

DICHIARAZIONE DI PRESTAZIONE
DoP Nr. MKT-113 - it

1. Codice di identificazione unico del prodotto-tipo: **MKT Tassello a autoespansione BZ plus e BZ-IG**
2. Numero di tipo, lotto, serie o qualsiasi altro elemento che consenta l'identificazione del prodotto da costruzione ai sensi dell'articolo 11, paragrafo 4:

ETA-99/0010, Allegato A3 e A5
Numero di lotto: stampato sull'imballo

3. Uso o usi previsti del prodotto da costruzione, conformemente alla relativa specifica tecnica armonizzata, come previsto dal fabbricante:

Prodotto-tipo	Tassello ad espansione a controllo di coppia (tipo a perno)
Utilizzo previsto	Calcestruzzo fessurato e non fessurato C20/25 - C50/60 (EN 206)
Opzione	1
Tipologia di carico	Statico o quasi statico, sismico, categoria C1+C2 (Gamma di misure BZ plus M8, M10, M12, M16, M20)
Materiale	<p><u>Acciaio zincato:</u> Solo per uso interno in condizioni asciutte Gamma di misure: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12</p> <p><u>Diffusione in acciaio zincato:</u> nur in trockenen Innenräumen Gamma di misure: BZ plus: M10, M12, M16, M20</p> <p><u>Acciaio inossidabile (A4):</u> Trova impiego in locali interni così come all'esterno, se non sono presenti condizioni particolarmente aggressive Gamma di misure: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12</p> <p><u>Acciaio resistente alla corrosione (HCR):</u> Trova impiego in locali interni così come all'esterno, in condizioni particolarmente aggressive Gamma di misure: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12</p>
Intervallo di temperatura (se applicabile)	--

4. Nome, denominazione commerciale registrata o marchio registrato e indirizzo del fabbricante ai sensi dell'articolo 11, paragrafo 5:

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

5. Se opportuno, nome e indirizzo del mandatario il cui mandato copre i compiti cui all'articolo 12, paragrafo 2:
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6. Sistema o sistemi di valutazione e verifica della costanza della prestazione del prodotto da costruzione di cui all'allegato V:
Sistema 1
7. Nel caso di una dichiarazione di prestazione relativa ad un prodotto da costruzione che rientra nell'ambito di applicazione di una norma armonizzata: --

8. Nel caso di una dichiarazione di prestazione relativa ad un prodotto da costruzione per il quale è stata rilasciata una valutazione tecnica europea:

Deutsches Institut für Bautechnik, Berlin

ha rilasciato il seguente Benestare Tecnico:

ETA-99/0010

sulla base di

ETAG 001-2

L'organismo di certificazione dei prodotti 1343-CPR ha effettuato le prove secondo il Sistema 1:

- i) determinazione del prodotto-tipo in base a prove di tipo (compreso il campionamento), a calcoli di tipo, a valori desunti da tabelle o a una documentazione descrittiva del prodotto;
- ii) ispezione iniziale dello stabilimento di produzione e del controllo della produzione in fabbrica;
- iii) sorveglianza, valutazione e verifica continue del controllo della produzione in fabbrica.

rilasciando il seguente: Certificato di costanza della prestazione 1343-CPR-M 550-1

9. Prestazione dichiarata:

Caratteristiche essenziali	Metodo di dimensionamento	Prestazione		Specifica tecnica armonizzata
		BZ plus	BZ-IG	
Resistenza caratteristica a trazione	ETAG 001, Allegato C CEN/TS 1992-4	Allegato C1-C4	Allegato C11-C12	ETAG 001
Resistenza caratteristica ai carichi orizzontali	ETAG 001, Allegato C CEN/TS 1992-4	Allegato C5	Allegato C13	
Resistenza caratteristica durante il carico sismico	TR 045	Allegato C6	NPD	
Spostamento in uso	ETAG 001, Allegato C CEN/TS 1992-4	Allegato C9-C10	Allegato C15	
Resistenza caratteristica in esposizione al fuoco	TR 020 CEN/TS 1992-4	Allegato C7-C8	Allegato C14	

Qualora sia stata usata la documentazione tecnica specifica, ai sensi dell'articolo 37 o 38, i requisiti cui il prodotto risponde: --

10. La prestazione del prodotto di cui ai punti 1 e 2 è conforme alla prestazione dichiarata di cui al punto 9.

Si rilascia la presente dichiarazione di prestazione sotto la responsabilità esclusiva del fabbricante di cui al punto 4.

Firmato a nome e per conto del fabbricante da:



Stefan Weustenhagen
(Direttore generale)
Weilerbach, 21.04.2016

i.v. 

Dipl.-Ing. Detlef Bigalke
(Direttore del Sviluppo del Prodotto)



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