



...eine starke Verbindung

DÉCLARATION DES PERFORMANCES  
DoP N° MKT-113 - fr

1. Code d'identification unique du produit type: **MKT Goujon à bague BZ plus et BZ-IG**
2. Numéro de type, de lot ou de série ou tout autre élément permettant l'identification du produit de construction, conformément à l'article 11, paragraphe 4:

**ETA-99/0010, Annex A3 & A5**  
**Numéro de lot: voir emballage**

3. Usage ou usages prévus du produit de construction, conformément à la spécification technique harmonisée applicable, comme prévu par le fabricant:

<b>Type de produit</b>	Cheville d'ancrage à couple de serrage contrôlé (type boulon (avec taraudage))
<b>Pour utilisation dans</b>	Béton fissuré et non fissuré C20/25 - C50/60 (EN 206)
<b>Option</b>	1
<b>Charge</b>	Statique ou quasi-statique, sismique, catégorie C1+C2 (dimensions comprises BZ plus M8, M10, M12, M16, M20)
<b>Material</b>	<u>Acier galvanisé:</u> Dans des locaux intérieurs secs uniquement Dimensions comprises: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 <u>Diffusion en acier galvanisé:</u> Dans des locaux intérieurs secs uniquement Dimensions comprises: BZ plus: M10, M12, M16, M20 <u>Acier inoxydable (marquage A4):</u> A l'intérieur et à l'extérieur sans conditions particulièrement agressives Dimensions comprises: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 <u>Acier hautement résistant à la corrosion (marquage HCR):</u> A l'intérieur et à l'extérieur dans des conditions particulièrement agressives Dimensions comprises: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
<b>Plage de température (éventuellement)</b>	--

4. Nom, raison sociale ou marque déposée et adresse de contact du fabricant, conformément à l'article 11, paragraphe 5:

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

5. Le cas échéant, nom et adresse de contact du mandataire dont le mandat couvre les tâches visées à l'article 12, paragraphe 2: --
6. Le ou les systèmes d'évaluation et de vérification de la constance des performances du produit de construction, conformément à l'annexe V: **Système 1**
7. Dans le cas de la déclaration des performances concernant un produit de construction couvert par une norme harmonisée: --

8. Dans le cas de la déclaration des performances concernant un produit de construction pour lequel une évaluation technique européenne a été délivrée:

**Deutsches Institut für Bautechnik, Berlin**

a délivré:

**ETA-99/0010**

sur la base de

**ETAG 001-2**

a réalisé 1343-CPR selon le système 1:

- i) La détermination du produit type sur la base d'essais de type (y compris l'échantillonnage), de calculs relatifs au type, de valeurs issues de tableaux ou de la documentation descriptive du produit;
- ii) Une inspection notifiée de certification du contrôle de la production;
- iii) Une surveillance, une évaluation et une appréciation permanentes du contrôle de la production en usine.

a délivré: Certificat de conformité 1343-CPR-M 550-1

9. Performances déclarées:


Caractéristiques essentielles	Méthode d'évaluation	Performances		Spécifications techniques harmonisées
		BZ plus	BZ-IG	
Résistance caractéristiques en charge de traction	ETAG 001, Annex C CEN/TS 1992-4	Annex C1-C4	Annex C11-C12	ETAG 001
Résistance caractéristiques en charge transversale	ETAG 001, Annex C CEN/TS 1992-4	Annex C5	Annex C13	
Résistance caractéristiques en sismique demande	TR 045	Annex C6	NPD	
Maj en cours d'utilisation	ETAG 001, Annex C CEN/TS 1992-4	Annex C9-C10	Annex C15	
Résistance caractéristiques entre influence de feu	TR 020 CEN/TS 1992-4	Annex C7-C8	Annex C14	

Lorsque, conformément à l'article 37 ou 38, la documentation technique spécifique a été utilisée, les exigences remplies par le produit: --

10. Les performances du produit identifié aux points 1 et 2 sont conformes aux performances déclarées indiquées au point 9.

La présente déclaration des performances est établie sous la seule responsabilité du fabricant identifié au point 4.

Signée pour le fabricant et en son nom par:

  
**Stefan Weustenhagen**  
 (Directeur Générale)  
**Weilerbach, 21.04.2016**

i.V.   
**Dipl.-Ing. Detlef Bigalke**  
 (Directeur du développement de produits)



**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					

<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 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
	$\delta_{N0}$	[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	$\delta_{N0}$	[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
	$\delta_{V0}$	[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**