RECA NORM

RECA | HÄLT. WIRKT. BEWEGT.

DECLARACIÓN DE PRESTACIONES
Nr. 0910000002-2015-05

1. Código de identificación única del producto tipo: **anclaje rápido BZ plus y BZ-IG**

2. Tipo, lote o número de serie o cualquier otro elemento que permita la identificación del producto de construcción como se establece en el artículo 11, apartado 4:

ETA-99/0010, Anexos A3, A5
Número de partida: ver embalaje

3. Uso o usos previstos del producto de construcción, con arreglo a la especificación técnica armonizada aplicable, tal como lo establece el fabricante:

Producto tipo	Anclaje de expansión controlada por el par de giro (tipo bulón (con rosca interior))
Para uso en	hormigón fisurado y no fisurado C20/25 - C50/60 (EN 206)
Opción	1
Carga	estática o casi-estática, sísmico, categoría C1+C2 (tamaños incluidos BZ plus M10, M12, M16, M20)
Material	Acero galvanizado: sólo en espacios interiores secos Tamaños incluidos: BZ plus: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 Acero inoxidable (marcado A4): En espacios interiores y exteriores no expuestos a condiciones especialmente agresivas Tamaños incluidos: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12 Acero altamente resistente a la corrosión (marcado HCR): En espacios interiores y exteriores expuestos a condiciones especialmente agresivas Tamaños incluidos: BZ plus: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
Rango de temperaturas	--

4. Nombre, nombre o marca registrados y dirección de contacto del fabricante según lo dispuesto en el artículo 11, apartado 5:

RECA NORM GmbH
Am Wasserturm 4
74635 Kupferzell

5. En su caso, nombre y dirección de contacto del representante autorizado, cuyo mandato abarca las tareas especificadas en el artículo 12, apartado 2: --

6. Sistema o sistemas de evaluación y verificación de la constancia de las prestaciones del producto de construcción tal como figura en el anexo V: **Sistema 1**

7. En caso de declaración de prestaciones relativa a un producto de construcción cubierto por una norma armonizada:

RECA NORM GmbH

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Sitz Kupferzell
Amtsgericht Stuttgart HRB 738108
USt-IdNr. DE146280166

Geschäftsführer
Ulrich Häfele
Ferdinand Pfaller

8. En caso de declaración de prestaciones relativa a un producto de construcción para el que se ha emitido una evaluación técnica europea:

   Instituto Alemán de Tecnología de la Construcción, Berlín

   emitido

   ETA-99/0010

   sobre la base de

   ETAG 001-2

   El organismo notificado para la certificación de productos 1343-CPR ha efectuado lo siguiente de acuerdo con el sistema 1:

   i) la determinación del producto tipo sobre la base de ensayos de tipo (incluido el muestreo), cálculos de tipo, valores tabulados o documentación descriptiva del product;
   ii) la inspección inicial de la planta de producción y del control de producción en fábrica;
   iii) la vigilancia, evaluación y supervisión permanentes del control de producción en fábrica.

   y ha emitido el documento siguiente: Certificado de la constancia del rendimiento 1343-CPR-M 550-1

9. Prestaciones declaradas:

Características esenciales	**Método de verificación**	**Prestaciones**		**Especificaciones técnicas armonizadas**
		BZ plus	**BZ-IG**	
Resistencia característica a esfuerzos de tracción	ETAG 001, Anexo C CEN/TS 1992-4	ETA-99/0010, Anexos C1-C4	ETA-99/0010, Anexos C10-C11	ETAG 001
Resistencia característica a los esfuerzos transversales	ETAG 001, Anexo C CEN/TS 1992-4	ETA-99/0010, Anexo C5	ETA-99/0010, Anexo C12	
Resistencia característica durante la carga sísmica	TR 045	ETA-99/0010, Anexo C6	NPD	
Cambio de uso	ETAG 001, Anexo C CEN/TS 1992-4	ETA-99/0010, Anexos C8-C9	ETA-99/0010, Anexo C14	
Resistencia característica bajo exposición al fuego	TR 020 CEN/TS 1992-4	ETA-99/0010, Anexo C7	ETA-99/0010, Anexo C13	

   Cuando en virtud de los artículos 37 o 38 la documentación técnica específica ha sido utilizada, los requisitos que cumple el producto: --

10. Las prestaciones del producto identificado en los puntos 1 y 2 son conformes con las prestaciones declaradas en el punto 9. La presente declaración de prestaciones se emite bajo la sola responsabilidad del fabricante identificado en el punto 4. Firmado por y en nombre del fabricante por:

ppa. Wolfgang Rau, Divisional director Product Management
(name and function)

Kupferzell, 2015-05-22
(place and date of issue)

.....
(signature)

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Table C1: Characteristic values for **tension loads,** BZ plus **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	$\gamma_2 = \gamma_{inst}$	[-]	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	$N_{Rk,p,red}$	[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) Pull-out is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C2: Characteristic values for **tension loads,** BZ plus **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	$\gamma_2 = \gamma_{inst}$	[-]	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	$N_{Rk,p,red}$	[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) Pull-out is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C3: Characteristic values for **tension loads,** BZ plus **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	$\gamma_2 = \gamma_{inst}$	[-]	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	$N_{Rk,p,red}$	[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) 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, design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Annex C3

Table C4: Characteristic values for **tension loads,** BZ plus **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	$\gamma_2 = \gamma_{inst}$	[-]	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	$N_{Rk,p,red}$	[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) Pull-out is not decisive.
2) Use restricted to anchoring of structural components statically indeterminate.

Table C5: Characteristic values for **shear loads**, BZ plus, **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		$\gamma_2 = \gamma_{inst}$	[-]	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										
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

Wedge Anchor BZ plus

Performance
Characteristic values for **shear loads**, BZ plus, **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 plus, **standard anchorage depth,** performance category **C1** and **C2,** design according to TR045

Tension loads						
Anchor size			**M10**	**M12**	**M16**	**M20**
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
Steel failure, steel zinc plated						
Characteristic resistance **C1**	$N_{Rk,s,seis,C1}$	[kN]	27	40	60	86
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]	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]	27	40	64	108
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]	27	40	64	108
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,5			1,68
Pull-out						
Characteristic resistance **C1**	$N_{Rk,p,seis,C1}$	[kN]	9	16	25	36
Characteristic resistance **C2**	$N_{Rk,p,seis,C2}$	[kN]	3,6	10,2	13,8	22,4

Shear loads						
Steel failure without lever arm, Steel zinc plated						
Characteristic resistance **C1**	$V_{Rk,s,seis,C1}$	[kN]	20	27	44	69
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	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]	20	27	44	69
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	14	16,2	35,7	55,2
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25			1,4

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, 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 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 $N_{Rk,p}$ in Eq. 2.4 and Eq. 2.5, TR 020 must be replaced by $N^0_{Rk,c}$.

Table C8: 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]		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 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]		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	$\gamma_2 = \gamma_{inst}$	[-]	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	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	$\gamma_2 = \gamma_{inst}$	[-]	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 ($N^0_{Rk,c}$ 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	$\gamma_2 = \gamma_{inst}$	[-]	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						
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 pull-out failure, concrete cone failure, concrete pry-out 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