Prestatieverklaring

Keilboutanker BZ

geldig voor
MÜPRO Keilboutanker BZ

Prestatieverklaring conform verordening (EU) Nr. 305/2011

DoP Nr. MP Hochleistungsanker 20150409

1. Unieke identificatiecode van het producttype:

MÜPRO Keilboutanker BZ en BZ-IG

2. Type-, charge- of serienummer, dan wel een ander identificatiemiddel voor het bouwproduct, zoals voorgeschreven in artikel 11, lid 4:

ETA-05/0158, bijlage A3 en A5
Chargenummer: zie verpakking

3. Beoogde gebruik van het bouwproduct, overeenkomstig de toepasselijke geharmoniseerde technische specificatie, zoals door de fabrikant bepaald:

Producttype	Spreidanker met gecontroleerd draaimoment (bouttype (met binnendraad))
Voor toepassing in	Gescheurd en ongescheurd beton C20/25 - C50/60 (EN 206)
Optie	1
Belasting	Statisch en quasi-statisch Seismisch, categorie C1+C2 (inbegrepen maten BZ plus M10, M12, M16, M20)
Materiaal	<u>Staal verzinkt:</u> alleen in droge binnenruimtes inbegrepen maten: BZ: M8, M10, 70 M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 <u>Roestvaststaal (markering A4) (3.16):</u> voor binnen- en buitenbereiken zonder bijzondere agressieve omstandigheden inbegrepen maten: BZ: M8, M10, 70 M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 <u>Hoog-corrosiebestendig staal (markering HCR):</u> voor binnen- en buitenbereiken onder bijzondere agressieve omstandigheden inbegrepen maten: BZ: M8, M10, 70 M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
Temperatuurbereik (indien van toepassing)	--

4. Naam, geregistreerde handelsnaam of geregistreerd handelsmerk en contactadres van de fabrikant, zoals voorgeschreven in artikel 11, lid 5:

MÜPRO Services GmbH
Hessenstrasse 11
D - 65719 Hofheim-Wallau

5. Indien van toepassing, naam en contactadres van de gemachtigde wiens mandaat de in artikel 12, lid 2, vermelde taken bestrijkt:

-

MP02022b

6. Het systeem of de systemen voor de beoordeling en verificatie van de prestatiebestendigheid van het bouwproduct, vermeld in bijlage V:

Systeem 1

7. Indien de prestatieverklaring betrekking heeft op een bouwproduct dat onder een geharmoniseerde norm valt:

-

8. Indien de prestatieverklaring betrekking heeft op een bouwproduct waarvoor een Europese technische beoordeling is afgegeven:

Deutsches Institut für Bautechnik, Berlin

heeft het volgende afgegeven:

ETA-05/0158

op basis van

ETAG 001-2

De aangemelde instantie voor productcertificering 0756-CPD heeft het volgende uitgevoerd volgens systeem 1:

i) de bepaling van het producttype op grond van type onderzoek (inclusief bemonstering), typeberekening, getabelleerde waarden of een beschrijvende documentatie van het product;

ii) de initiële inspectie van de productie-installatie en van de productiecontrole in de fabriek;

iii) permanente bewaking, beoordeling en evaluatie van de productiecontrole in de fabriek

en heeft het volgende afgegeven: Certificaat van prestatiebestendigheid 1343-CPR-M552-1

MP02022b

MÜPRO GmbH
Postfach 40 01 44
D-65708 Hofheim-Wallau
Hessenstr. 11
D-65719 Hofheim-Wallau

Kontakt
Telefon: +49 6122 808-0
Telefax: +49 6122 47 02
Internet: www.muepro.de
E-Mail: info@muepro.de

Geschäftsführer
Harald Müller, Frank Schell
Amtsgericht Frankfurt/Main
HRB 76963
Ust.-Id.-Nr. DE 814699553

Bankkonten
Commerzbank
Konto: 126 971 900
BLZ: 510 800 60
SWIFT–BIC: DRES DE FF 510
IBAN: DE04 5108 0060 0126 9719 00

Frankfurter Sparkasse
Konto: 608 141
BLZ: 500 502 01
SWIFT–BIC: HELADEF1822
IBAN: DE86 5005 0201 0000 6081 41

9. Aangegeven prestatie

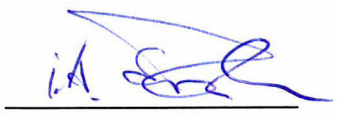
Essentiële kenmerken	Beoordelingsmethode	Prestatie		Geharmoniseerde technische specificaties
		BZ	BZ-IG	
Karakteristieke trekweerstand	ETAG 001, bijlage C CEN/TS 1992-4	ETA-05/0158, bijlage C1-C4	ETA-05/0158, bijlage C10-C11	ETAG 001
Karakteristieke afschuifweerstand	ETAG 001, bijlage C CEN/TS 1992-4	ETA-05/0158, bijlage C5	ETA-05/0158, bijlage C12	
Karakteristieke seismische weerstand	TR 045	ETA-05/0158 bijlage C6	NPD	
Verschuiving in gebruikstoestand	ETAG 001, bijlage C CEN/TS 1992-4	ETA-05/0158, bijlage C8-C9	ETA-05/0158, bijlage C14	
Karakteristieke brandweerstand	TR 020 CEN/TS 1992-4	ETA-05/0158, bijlage C7	ETA-05/0158, bijlage C13	

Indien overeenkomstig artikel 37 of 38 een specifieke technische documentatie is gebruikt, de eisen waaraan het product voldoet: --

10. De prestatie van het in de punten 1 en 2 omschreven product zijn conform de in punt 9 aangegeven prestaties

Deze prestatieverklaring wordt verstrekt onder de exclusieve verantwoordelijkheid van de in punt 4 vermelde fabrikant.

Ondertekend voor en namens de fabrikant door:



Hofheim-Wallau, 09.04.2015

i.A. Stefan Podszus,
Kwaliteitsmanager

MP02022b

MÜPRO GmbH
Postfach 40 01 44
D-65708 Hofheim-Wallau
Hessenstr. 11
D-65719 Hofheim-Wallau

Kontakt
Telefon: +49 6122 808-0
Telefax: +49 6122 47 02
Internet: www.muepro.de
E-Mail: info@muepro.de

Geschäftsführer
Harald Müller, Frank Schell
Amtsgericht Frankfurt/Main
HRB 76963
Ust.-Id.-Nr. DE 814699553

Bankkonten
Commerzbank
Konto: 126 971 900
BLZ: 510 800 60
SWIFT–BIC: DRES DE FF 510
IBAN: DE04 5108 0060 0126 9719 00

Frankfurter Sparkasse
Konto: 608 141
BLZ: 500 502 01
SWIFT–BIC: HELADEF1822
IBAN: DE86 5005 0201 0000 6081 41

Table C1: Characteristic values for **tension loads,** BZ **zinc plated, cracked concrete,** static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Installation safety factor	γ_2	[-]	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	
Pullout									
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	$N_{Rk,p,red}$	[kN]	5	7,5	1)	1)			
Increasing factor for $N_{Rk,p}$ and $N_{Rk,p,red}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$						
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 for cracked concrete	k_{cr}	[-]	7,2						

1) Pullout is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C2: Characteristic values for **tension loads,** BZ **A4** / **HCR,**
cracked concrete, static and quasi-static action,
design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Installation safety factor	γ_2	[-]	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
Pullout								
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	$N_{Rk,p,red}$	[kN]	5	7,5	1)	1)		
Increasing factor for $N_{Rk,p}$ and $N_{Rk,p,red}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
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 for cracked concrete	k_{cr}	[-]	7,2					

1) Pullout is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C3: Characteristic values for **tension loads,** BZ **zinc plated, non-cracked concrete,** static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Installation safety factor	γ_2	[-]	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	
Pullout									
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	$N_{Rk,p,red}$	[kN]	7,5	9	1)	1)			
Splitting For the proof against splitting failure $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$ 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 $h_{min} < h < h_{std}$ (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	$N^0_{Rk,sp}$	[kN]	9	12	20	30	40	1)	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	$N^0_{Rk,sp}$	[kN]	12	16	25	35	1)	1)	1)
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	$N^0_{Rk,sp}$	[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	$N^0_{Rk,sp}$	[kN]	7,5	9	1)	1)			
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	200	200	250	300			
Increasing factor for $N_{Rk,p(red)}$ and $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$						
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 for non-cracked concrete	k_{ucr}	[-]	10,1						

1) Pullout is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C4: Characteristic values for **tension loads,** BZ **A4** / **HCR,**
non-cracked concrete, static and quasi-static action,
design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Installation safety factor	γ_2	[-]	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
Pullout								
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	$N_{Rk,p,red}$	[kN]	7,5	9	1)	1)		
Splitting For the proof against splitting failure $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$ 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 $h_{min} < h < h_{std}$ (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	$N^0_{Rk,sp}$	[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	$N^0_{Rk,sp}$	[kN]	12	16	25	35	1)	1)
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	$N^0_{Rk,sp}$	[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	$N^0_{Rk,sp}$	[kN]	7,5	9	1)	1)		
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	200	200	250	300		
Increasing factor for $N_{Rk,p(red)}$ and $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
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 for non-cracked concrete	k_{ucr}	[-]	10,1					

1) Pullout is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C5: Characteristic values for **shear loads**, BZ,
cracked and **non-cracked concrete,** static or quasi static action,
design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Installation safety factor		γ_2	[-]	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 pryout failure										
k factor		$k_{(3)}$	[-]	2,4				2,8		
Concrete edge failure										
Effective length of anchor in shear loading with $\mathbf{h_{ef}}$	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 $\mathbf{h_{ef,red}}$	Steel zinc plated	$l_{f,red}$	[mm]	35	40	50	65			
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35	40	50	65			
Outside diameter of anchor		d_{nom}	[mm]	8	10	12	16	20	24	27

Heavy duty anchor BZ

Performance
Characteristic values for **shear loads**, BZ,
cracked and **non-cracked concrete,** static or quasi static action,
design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C5

Table C6: Characteristic resistance for **seismic loading**, BZ, **standard anchorage depth,** performance category **C1** and **C2,** design according to TR045

Tension loads						
Anchor size			**M10**	**M12**	**M16**	**M20**
Installation safety factor	γ_2	[-]	1,0			
Steel failure, steel zinc plated						
Characteristic resistance **C1**	$N^0_{Rk,s,seis,C1}$	[kN]	27	40	60	86
Characteristic resistance **C2**	$N^0_{Rk,s,seis,C2}$	[kN]	27	40	60	86
Partial safety factor	γ_{Ms}	[-]	1,53	1,5		1,6
Steel failure, stainless steel A4, HCR						
Characteristic resistance **C1**	$N^0_{Rk,s,seis,C1}$	[kN]	27	40	64	108
Characteristic resistance **C2**	$N^0_{Rk,s,seis,C2}$	[kN]	27	40	64	108
Partial safety factor	γ_{Ms}	[-]	1,5			1,68
Pullout						
Characteristic resistance **C1**	$N^0_{Rk,p,seis,C1}$	[kN]	9	16	25	36
Characteristic resistance **C2**	$N^0_{Rk,p,seis,C2}$	[kN]	3,6	10,2	13,8	22,4

Shear loads						
Steel failure without lever arm, Steel zinc plated						
Characteristic resistance **C1**	$V^0_{Rk,s,seis,C1}$	[kN]	20	27	44	69
Characteristic resistance **C2**	$V^0_{Rk,s,seis,C2}$	[kN]	14	16,2	35,7	55,2
Partial safety factor	γ_{Ms}	[-]	1,25			1,33
Steel failure without lever arm, Stainless steel A4, HCR						
Characteristic resistance **C1**	$V^0_{Rk,s,seis,C1}$	[kN]	20	27	44	69
Characteristic resistance **C2**	$V^0_{Rk,s,seis,C2}$	[kN]	14	16,2	35,7	55,2
Partial safety factor	γ_{Ms}	[-]	1,25			1,4

Table C7: Characteristic values **for tension and shear load** under **fire exposure,** BZ, **standard anchorage depth,** cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

Anchor size				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**
Tension load										
Steel failure										
Steel zinc plated										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,4	2,2	3,2	6,0	9,4	13,6	17,6
	R60			1,1	1,8	2,8	5,2	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	11,5	21,5	33,5	48,2	
	R60			2,9	5,2	8,6	16	25,0	35,9	
	R90			2,0	3,5	5,6	10,5	16,4	23,6	
	R120			1,6	2,7	4,2	7,8	12,1	17,4	
Shear load										
Steel failure without lever arm										
Steel zinc plated										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	3,8	7,0	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	11,5	21,5	33,5	48,2	
	R60			2,9	5,2	8,6	16	25,0	35,9	
	R90			2,0	3,5	5,6	10,5	16,4	23,6	
	R120			1,6	2,7	4,2	7,8	12,1	17,4	
Steel failure with lever arm										
Steel zinc plated										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	5,9	15	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	17,9	45,5	88,8	153,5	
	R60			2,9	6,8	13,3	33,9	66,1	114,3	
	R90			2,1	4,5	8,8	22,2	43,4	75,1	
	R120			1,6	3,4	6,5	16,4	32,1	55,5	

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

Heavy duty anchor BZ

Performance
Characteristic values **for tension and shear load** under **fire exposure,** BZ, cracked and non-cracked concrete C20/25 to C50/60, design acc. to TR 020 or CEN/TS 1992-4, Annex D

Annex C7

Table C8: Displacements under tension load, BZ

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]		4,1	4,9	3,6	5,1		
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]		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]		4,1	4,9	3,6	5,1		
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]		13,8	15,7	9,5	15,2		
Reduced anchorage depth									
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			

Table C9: Displacements under shear load, BZ

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]		2,7	3,5	4,3	4,7		
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]		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]		2,7	3,5	4,3	4,7		
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]		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			

Table C10: Characteristic values for **tension loads, BZ-IG,**
cracked concrete, static and quasi-static action,
design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M6**	**M8**	**M10**	**M12**
Installation safety factor	γ_2	[-]	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			
Pullout failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor for cracked concrete	k_{cr}	[-]	7,2			

Table C11: Characteristic values for **tension loads, BZ-IG, non-cracked concrete,** static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M6**	**M8**	**M10**	**M12**
Installation safety factor	γ_2	[-]	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			
Pullout						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
Splitting ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$. 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	$N^0_{Rk,sp}$	[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	$N^0_{Rk,sp}$	[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 $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	45	58	65	80
Factor for non-cracked concrete	k_{ucr}	[-]	10,1			

Table C12: Characteristic values for **shear loads, BZ-IG, cracked and non-cracked concrete,** static and quasi-static action, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchor size			**M6**	**M8**	**M10**	**M12**
Installation safety factor	γ_2	[-]	1,2			
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 pryout failure						
k factor	$k_{(3)}$	[-]	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

Table C13: Characteristic values for **tension** and **shear load** under **fire exposure, BZ-IG**
cracked and non-cracked concrete C20/25 to C50/60,
design acc. to TR 020 or CEN/TS 1992-4, Annex D

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 pullout failure, concrete cone failure, concrete pryout failure and concrete edge failure can be designed according to TR020 / CEN/TS 1992-4.

Table C14: 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	δ_{N0}	[mm]	0,6	0,6	0,8	1,0
	$\delta_{N\infty}$	[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	δ_{N0}	[mm]	0,4	0,5	0,7	0,8
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4

Table C15: 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	δ_{V0}	[mm]	2,8	2,9	2,5	3,6
	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3