

PRESTANDEDEKLARATION  
DoP Nr. MKT-113 - sv

1. Produkttypens unika identifikationskod: **MKT Bolzenanker BZ plus och BZ-IG**
2. Typ-, parti- eller serienummer eller någon annan beteckning som möjliggör identifiering av byggprodukter i enlighet med artikel 11.4:

**ETA-99/0010, Appendix A3 och A5**  
**Partinummer: se förpackning**

3. Byggproduktens avsedda användning eller användningar i enlighet med den tillämpliga, harmoniserade tekniska specifikationen, såsom förutsett av tillverkaren:

<b>Typ av produkt</b>	vridmoment-expander (Bolt type (med invändig tråd))
<b>För användning i</b>	sprucken och osprucken betong C20/25 - C50/60 (EN 206)
<b>Option</b>	1
<b>Belastning</b>	statiska eller kvasistatiska, seismisk, Kategori C1+C2 (storlekar ingår BZ plus M8, M10, M12, M16, M20)
<b>Material</b>	<p><u>Galvaniserat stål:</u> endast i torra utrymmen storlekar: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12</p> <p><u>Diffusion galvaniserad stål:</u> endast i torra utrymmen storlekar: BZ plus: M10, M12, M16, M20</p> <p><u>Rostfritt stål (Prägling A4):</u> inomhus och utomhus förutom särskilt aggressiva förhållanden storlekar: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12</p> <p><u>Mycket korrosionsbeständig stål (Prägling HCR):</u> inomhus och utomhus områden med särskilt aggressiva förhållanden storlekar: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12</p>
<b>Temperaturområde (möjligen)</b>	--

4. Tillverkarens namn, registrerade företagsnamn eller registrerade varumärke samt kontaktadress enligt vad som krävs i artikel 11.5:

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

5. I tillämpliga fall namn och kontaktadress för tillverkarens representant vars mandat omfattar de uppgifter som anges i artikel 12.2: --
6. Systemet eller systemen för bedömning och fortlöpande kontroll av byggproduktens prestanda enligt bilaga V:  
**System 1**
7. För det fall att prestandadeklarationen avser en byggprodukt som omfattas av en harmoniserad standard:  
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8. För det fall att prestandadeklarationen avser en byggprodukt för vilken en europeisk teknisk bedömning har utfärdats:

har utfärdat **Deutsches Institut für Bautechnik, Berlin**  
 på grundval av **ETA-99/0010**  
**ETAG 001-2**

Det anmälda produktcertifieringsorganet 1343-CPR har utförts enligt System 1:

- i) bestämning av produkttypen på grundval av typprovning (inkl. stickprov), typberäkning, tabellerade värden eller beskrivande dokumentation av produkten;
- ii) inledande inspektion av tillverkningsanläggningen och tillverkningskontrollen i fabrik;
- iii) fortlöpande övervakning, bedömning och utvärdering av tillverkningskontrollen i fabrik.

och har utfärdat: Intyg om överensstämmelse 1343-CPR-M 550-1

9. Angiven prestanda:

Väsentliga egenskaper	Design method	Prestanda		Harmoniserad teknisk specifikation
		BZ plus	BZ-IG	
Karakteristisk motstånd mot dragbelastningar	ETAG 001, Appendix C CEN/TS 1992-4	Appendix C1-C4	Appendix C11-C12	ETAG 001
Karakteristisk resistens mot skjuvlaster	ETAG 001, Appendix C CEN/TS 1992-4	Appendix C5	Appendix C13	
Karakteristiskt motstånd vid seismisk belastning	TR 045	Appendix C6	NPD	
Skift i bruk	ETAG 001, Appendix C CEN/TS 1992-4	Appendix C9-C10	Appendix C15	
Karakteristiskt motstånd under brandexponering	TR 020 CEN/TS 1992-4	Appendix C7-C8	Appendix C14	

När den specifika tekniska dokumentationen har använts enligt artikel 37 eller 38, de krav med vilka produkten överensstämmer: --

10. Prestandan för den produkt som anges i punkterna 1 och 2 överensstämmer med den prestanda som anges i punkt 9.

Denna prestandadeklaration utfärdas på eget ansvar av den tillverkare som anges under punkt 4.

Undertecknat för tillverkaren av:

*Stefan Weustenhagen*

**Stefan Weustenhagen**  
(Verkställande direktör)  
**Weilerbach, 21.04.2016**

i.V. *Detlef Bigalke*

**Dipl.-Ing. Detlef Bigalke**  
(Produktutveckling direktör)



**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							
<b>Steel failure</b>										
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196	
Partial safety factor	$\gamma_{Ms}$	[-]	1,53		1,5		1,6	1,5		
<b>Pull-out</b>										
<b>Standard anchorage depth</b>										
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	1)	1)	
<b>Reduced anchorage depth</b>										
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-	-	
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$							
<b>Concrete cone failure</b>										
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	115	125	
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	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					
<b>Steel failure</b>								
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$	[-]	1,5				1,68	1,5
<b>Pull-out</b>								
<b>Standard anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	40
<b>Reduced anchorage depth</b>								
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
<b>Concrete cone failure</b>								
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	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						
<b>Steel failure</b>									
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial safety factor	$\gamma_{Ms}$	[-]	1,53		1,5		1,6	1,5	
<b>Pull-out</b>									
<b>Standard anchorage depth</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	25	35	1)	1)	1)
<b>Reduced anchorage depth</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9	1)	1)	-	-	-
<b>Splitting</b> 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									
<b>Standard anchorage depth</b>									
Splitting for <b>standard thickness of concrete member</b> (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
<b>Case 1</b>									
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 $h_{ef}$						
<b>Case 2</b>									
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 $h_{ef}$
<b>Splitting for minimum thickness of concrete member</b>									
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 $h_{ef}$						
<b>Reduced anchorage depth</b>									
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 $N_{Rk,sp}^0$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$						
<b>Concrete cone failure</b>									
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	40	50	65	-	-	-
Factor according to CEN/TS 1992-4	$k_{ucr}$	[-]	10,1						

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> 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					
<b>Steel failure</b>								
Characteristic tension resistance	$N_{RK,s}$	[kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$	[-]	1,5				1,68	1,5
<b>Pull-out</b>								
<b>Standard anchorage depth</b>								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,p}$	[kN]	12	16	25	35	1)	1)
<b>Reduced anchorage depth</b>								
Characteristic resistance in non-cracked concrete C20/25	$N_{RK,p}$	[kN]	7,5	9	1)	1)	-	-
<b>Splitting</b> 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								
<b>Standard anchorage depth</b>								
Splitting for <b>standard thickness of concrete member</b> (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
<b>Case 1</b>								
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 $h_{ef}$					
<b>Case 2</b>								
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
<b>Splitting for minimum thickness of concrete member</b>								
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 $h_{ef}$					
<b>Reduced anchorage depth</b>								
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 $N_{RK,sp}^0$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
<b>Concrete cone failure</b>								
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	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							
<b>Steel failure without lever arm, Steel zinc plated</b>										
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	$\gamma_{Ms}$	[-]	1,25				1,33	1,25	1,25	
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-	
Factor for ductility	$k_2$	[-]	1,0							
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,4	1,25		
<b>Steel failure with lever arm, Steel zinc plated</b>										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	23	47	82	216	363	898	1331,5	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,33	1,25	1,25	
<b>Steel failure with lever arm, Stainless steel A4, HCR</b>										
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	200	454	785,4	-	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,4	1,25		
<b>Concrete pry-out failure</b>										
Factor k acc. to ETAG 001, Annex C or k <sub>3</sub> acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	2,4				2,8			
<b>Concrete edge failure</b>										
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 <sup>1)</sup>	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35 <sup>1)</sup>	40	50	65			
Outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	16	20	24	27	

<sup>1)</sup> 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
<b>Tension loads</b>							
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0				
<b>Steel failure, Steel zinc plated</b>							
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
<b>Steel failure, Stainless steel A4, HCR</b>							
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
<b>Pull-out (steel zinc plated, stainless steel A4 and HCR)</b>							
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 $N_{Rk,p}$	$\psi_C$	[-]	1,0				
<b>Shear loads</b>							
<b>Steel failure without lever arm, Steel zinc plated</b>							
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
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>							
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		
<b>Tension load</b>										
<b>Steel failure</b>										
<b>Steel, galvanised</b>										
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
<b>Stainless steel A4, HCR</b>										
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	
<b>Shear load</b>										
<b>Steel failure without lever arm</b>										
<b>Steel, galvanised</b>										
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
<b>Stainless steel A4, HCR</b>										
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	
<b>Steel failure with lever arm</b>										
<b>Steel, galvanised</b>										
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
<b>Stainless steel A4, HCR</b>										
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		
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel, galvanised</b>							
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
<b>Stainless steel A4, HCR</b>							
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
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel, galvanised</b>							
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
<b>Stainless steel A4, HCR</b>							
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
<b>Steel failure with lever arm</b>							
<b>Steel, galvanised</b>							
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
<b>Stainless steel A4, HCR</b>							
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
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	$\delta_{N0}$	[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	$\delta_{N0}$	[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	
<b>Displacements under seismic tension loads C2</b>									
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	-	-
<b>Stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	-
Displacement	$\delta_{N0}$	[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	$\delta_{N0}$	[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	
<b>Displacements under seismic tension loads C2</b>									
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	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated, stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0	-	-	-
Displacement	$\delta_{N0}$	[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	$\delta_{N0}$	[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
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
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	$\delta_{V0}$	[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
<b>Displacements under seismic shear loads C2</b>									
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	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	$\delta_{V0}$	[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	-
<b>Displacements under seismic shear loads C2</b>									
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	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[mm]	2,0	3,2	3,6	3,5	-	-	-
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	-	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[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			
<b>Steel failure</b>						
Characteristic tension resistance, <b>steel zinc plated</b>	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, <b>stainless steel A4, HCR</b>	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out failure</b>						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
<b>Concrete cone failure</b>						
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			
<b>Steel failure</b>						
Characteristic tension resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out</b>						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
<b>Splitting</b> ( $N_{Rk,c}^0$ 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
<b>Case 1</b>						
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 $h_{ef}$			
<b>Case 2</b>						
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 $N_{Rk,sp}^0$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
<b>Concrete cone failure</b>						
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			
<b>BZ-IG, steel zinc plated</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_2$	[-]	1,0			
<b>BZ-IG, stainless steel A4, HCR</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,56			
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_2$	[-]	1,0			
<b>Concrete pry-out failure</b>						
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
<b>Concrete edge failure</b>						
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		
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel zinc plated</b>							
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
<b>Stainless steel A4, HCR</b>							
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
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel zinc plated</b>							
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
<b>Stainless steel A4, HCR</b>							
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
<b>Steel failure with lever arm</b>							
<b>Steel zinc plated</b>							
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
<b>Stainless steel A4, HCR</b>							
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
	Displacements	$\delta_{N0}$	[mm]	0,6	0,6	0,8
$\delta_{N\infty}$		[mm]	0,8	0,8	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	4,8	6,4	8,0	12,0
	Displacements	$\delta_{N0}$	[mm]	0,4	0,5	0,7
$\delta_{N\infty}$		[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
	Displacements	$\delta_{V0}$	[mm]	2,8	2,9	2,5
$\delta_{V\infty}$		[mm]	4,2	4,4	3,8	5,3

**Wedge Anchor BZ-IG****Performance**

Displacements under tension load and under shear load

**Annex C15**