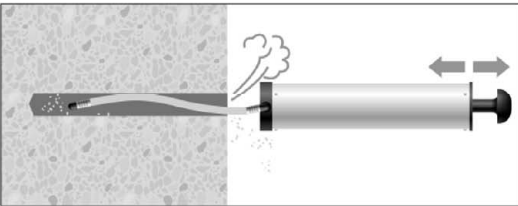
Minimum member thickness, minimum edge distance and anchor spacing

**Annex B3**

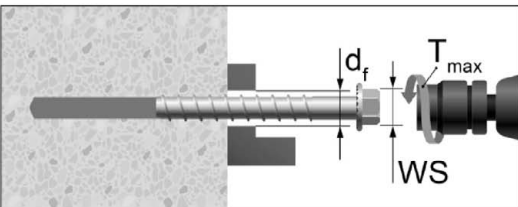
## Installation instruction



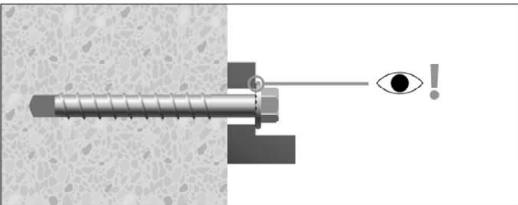
Drill the hole to the bore hole depth  $h_1$ .



Clean the hole.



Screw in the anchor by using a torque wrench or an impact screw driver.  
In case of using torque wrench:  $T_{inst}$  acc. to Table B1 and B2.  
In case of using impact screw driver:  $T_{max}$  acc. to Table B1 and B2  
WS= Wrench Size



Control of complete setting, full contact of screw head with fixture part.

WDB-08, WDB-10, WDB-12

Intended Use  
Installation Instruction

Annex B4

**Table C1: Characteristic resistance under tension loading (Steel 10B21)**

Fastener size			WDB 8			WDB 10			WDB 12
Head type			LS LSF	LP	LG	LS LSF	LP	LG	LS LSF
Material			Steel 10B21						
<b>Steel failure</b>									
Characteristic resistance	$N_{Rk,s}$	[kN]	35,9			57,0			83,0
Partial factor	$\gamma_{Ms}^{1)}$	[-]	1,4			1,4			1,4
<b>Pull-out failure</b>									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	4,5			10,0			12,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9,0	9,0	6,5	16,0	16,0	11	25,0
Increasing factors for $N_{Rk,p}$ in cracked or uncracked concrete	$\psi_c$	C30/37	1,22						
		C40/50	1,41						
		C50/60	1,58						
Installation factor	$\gamma_{inst}$	[-]	1,4			1,0			1,2
<b>Concrete cone failure</b>									
Effective embedment depth	$h_{ef}$	[mm]	50,6			58,1			75,4
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 $h_{ef}$						
Characteristic spacing	$s_{cr,N}$	[mm]	3 $h_{ef}$						
Factor for cracked concrete	$k_{cr}$	[-]	7,7						
Factor for uncracked concrete	$k_{ucr}$	[-]	11,0						
<b>Splitting failure</b>									
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	$N^0_{Rk,sp} = N_{Rk,p}$						
Characteristic edge distance for splitting	$c_{cr,sp}$	[mm]	1,5 $h_{ef}$						
Characteristic anchor spacing for splitting	$s_{cr,sp}$	[mm]	3 $h_{ef}$						

<sup>1)</sup> In absence of other national regulations.

**WDB-08, WDB-10, WDB-12**

**Performance**  
Characteristic values under tension loading

**Annex C1**

**Table C2: Characteristic resistance under tension loading  
(Stainless Steel A4)**

Fastener size			WDB 8			WDB 10				WDB 12
Head type			LS LSF	LP	LG	LS LSF	GW	LP	LG	LS LSF
Material			Stainless steel A4							
<b>Steel failure</b>										
Characteristic resistance	$N_{Rk,s}$	[kN]	33,0	22,3	22,3	53,7	53,7	36,2	36,2	78,1
Partial factor	$\gamma_{Ms}^{1)}$	[-]	1,5			1,5			1,5	
<b>Pull-out failure</b>										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	4,5	4,5	4,0	7,0	7,0	7,0	7,0	12,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9,0	5,5	4,0	16,0	16,0	10	7,0	25,0
Increasing factors for $N_{Rk,p}$ in cracked or uncracked concrete	$\psi/c$	C30/37	1,22							
		C40/50	1,41							
		C50/60	1,58							
Installation factor	$\gamma_{inst}$	[-]	1,4			1,0			1,2	
<b>Concrete cone failure</b>										
Effective embedment depth	$h_{ef}$	[mm]	51,9			58,7			75,6	
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 $h_{ef}$							
Characteristic spacing	$s_{cr,N}$	[mm]	3 $h_{ef}$							
Factor for cracked concrete	$k_{cr}$	[-]	7,7							
Factor for uncracked concrete	$k_{ucr}$	[-]	11,0							
<b>Splitting failure</b>										
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	$N^0_{Rk,sp} = N_{Rk,p}$							
Characteristic edge distance for splitting	$c_{cr,sp}$	[mm]	1,5 $h_{ef}$							
Characteristic anchor spacing for splitting	$s_{cr,sp}$	[mm]	3 $h_{ef}$							

<sup>1)</sup> In absence of other national regulations.

**WDB-08, WDB-10, WDB-12**

**Performance**  
Characteristic values under tension loading

**Annex C2**

**Table C3: Displacements under tension loads for non-cracked and cracked concrete**

Fastener size	Material	Head type	Concrete	Tension load N	Displacement			
					$\delta_{N0}$	$\delta_{N\infty}$		
[-]	[-]	[-]	[-]	[kN]	[mm]	[mm]		
WDB 8	Steel 10B21	LS/LSF	cracked C20/25	1,5	0,1	0,8		
		LP						
		LG						
WDB 10		LS/LSF		4,8	0,2	1,0		
		LP						
		LG						
WDB 12		LS/LSF		4,8	0,3	1,2		
WDB 8		Stainless steel A4		LS/LSF	cracked C20/25	1,5	0,1	0,8
				LP		1,5		
	LG		1,4					
WDB 10	LS/LSF/GW		3,3	0,2		1,0		
	LP							
	LG							
WDB 12	LS/LSF		4,8	0,3		1,2		
WDB 8	Steel 10B21		LS/LSF	uncracked C20/25		3,1	0,1	0,8
			LP			2,2		
		LG	7,6					
WDB 10		LS/LSF	7,6		0,1	1,0		
		LP						
		LG						
WDB 12		LS/LSF	9,9		0,3	1,2		
WDB 8		Stainless steel A4	LS/LSF		uncracked C20/25	3,1	0,1	0,8
			LP			1,8		
	LG		1,4					
WDB 10	LS/LSF/GW		7,6	0,1		1,0		
	LP						4,8	
	LG						3,3	
WDB 12	LS/LSF		9,9	0,3		1,2		

**WDB-08, WDB-10, WDB-12**

**Performance**  
Displacements under tension loading

**Annex C3**

**Table C4: Characteristic resistance under shear loading**

Fastener size			WDB 8			WDB 10			WDB 12	
Head type			LS LSF LP LG	LS LSF	LP LG	LS LSF LP LG	LS LSF, GW	LP LG	LS LSF LP LG	LS LSF
Material			10B21	A4		10B21	A4		10B21	A4
Setting depth	$h_{nom}$	[mm]	65	85		75	100		95	120
Effective embedment depth	$h_{ef}$	[mm]	50,6	51,9		58,1	58,7		75,4	75,6
<b>Steel failure without lever arm</b>										
Characteristic resistance	$V_{RK,s}^0$	[kN]	16,9	16,5	11,2	26,8	26,8	18,1	39,0	39,0
Ductility factor	$k_7$	[-]	0,8							
Partial factor	$\gamma_{Ms}^{1)}$	[-]	1,5	1,25		1,5	1,25		1,5	1,25
<b>Steel failure with lever arm</b>										
Characteristic resistance	$M_{RK,s}^0$	[Nm]	39,1	35,9	24,2	79,0	74,4	50,2	138,8	130,6
Partial factor	$\gamma_{Ms}^{1)}$	[-]	1,5	1,25		1,5	1,25		1,5	1,25
<b>Concrete pryout failure</b>										
k-factor	$k_8$	[-]	1,0						2,0	
Partial factor	$\gamma_{Mcp}^{1)}$	[-]	1,5							
<b>Concrete edge failure</b>										
Effective length of anchor	$\ell_f$	[mm]	50,6	51,9		58,1	58,7		75,4	75,6
Outside diameter of fastener	$d_{nom}$	[mm]	7,25			9,24			11,15	
Partial factor	$\gamma_{Mc}^{1)}$	[-]	1,5							

<sup>1)</sup> In absence of other national regulations.

**WDB-08, WDB-10, WDB-12**

**Performance**  
Characteristic values under shear loading

**Annex C4**

**Table C5: Displacements under shear loads for non-cracked and cracked concrete**

Fastener size	Material	Head type	Concrete	Shear load V	Displacement	
					$\delta_{V0}$	$\delta_{V\infty}$
[-]	[-]	[-]	[-]	[kN]	[mm]	[mm]
WDB 8	Steel 10B21	LS/LSF	Cracked and uncracked C20/25	8,0	1,8	2,7
		LP				
		LG				
WDB 10		LS/LSF		12,8		
		LP				
WDB 12		LG		18,6		
	LS/LSF					
WDB 8	Stainless steel A4	LS/LSF	Cracked and uncracked C20/25	9,4	1,8	2,7
		LP				
		LG				
WDB 10		LS/LSF/GW		15,3		
		LP				
WDB 12		LG		10,3		
	LS/LSF	22,3				

**WDB-08, WDB-10, WDB-12**

**Performance**  
Displacements under shear loading

**Annex C5**



**Table C6: Characteristic tension resistance values for resistance to fire**

Fastener size				WDB 8			WDB 10		WDB 12	
Head type				LS LSF LP LG	LS LSF LP	LG	LS LSF LP LG	LS LSF GW LP LG	LG	LS LSF LP LG
Material				10B21	A4		10B21	A4	10B21	A4
<b>Steel failure</b>										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,41	0,8		1,0	1,7	2,0	2,9
	R60	$N_{Rk,s,fi}$	[kN]	0,37	0,7		0,9	1,3	1,5	2,4
	R90	$N_{Rk,s,fi}$	[kN]	0,29	0,5		0,7	1,0	1,3	2,0
	R120	$N_{Rk,s,fi}$	[kN]	0,21	0,4		0,5	0,9	1,0	1,6
<b>Pull-out failure</b>										
Characteristic resistance in concrete $\geq$ C20/25	R30	$N_{Rk,p,fi}$	[kN]	1,1	1,1	1,0	2,5	1,8	3,0	3,0
	R60									
	R90									
	R120	$N_{Rk,p,fi}$	[kN]	0,9	0,9	0,8	2,0	1,4	2,4	2,4
<b>Concrete cone failure</b>										
Characteristic resistance in concrete $\geq$ C20/25	R30	$N^0_{Rk,c,fi}$	[kN]	3,1	3,3		4,4	4,5	8,5	8,6
	R60									
	R90									
	R120	$N^0_{Rk,c,fi}$	[kN]	2,5	2,7		3,5	3,6	6,8	6,8
Effective embedment depth		$h_{ef}$	[mm]	50,6	51,9		58,1	58,7	75,4	75,6
Minimum member thickness		$h_{min}$	[mm]	110	125		130	140	160	170
Spacing		$s_{cr,N,fi}$	[mm]	$4h_{ef}$						
		$s_{min}$	[mm]	50		60		70		
Edge distance		$c_{cr,N,fi}$	[mm]	$2h_{ef}$						
Fire exposure from one side only		$c_{min}$	[mm]	50			60		70	
Fire exposure from more than one side				$\geq 300$ mm						

<sup>1)</sup> In absence of other national regulations.

**WDB-08, WDB-10, WDB-12**

**Performance**  
Characteristic values for resistance to fire (tension)

**Annex C6**

**Table C7: Characteristic shear resistance values for resistance to fire**

Fastener size				WDB 8		WDB 10		WDB 12	
Head type				all	all	all	all	all	all
Material				10B21	A4	10B21	A4	10B21	A4
<b>Steel failure without level arm</b>									
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,41	0,8	1,0	1,7	2,0	2,9
	R60	$V_{Rk,s,fi}$	[kN]	0,37	0,7	0,9	1,3	1,5	2,4
	R90	$V_{Rk,s,fi}$	[kN]	0,29	0,5	0,7	1,0	1,3	2,0
	R120	$V_{Rk,s,fi}$	[kN]	0,21	0,4	0,5	0,9	1,0	1,6
<b>Steel failure with level arm</b>									
Characteristic resistance	R30	$M^0_{Rk,p,fi}$	[Nm]	0,45	0,9	1,4	2,3	3,4	4,9
	R60	$M^0_{Rk,p,fi}$	[Nm]	0,40	0,7	1,2	1,9	2,5	4,0
	R90	$M^0_{Rk,p,fi}$	[Nm]	0,31	0,5	0,9	1,5	2,1	3,3
	R120	$M^0_{Rk,p,fi}$	[Nm]	0,22	0,45	0,7	1,3	1,6	2,6
<b>Pry-out failure</b>									
$k_8$				[-]	1	1	2		
Characteristic resistance	R30	$V_{Rk,cp,fi}$	[kN]	3,1	3,3	4,4	4,5	17,0	17,1
	R60								
	R90								
	R120	$V_{Rk,cp,fi}$	[kN]	2,5	2,7	3,5	3,6	13,6	13,7
<b>Concrete edge failure</b>									
Characteristic resistance	≤ R90	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.25 * V^0_{Rk,c}^{2)}$					
	R120	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.20 * V^0_{Rk,c}^{2)}$					

1) In absence of other national regulations.

2)  $V^0_{Rk,c}$  = characteristic resistance for concrete edge failure in cracked concrete C20/C25 under normal temperature calculated acc. to EN 1992-4:2018.

**WDB-08, WDB-10, WDB-12**

**Performance**  
Characteristic values for resistance to fire (shear)

**Annex C7**