

DECLARATION OF PERFORMANCE
DoP No. MKT-113 - en

1. Unique identification code of the product-type: **MKT Wedge Anchor BZ plus and BZ-IG**
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):

ETA-99/0010, Annex A3 and A5
Batch number: see packaging of the product

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	torque controlled expansion anchor (bolt type (with internal thread))
for use in	cracked and non-cracked concrete, C20/25 - C50/60 (EN 206)
option	1
loading	static or quasi-static, seismic, category C1 + C2 (covered sizes: BZ plus M8, M10, M12, M16, M20)
material	<u>steel galvanised:</u> dry internal conditions only covered sizes: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 <u>steel sherardized:</u> dry internal conditions only covered sizes: BZ plus: M10, M12, M16, M20 <u>stainless steel (marking A4):</u> internal and external use without particular aggressive conditions covered sizes: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 <u>high corrosion resistant steel (marking HCR):</u> internal and external use with particular aggressive conditions covered sizes: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
temperature range (if applicable)	--

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):

MKT Metall-Kunststoff-Technik GmbH & Co. KG
Auf dem Immel 2
D - 67685 Weilerbach

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2): --
6. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V: **System 1**

7. In case of the declaration of performance concerning a construction product covered by a harmonised standard:

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8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

Deutsches Institut für Bautechnik, Berlin

issued

ETA-99/0010

on the basis of

ETAG 001-2

The notified body 1343-CPR performed under system 1:

- (i) determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;
- (ii) initial inspection of the manufacturing plant and of factory production control;
- (iii) continuous surveillance, assessment and evaluation of factory production control

and issued: Certificate of constancy of performance 1343-CPR-M 550-1

9. Declared performance:

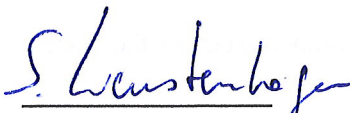
Essential Characteristics	Design Method	Performance		Harmonized Technical Specification
		BZ plus	BZ-IG	
Characteristic resistance for tension	ETAG 001, Annex C CEN/TS 1992-4	Annex C1-C4	Annex C11-C12	ETAG 001
Characteristic resistance for shear	ETAG 001, Annex C CEN/TS 1992-4	Annex C5	Annex C13	
Characteristic resistance for seismic loading	TR 045	Annex C6	NPD	
Displacement for serviceability limit state	ETAG 001, Annex C CEN/TS 1992-4	Annex C9-C10	Annex C15	
Characteristic resistance under fire exposure	TR 020 CEN/TS 1992-4	Annex C7-C8	Annex C14	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies: --

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:


Stefan Weustenhagen
 (General Manager)
 Weilerbach, 21.04.2016

i.V. 
Dipl.-Ing. Detlef Bigalke
 (Head of product development)



Table C1: Characteristic values for **tension loads, BZ plus zinc plated, cracked concrete**, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24	M27
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0						
Steel failure									
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial safety factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5	
Pull-out									
Standard anchorage depth									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	1)	1)
Reduced anchorage depth									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-	-
Increasing factor for $N_{Rk,p}$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$						
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-	-
Factor acc. to CEN/TS 1992-4	k_{cr}	[-]	7,2						

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate.

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus zinc plated, cracked concrete**, static and quasi-static action

Annex C1

Table C2: Characteristic values for **tension loads**, BZ plus **A4 / HCR**, **cracked concrete**, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					
Steel failure								
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	γ_{Ms}	[-]	1,5				1,68	1,5
Pull-out								
Standard anchorage depth								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	40
Reduced anchorage depth								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-
Increasing factor for $N_{Rk,p}$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-
Factor according to CEN/TS 1992-4	k_{cr}	[-]	7,2					

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate.

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads**, BZ plus **A4 / HCR**, **cracked concrete**, static and quasi-static action

Annex C2

Table C3: Characteristic values for tension loads, BZ plus zinc plated, non-cracked concrete, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							
Steel failure										
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196	
Partial safety factor	γ_{Ms}	[-]	1,53		1,5		1,6	1,5		
Pull-out										
Standard anchorage depth										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)	1)	
Reduced anchorage depth										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-	-	
Splitting For the proof against splitting failure $N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$ with consideration of the member thickness										
Standard anchorage depth										
Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$)										
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	170	200	230	250	
Case 1										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	9	12	20	30	40	62,3	50	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	3 h_{ef}							
Case 2										
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	12	16	25	35	50,5	62,3	70,6	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	4 h_{ef}				4,4 h_{ef}	3 h_{ef}	5 h_{ef}	
Splitting for minimum thickness of concrete member										
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140				
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	12	16	25	35	-	-	-	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	5 h_{ef}							
Reduced anchorage depth										
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140				
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	7,5	9	17,9	26,5	-	-	-	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	200	200	250	300				
Increasing factor for $N_{Rk,p}$ and $N_{Rk,sp}^0$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$							
Concrete cone failure										
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	115	125	
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-	-	
Factor according to CEN/TS 1992-4	k_{ucr}	[-]	10,1							

¹⁾ Pull-out is not decisive.

²⁾ Use restricted to anchoring of structural components statically indeterminate.

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus zinc plated, non-cracked concrete**, static and quasi-static action

Annex C3

Table C4: Characteristic values for tension loads, BZ plus A4 / HCR, non-cracked concrete, static and quasi-static action

Anchor size			M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					
Steel failure								
Characteristic tension resistance	$N_{RK,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	γ_{Ms}	[-]	1,5				1,68	1,5
Pull-out								
Standard anchorage depth								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,p}$	[kN]	12	16	25	35	1)	1)
Reduced anchorage depth								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,p}$	[kN]	7,5	9	1)	1)	-	-
Splitting For the proof against splitting failure $N_{RK,c}^0$ has to be replaced by $N_{RK,sp}^0$ with consideration of the member thickness								
Standard anchorage depth								
Splitting for standard thickness of concrete member (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$)								
Standard thickness of concrete	$h_{min,1} \geq$	[mm]	100	120	140	160	200	250
Case 1								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,sp}^0$	[kN]	9	12	20	30	40	-
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	3 h_{ef}					
Case 2								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,sp}^0$	[kN]	12	16	25	35	50,5	70,6
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	230	250	280	400	440	500
Splitting for minimum thickness of concrete member								
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,sp}^0$	[kN]	12	16	25	35		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	5 h_{ef}					
Reduced anchorage depth								
Minimum thickness of concrete	$h_{min,3} \geq$	[mm]	80	80	100	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,sp}^0$	[kN]	7,5	9	17,9	26,5		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	200	200	250	300		
Increasing factor for $N_{RK,p}$ and $N_{RK,sp}^0$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 ²⁾	40	50	65	-	-
Factor according to CEN/TS 1992-4	k_{ucr}	[-]	10,1					

¹⁾ Pull-out is not decisive.

²⁾ Use restricted to anchoring of structural components statically indeterminate.

Wedge Anchor BZ plus

Performance

Characteristic values for **tension loads, BZ plus A4 / HCR, non-cracked concrete**, static and quasi-static action

Annex C4

Table C5: Characteristic values for **shear loads**, BZ plus, **cracked and non-cracked concrete**, static or quasi static action

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							
Steel failure without lever arm, Steel zinc plated										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	12,2	20,1	30	55	69	114	169,4	
Factor for ductility	k_2	[-]	1,0							
Partial safety factor	γ_{Ms}	[-]	1,25				1,33	1,25	1,25	
Steel failure without lever arm, Stainless steel A4, HCR										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-	
Factor for ductility	k_2	[-]	1,0							
Partial safety factor	γ_{Ms}	[-]	1,25				1,4	1,25		
Steel failure with lever arm, Steel zinc plated										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	23	47	82	216	363	898	1331,5	
Partial safety factor	γ_{Ms}	[-]	1,25				1,33	1,25	1,25	
Steel failure with lever arm, Stainless steel A4, HCR										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	200	454	785,4	-	
Partial safety factor	γ_{Ms}	[-]	1,25				1,4	1,25		
Concrete pry-out failure										
Factor k acc. to ETAG 001, Annex C or k_3 acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	2,4				2,8			
Concrete edge failure										
Effective length of anchor in shear loading with h_{ef}	Steel zinc plated	l_f	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	l_f	[mm]	46	60	70	85	100	125	-
Effective length of anchor in shear loading with $h_{ef,red}$	Steel zinc plated	$l_{f,red}$	[mm]	35 ¹⁾	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35 ¹⁾	40	50	65			
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24	27	

¹⁾ Use restricted to anchoring of structural components statically indeterminate.

Wedge Anchor BZ plus

Performance

Characteristic values for **shear loads**, BZ plus, **cracked and non-cracked concrete**, static or quasi static action

Annex C5

Table C6: Characteristic resistance for seismic loading, BZ plus, standard anchorage depth, performance category C1 and C2

Anchor size			M8	M10	M12	M16	M20
Tension loads							
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0				
Steel failure, Steel zinc plated							
Characteristic resistance C1	$N_{Rk,s,seis,C1}$	[kN]	16	27	40	60	86
Characteristic resistance C2	$N_{Rk,s,seis,C2}$	[kN]	16	27	40	60	86
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,53		1,5		1,6
Steel failure, Stainless steel A4, HCR							
Characteristic resistance C1	$N_{Rk,s,seis,C1}$	[kN]	16	27	40	64	108
Characteristic resistance C2	$N_{Rk,s,seis,C2}$	[kN]	16	27	40	64	108
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,5				1,68
Pull-out (steel zinc plated, stainless steel A4 and HCR)							
Characteristic resistance C1	$N_{Rk,p,seis,C1}$	[kN]	5	9	16	25	36
Characteristic resistance C2	$N_{Rk,p,seis,C2}$	[kN]	2,3	3,6	10,2	13,8	24,4
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	1,0				
Shear loads							
Steel failure without lever arm, Steel zinc plated							
Characteristic resistance C1	$V_{Rk,s,seis,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance C2	$V_{Rk,s,seis,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25				1,33
Steel failure without lever arm, Stainless steel A4, HCR							
Characteristic resistance C1	$V_{Rk,s,seis,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance C2	$V_{Rk,s,seis,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25				1,4

Wedge Anchor BZ plus

Performance

Characteristic resistance for **seismic loading**, BZ plus, **standard anchorage depth**, performance category **C1** and **C2**

Annex C6

Table C7: Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M8	M10	M12	M16	M20	M24	M27		
Tension load										
Steel failure										
Steel, galvanised										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7	9,4	13,6	17,6
	R60			1,1	1,9	3,0	5,6	8,2	11,8	15,3
	R90			0,8	1,4	2,4	4,4	6,9	10,0	13,0
	R120			0,7	1,2	2,2	4,0	6,3	9,1	11,8
Stainless steel A4, HCR										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
Shear load										
Steel failure without lever arm										
Steel, galvanised										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	4,1	7,7	11	16	20,6
	R60			1,5	2,5	3,6	6,8	11	15	19,8
	R90			1,2	2,1	3,5	6,5	10	15	19,0
	R120			1,0	2,0	3,4	6,4	10	14	18,6
Stainless steel A4, HCR										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
Steel failure with lever arm										
Steel, galvanised										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	6,4	16,3	29	50	75
	R60			1,6	3,2	5,6	14	28	48	72
	R90			1,2	2,7	5,4	14	27	47	69
	R120			1,1	2,5	5,3	13	26	46	68
Stainless steel A4, HCR										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,8	9,0	19,7	50,1	88,8	153,5	-
	R60			2,9	6,8	14,6	37,2	66,1	114,3	
	R90			2,1	4,7	9,5	24,2	43,4	75,1	
	R120			1,6	3,6	7,0	17,8	32,1	55,5	

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to TR020 / CEN/TS 1992-4. If pull-out is not decisive in Eq. 2.4 and Eq. 2.5, TR 020 $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$.

Wedge Anchor BZ plus

Performance

Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Annex C7

Table C8: Characteristic values for tension and shear load under fire exposure, BZ plus, reduced anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M8	M10	M12	M16		
Tension load							
Steel failure							
Steel, galvanised							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
Stainless steel A4, HCR							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
Shear load							
Steel failure without lever arm							
Steel, galvanised							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
Stainless steel A4, HCR							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
Steel failure with lever arm							
Steel, galvanised							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,5	3,3	6,4	16,3
	R60			1,2	2,5	4,7	11,9
	R90			0,8	1,7	3,0	7,5
	R120			0,6	1,2	2,1	5,3
Stainless steel A4, HCR							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,2	8,9	19,7	50,1
	R60			2,6	6,8	14,6	37,2
	R90			2,0	4,7	9,5	24,2
	R120			1,6	3,6	7,0	17,8

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to TR020 / CEN/TS 1992-4. If pull-out is not decisive in Eq. 2.4 and Eq. 2.5, TR 020 $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$.

Wedge Anchor BZ plus

Performance

Characteristic values for tension and shear load under fire exposure, BZ plus, reduced anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

Annex C8

Table C9: Displacements under tension load, BZ plus

Anchor size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage depth									
Steel zinc plated									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	δ_{N0}	[mm]	0,6	1,0	0,4	1,0	0,9	0,7	0,9
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,4	1,3	1,0	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	5,7	7,6	11,9	16,7	23,8	29,6	34
Displacement	δ_{N0}	[mm]	0,4	0,5	0,7	0,3	0,4	0,5	0,3
	$\delta_{N\infty}$	[mm]	0,8		1,4	0,8		1,4	
Displacements under seismic tension loads C2									
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
Stainless steel A4, HCR									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	-
Displacement	δ_{N0}	[mm]	0,7	1,8	0,4	0,7	0,9	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,4	1,4	1,4	1,0	1,8	
Tension load in non-cracked concrete	N	[kN]	5,8	7,6	11,9	16,7	23,8	33,5	-
Displacement	δ_{N0}	[mm]	0,6	0,5	0,7	0,2	0,4	0,5	
	$\delta_{N\infty}$	[mm]	1,2	1,0	1,4	0,4	0,8	1,1	
Displacements under seismic tension loads C2									
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
Reduced anchorage depth									
Steel zinc plated, stainless steel A4, HCR									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0	-	-	-
Displacement	δ_{N0}	[mm]	0,8	0,7	0,5	1,0			
	$\delta_{N\infty}$	[mm]	1,2	1,0	0,8	1,1			
Tension load in non-cracked concrete	N	[kN]	3,7	4,3	8,5	12,6	-	-	-
Displacement	δ_{N0}	[mm]	0,1	0,2	0,2	0,2			
	$\delta_{N\infty}$	[mm]	0,7	0,7	0,7	0,7			

Wedge Anchor BZ plus

Performance
Displacements under tension load

Annex C9

Table C10: Displacements under shear load, BZ plus

Anchor size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage depth									
Steel zinc plated									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	36,8	64,9	96,8
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5	1,8	3,5	3,6
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	2,7	5,3	5,4
Displacements under seismic shear loads C2									
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3	2,9	2,8	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	4,3	4,2	-
Displacements under seismic shear loads C2									
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
Reduced anchorage depth									
Steel zinc plated									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5	-	-	-
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	-	-	-
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3	-	-	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	-	-	-

Wedge Anchor BZ plus

Performance
Displacements under shear load

Annex C10

Table C11: Characteristic values for **tension loads, BZ-IG, cracked concrete**, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2			
Steel failure						
Characteristic tension resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	γ_{Ms}	[-]	1,5			
Characteristic tension resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	k_{cr}	[-]	7,2			

Wedge Anchor BZ-IG

Performance

Characteristic values for **tension loads, BZ-IG, cracked concrete**, static and quasi-static action

Annex C11

Table C12: Characteristic values for tension loads, BZ-IG, non-cracked concrete, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2			
Steel failure						
Characteristic tension resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	γ_{Ms}	[-]	1,5			
Characteristic tension resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	γ_{Ms}	[-]	1,87			
Pull-out						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
Splitting ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$. The higher resistance of Case 1 and Case 2 may be applied.)						
Minimum thickness of concrete member	h_{min}	[mm]	100	120	130	160
Case 1						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	9	12	16	25
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	3 h_{ef}			
Case 2						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	12	16	20	30
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	5 h_{ef}			
Increasing factor for $N_{Rk,p}$ and $N_{Rk,sp}^0$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	k_{ucr}	[-]	10,1			

Wedge Anchor BZ-IG

Performance
Characteristic values for tension loads, BZ-IG, non-cracked concrete, static and quasi-static action

Annex C12

Table C13: Characteristic values for shear loads, BZ-IG, cracked and non-cracked concrete, static and quasi-static action

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
BZ-IG, steel zinc plated						
Steel failure without lever arm, Installation type V						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
Steel failure without lever arm, Installation type D						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
Steel failure with lever arm, Installation type V						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
Steel failure with lever arm, Installation type D						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	γ_{Ms}	[-]	1,25			
Factor of ductility	k_2	[-]	1,0			
BZ-IG, stainless steel A4, HCR						
Steel failure without lever arm, Installation type V						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	γ_{Ms}	[-]	1,25			
Steel failure without lever arm, Installation type D						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	γ_{Ms}	[-]	1,25			
Steel failure with lever arm, Installation type V						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	γ_{Ms}	[-]	1,56			
Steel failure with lever arm, Installation type D						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	γ_{Ms}	[-]	1,25			
Factor of ductility	k_2	[-]	1,0			
Concrete pry-out failure						
Factor k acc. to ETAG 001, Annex C or k_3 acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	1,5	1,5	2,0	2,0
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	45	58	65	80
Effective diameter of anchor	d_{nom}	[mm]	8	10	12	16

Wedge Anchor BZ-IG

Performance
 Characteristic values for shear loads, BZ-IG, cracked and non-cracked concrete, static and quasi-static action

Annex C13

Table C14: Characteristic values for **tension** and **shear load** under **fire exposure**, **BZ-IG**, cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M6	M8	M10	M12		
Tension load							
Steel failure							
Steel zinc plated							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
Shear load							
Steel failure without lever arm							
Steel zinc plated							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
Steel failure with lever arm							
Steel zinc plated							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,4	3,3	5,7
	R60			0,4	1,2	2,6	4,6
	R90			0,4	0,9	2,0	3,4
	R120			0,3	0,8	1,6	2,8
Stainless steel A4, HCR							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	2,2	5,5	11,2	19,6
	R60			1,5	3,9	8,1	14,3
	R90			0,7	2,2	5,1	8,9
	R120			0,4	1,3	3,5	6,2

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure can be designed according to TR020 / CEN/TS 1992-4.

Wedge Anchor BZ-IG

Performance

Characteristic values for **tension** and **shear loads** under **fire exposure**, **BZ-IG** cracked and non-cracked concrete C20/25 to C50/60

Annex C14

Table C15: Displacements under tension load, BZ-IG

Anchor size			M6	M8	M10	M12
Tension load in cracked concrete	N	[kN]	2,0	3,6	4,8	8,0
	δ_{N0}	[mm]	0,6	0,6	0,8	1,0
Displacements	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4
	N	[kN]	4,8	6,4	8,0	12,0
Tension load in non-cracked concrete	δ_{N0}	[mm]	0,4	0,5	0,7	0,8
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4

Table C16: Displacements under shear load, BZ-IG

Anchor size			M6	M8	M10	M12
Shear load in cracked and non-cracked concrete	V	[kN]	4,2	5,3	6,2	16,9
	δ_{V0}	[mm]	2,8	2,9	2,5	3,6
Displacements	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3

Wedge Anchor BZ-IG

Performance
Displacements under tension load and under shear load

Annex C15