... eine starke Verbindung

VYHLÁSENIE O PARAMETROCH
DoP č. MKT-311 - sk

1. Jedinečný identifikačný kód typu výrobku: **MKT chemická kotva VMZ a VMZ-IG**

2. Typ, číslo výrobnej dávky alebo sériové číslo, alebo akýkoľvek iný prvok umožňujúci identifikáciu stavebného výrobku, ako sa vyžaduje podľa článku 11 ods. 4:
ETA-04/0092, príloha A3 a A5
číslo šarže: viď obal výrobku

3. Zamýšľané použitia stavebného výrobku, ktoré uvádza výrobca, v súlade s uplatniteľnou harmonizovanou technickou špecifikáciou:

typ	lepená chemická kotva s kontrolovaným uťahovacím momentom
použitie	trhlinový a netrhlinový betón C20/25 - C50/60 (EN 206)
úroveň / kategória	1
zaťaženie	statické, kvázi statické alebo seizmické (výkonná kategória C1+C2) (rozmery VMZ: M10, M12, M16, M20, M24)
materiál	<u>pozinkovaná alebo diffusion pozinkované oceľ:</u> len v suchom prostredí v interiéri: rozmery: VMZ: M8, M10, M12, M16, M20, M24 <u>diffusion pozinkované oceľ:</u> len v suchom prostredí v interiéri: rozmery: VMZ-IG: M6, M8, M10, M12, M16, M20 <u>žiarovo pozinkovaná oceľ:</u> len v suchom prostredí v interiéri: rozmery: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20 <u>nehrdzavejúca oceľ (A4):</u> v interiéri alebo exteriéri bez mimoriadnych agresívnych podmienok rozmery: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20 <u>vysokoodolná nehrdzavejúca oceľ (HCR):</u> v interiéri alebo exteriéri za zvlášť agresívnych podmienok rozmery: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20
teplotný rozsah (ak je to relevantné)	Teplotný rozsah I: -40°C do +80°C Teplotný rozsah II: -40°C do +120°C

4. Meno, registrované obchodné meno alebo registrovaná ochranná známka a kontaktná adresa výrobcu, ako sa vyžaduje podľa článku 11 ods. 5:

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

5. V prípade potreby meno a kontaktná adresa splnomocneného zástupcu, ktorého splnomocnenie zahŕňa úlohy vymedzené v článku 12 ods. 2: --

6. Systém alebo systémy posudzovania a overovania nemennosti parametrov stavebného výrobku, ako sa uvádzajú v prílohe V: **systém 1**

7. V prípade vyhlásenia o parametroch týkajúceho sa stavebného výrobku, na ktorý sa vzťahuje harmonizovaná norma:

   --

8. V prípade vyhlásenia o parametroch týkajúceho sa stavebného výrobku, na ktorý bolo vypracované európske technické posúdenie:

   Nemecký inštitút pre stavebnú techniku, Berlin

   vydal:

   ETA-04/0092

   na základe

   ETAG 001-5

   vykonal notifikovaný orgán certifikácie výrobkov 1343-CPR v systéme: **1**

   i) určenie typu výrobku na základe typovej skúšky (vrátane odberu vzoriek), typového výpočtu a z tabuľkových hodnôt alebo podkladov o výrobkoch;
   ii) počiatočnú inšpekciu továrne a kontrolu výroby;
   iii) priebežný dohľad, posudzovanie a hodnotenie systému riadenia kvality

   a vydal: certifikát o nemennosti parametrov 1343-CPR-M 550-4

9. Deklarované parametre:

podstatné vlastnosti	**návrhová metóda**	**prevedenie**		**harmonizovaná technická špecifikácia**
		VMZ-A	**VMZ-IG**	
charakteristická únosnosť pri zaťažení v ťahu	ETAG 001, príloha C CEN/TS 1992-4	príloha C1-C3	príloha C10, C11	ETAG 001
charakteristická únosnosť pri zaťažení v šmyku	ETAG 001, príloha C CEN/TS 1992-4	príloha C4, C5	príloha C12	
charakteristická únosnosť pri seizmickom zaťažení	TR 045	príloha C6, C7	--	
Shift v prevádzke	ETAG 001, príloha C CEN/TS 1992-4	príloha C8, C9	príloha C12	

   Ak sa použila špecifická technická dokumentácia podľa článkov 37 alebo 38, požiadavky, ktoré výrobok spĺňa: --

10. Parametre výrobku uvedené v bodoch 1 a 2 sú v zhode s deklarovanými parametrami v bode 9. Toto vyhlásenie o parametroch sa vydáva na výhradnú zodpovednosť výrobcu uvedeného v bode 4.

    Podpísal za a v mene výrobcu:

L. Weustenhagen

Lore Weustenhagen
(vedúci podniku)
Weilerbach, 22.04.2015

i.V. Bigalke

Dipl.-Ing. Detlef Bigalke
(riaditeľ vývoja produktov)

Table C1: Characteristic values for **tension loads, VMZ-A M8 – M12, cracked concrete,** static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-A			**40 M8**	**50 M8**	**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure													
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	15	18	25		35	49	54		57		
	A4, HCR	[kN]	15	18	25		35	49	54		57		
Partial safety factor	γ_{Ms}	[-]	1,5										
Pull-out													
Characteristic resistance $N_{Rk,p}$ in concrete C20/25	50 °C / 80 °C[2]	[kN]	[1]										
	72 °C / 120 °C[2]	[kN]	5	7,5	12	12	12	16	20	20	30	30	30
Increasing factor	ψ_C	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$										
Concrete cone failure													
Effective anchorage depth	$h_{ef} \geq$	[mm]	40	50	60	75	75	70	80	95	100	110	125
Factor acc. to CEN/TS 1992-4	k_{cr}	[-]	7,2										

[1] Pull-out failure is not decisive
[2] Maximum long term temperature / Maximum short term temperature

Table C2: Characteristic values for **tension loads, VMZ-A M16 – M24, cracked concrete,** static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure													
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	88	95	111		97	96	188		222		
	A4, HCR	[kN]	88	95	111		97	114	165		194		
Partial safety factor	γ_{Ms}	[-]	1,5					1,68	1,5		1,5		
Pull-out													
Characteristic resistance $N_{Rk,p}$ in concrete C20/25	50 °C / 80 °C[2]	[kN]	[1]										
	72 °C / 120 °C[2]	[kN]	25	30	50		51	30	60		75		
Increasing factor	ψ_C	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$										
Concrete cone failure													
Effective anchorage depth	$h_{ef} \geq$	[mm]	90	105	125	145	160	115	170	190	170	200	225
Factor acc. to CEN/TS 1992-4	k_{cr}	[-]	7,2										

[1] Pull-out failure is not decisive
[2] Maximum long term temperature / Maximum short term temperature

Injection System VMZ

Performance
Characteristic values for **tension loads, VMZ-A** in **cracked concrete,** static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Annex C1

Table C3: Characteristic values for **tension loads, VMZ-A M8 – M12** in **non-cracked concrete,** static and quasi-static action (Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-A			**40 M8**	**50 M8**	**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure													
Characteristic tension resistance $N_{Rk,s}$ – Steel, zinc plated		[kN]	15	18	25		35	49	54		57		
Characteristic tension resistance $N_{Rk,s}$ – A4, HCR		[kN]	15	18	25		35	49	54		57		
Partial safety factor	γ_{Ms}	[-]	1,5										
Pull-out													
Characteristic resistance $N_{Rk,p}$ in non-cracked concrete C20/25 – 50°C / 80°C[2)]		[kN]	9	[1)]	[1)]		[1)]			40	[1)]	50	50
Characteristic resistance $N_{Rk,p}$ in non-cracked concrete C20/25 – 72°C / 120°C[2)]		[kN]	6	9	16		16	16	25	25	30	30	30
Splitting													
Splitting for **standard thickness of concrete member** (The higher resistance of Case 1 and Case 2 may be applied.)													
Standard thickness of concrete	$h_{std} \geq 2\ h_{ef}$	[mm]	100		120	150	150	140	160	190	200	220	250
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)													
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	16	20	20	20	[1)]	30	40	40	40
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}										
Case 2													
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	6 h_{ef}		5 h_{ef}	7 h_{ef}	7 h_{ef}	5 h_{ef}	3 h_{ef}	5 h_{ef}	4 h_{ef}	6 h_{ef}	5 h_{ef}
Splitting for **minimum thickness of concrete member** (The higher resistance of Case 1 and Case 2 may be applied.)													
Minimum thickness of concrete	$h_{min} \geq$	[mm]	80		100		110	110	110	125	130	140	160
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)													
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	-	16		16	20	25	25	30	30	30
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}	-	3 h_{ef}		3 h_{ef}						
Case 2													
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	6 h_{ef}	7 h_{ef}	6 h_{ef}	7 h_{ef}	7 h_{ef}	7 h_{ef}	6 h_{ef}	7 h_{ef}	6 h_{ef}	6 h_{ef}	6 h_{ef}
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_C	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$										
Concrete cone failure													
Effective anchorage depth	$h_{ef} \geq$	[mm]	40	50	60	75	75	70	80	95	100	110	125
Factor acc. to CEN/TS 1992-4	k_{ucr}	[-]	10,1										

[1)] Pull-out failure is not decisive
[2)] Maximum long term temperature / Maximum short term temperature

Table C4: Characteristic values for **tension loads, VMZ-A M16 – M24, non-cracked concrete,** static and quasi-static action, (Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure													
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	88	95	111	111	97	96	188	188	222	222	222
	A4, HCR	[kN]	88	95	111	111	97	114	165	165	194	194	194
Partial safety factor	γ_{Ms}	[-]	1,5					1,68	1,5		1,5		
Pull-out													
Characteristic resistance $N_{Rk,p}$ in non-cracked concrete C20/25	50°C / 80°C [2]	[kN]	[1]			75	90	[1]			[1]		
	72°C / 120°C [2]	[kN]	25	35	50	50	53	40	75	75	95	95	95
Splitting													
Splitting for **standard thickness of concrete** (The higher resistance of Case 1 and Case 2 may be applied.)													
Standard thickness of concrete	$h_{std} \geq 2\ h_{ef}$	[mm]	180	200	250	290	320	230	340	380	340	400	450
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)													
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	40	50	50	60	80	[1]		115	[1]		140
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}										
Case 2													
Spacing (edge distance)	$s_{cr,sp}$ (= 2$c_{cr,sp}$)	[mm]	4 h_{ef}	4 h_{ef}	4 h_{ef}	4 h_{ef}	4 h_{ef}	3 h_{ef}	3 h_{ef}	4 h_{ef}	3 h_{ef}	3 h_{ef}	3,6 h_{ef}
Splitting for **minimum thickness of concrete** (The higher resistance of Case 1 and Case 2 may be applied.)													
Minimum thickness of concrete	$h_{min} \geq$	[mm]	130	150	160	180	200	160	220	240	220	260	290
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)													
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	35	50	40	50	71	-	75	75	[1]	115	115
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}										
Case 2													
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	5 h_{ef}	5 h_{ef}	6 h_{ef}	5 h_{ef}	5 h_{ef}	5 h_{ef}	5,2 h_{ef}	4,4 h_{ef}	5,2 h_{ef}	4,4 h_{ef}	4,4 h_{ef}
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_C	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$										
Concrete cone failure													
Effective anchorage depth	$h_{ef} \geq$	[mm]	90	105	125	145	160	115	170	190	170	200	225
Factor acc. to CEN/TS 1992-4	k_{ucr}	[-]	10,1										

[1] Pull-out failure is not decisive
[2] Maximum long term temperature / Maximum short term temperature

Table C5: Characteristic values for **shear load**, **VMZ-A M8 – M12, 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 VMZ-A			**40 M8**	**50 M8**	**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure without lever arm													
Characteristic shear resistance $V_{Rk,s}$	Steel, zinc plated	[kN]	14		21		34						
	A4, HCR	[kN]	15		23		34						
Partial safety factor	γ_{Ms}	[-]	1,25										
Factor for ductility	k_2	[-]	1,0										
Steel failure with lever arm													
Characteristic bending moments $M^0_{Rk,s}$	Steel, zinc plated	[Nm]	30		60		105						
	A4, HCR	[Nm]	30		60		105						
Partial safety factor	γ_{Ms}	[-]	1,25										
Concrete pry-out failure													
Factor k acc ETAG 001, Annex C or k_3 acc. CEN/TS 1992-4	$k_{(3)}$	[-]	2										
Concrete edge failure													
Effective length of anchor in shear load	l_f	[mm]	40	50	60	75	75	70	80	95	100	110	125
Diameter of anchor	d_{nom}	[mm]	10		12		12	14					

Injection System VMZ

Performance
Characteristic values for **shear load**, **VMZ-A M8 – M12, cracked and non-cracked concrete,** static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

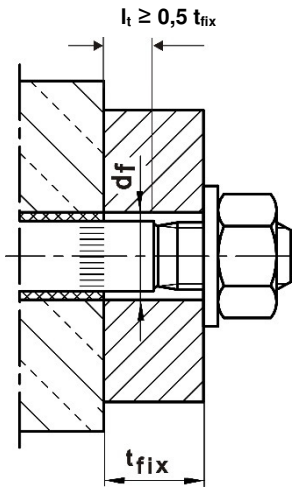
Annex C4

Table C6: Characteristic values for **shear load, VMZ-A M16 – M24, 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 VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure without lever arm													
Characteristic shear resistance $V_{Rk,s}$	Steel, zinc plated	[kN]	63					70	149 [1] (98)		178 [1] (141)		
	A4, HCR	[kN]	63					86	131 [1] (86)		156 [1] (123)		
Partial safety factor	γ_{Ms}	[-]	1,25					1,4	1,25		1,25		
Factor for ductility	k_2	[-]	1,0										
Steel failure with lever arm													
Characteristic bending moments $M^0_{Rk,s}$	Steel, zinc plated	[Nm]	266					392	519		896		
	A4, HCR	[Nm]	266					454			784		
Partial safety factor	γ_{Ms}	[-]	1,25					1,4	1,25		1,25		
Concrete pry-out failure													
Factor k acc ETAG 001, Annex C or k_3 acc. CEN/TS 1992-4	$k_{(3)}$	[-]	2										
Concrete edge failure													
Effective length of anchor in shear load	l_f	[mm]	90	105	125	145	160	115	170	190	170	200	225
Diameter of anchor	d_{nom}	[mm]	18					22	24		26		

[1] This value may only be applied if $l_t \geq 0,5\ t_{fix}$

Size M20 + M24:



Injection System VMZ

Performance
Characteristic values for **shear load, VMZ-A M16 – M24, cracked and non-cracked concrete,** static and quasi-static action (Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Annex C5

Table C7: Characteristic resistances for **seismic tension loading**
VMZ-A M10 – M12 performance category **C1** and **C2**
(Design according to EOTA Technical Report TR045)

Anchor size VMZ-A				**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]		1,0								
Steel failure, steel zinc plated												
Characteristic resistance **C1**	$N_{Rk,s,seis,C1}$	[kN]		25		35	49	54		57		
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]		25		35	49	54		57		
Steel failure, stainless steel A4, HCR												
Characteristic resistance **C1**	$N_{Rk,s,seis,C1}$	[kN]		25		35	49	54		57		
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]		25		35	49	54		57		
Partial safety factor	$\gamma_{Ms,seis}$	[-]		1,5								
Pull-out												
Characteristic resistance **C1**	$N_{Rk,p,seis,C1}$	50℃ / 80℃ [1]	[kN]	14,5		14,5		30,6				
		72℃ / 120℃ [1]	[kN]	10,9		10,9		20,0				
Characteristic resistance **C2**	$N_{Rk,p,seis,C2}$	50℃ / 80℃ [1]	[kN]	7,4		7,4		8,7				
		72℃ / 120℃ [1]	[kN]	5,1		5,1		6,5				

Table C8: Characteristic resistances for **seismic tension loading**
VMZ-A M16 – M24 performance category **C1** and **C2**
(Design according to EOTA Technical Report TR045)

Anchor size VMZ-A				**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]		1,0										
Steel failure, steel zinc plated														
Characteristic resistance **C1**	$N_{Rk,s,seis,C1}$	[kN]		88	95	111		97	96	188		222		
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]		88	95	111		97	96	188		222		
Steel failure, stainless steel A4, HCR														
Characteristic resistance **C1**	$N_{Rk,s,seis,C1}$	[kN]		88	95	111		97	114	165		194		
Characteristic resistance **C2**	$N_{Rk,s,seis,C2}$	[kN]		88	95	111		97	114	165		194		
Partial safety factor	$\gamma_{Ms,seis}$	[-]		1,5					1,68	1,5		1,5		
Pull-out														
Characteristic resistance **C1**	$N_{Rk,p,seis,C1}$	50℃ / 80℃ [1]	[kN]	30,6		43,7			30,6	88,2		90,7		
		72℃ / 120℃ [1]	[kN]	20,0		38,5			20,0	55,8		59,3		
Characteristic resistance **C2**	$N_{Rk,p,seis,C2}$	50℃ / 80℃ [1]	[kN]	13,5	16,1	26,1			16,1	59,7		59,7		
		72℃ / 120℃ [1]	[kN]	10,0	12,0	19,5			11,0	44,4		44,4		

[1] Maximum long term temperature / Maximum short term temperature

Table C9: Characteristic resistances for **seismic shear loading** **VMZ-A M10 – M12** performance category **C1** and **C2** (Design according to EOTA Technical Report TR045)

Anchor size VMZ-A			**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0								
Steel failure without lever arm, steel zinc plated											
Characteristic resistance **C1**	$V_{Rk,s,seis,C1}$	[kN]	11,8		27,2						
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	12,6		27,2						
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25								
Steel failure without lever arm, stainless steel A4, HCR											
Characteristic resistance **C1**	$V_{Rk,s,seis,C1}$	[kN]	12,9		27,2						
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	13,8		27,2						
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25								
Steel failure with lever arm											
Characteristic bending moment **C1**	$M^0_{Rk,s,seis,C1}$	[Nm]	no performance determined								
Characteristic bending moment **C2**	$M^0_{Rk,s,seis,C2}$	[Nm]	no performance determined								

Table C10: Characteristic resistances for **seismic shear loading** **VMZ-A M16 – M24** performance category **C1** and **C2** (Design according to EOTA Technical Report TR045)

Anchor size VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0										
Steel failure without lever arm, steel zinc plated													
Characteristic resistance **C1**	$V_{Rk,s,seis,C1}$	[kN]	39,1					39,1	82,3	107			
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	50,4					51,0	108,8 [1] (71,5)	154,9 [1] (122,7)			
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25					1,4	1,25	1,25			
Steel failure without lever arm, stainless steel A4, HCR													
Characteristic resistance **C1**	$V_{Rk,s,seis,C1}$	[kN]	39,1					39,1	72,2	93			
Characteristic resistance **C2**	$V_{Rk,s,seis,C2}$	[kN]	50,4					62,6	95,6 [1] (62,8)	135,7 [1] (107)			
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25					1,4	1,25	1,25			
Steel failure with lever arm													
Characteristic bending moment **C1**	$M^0_{Rk,s,seis,C1}$	[Nm]	no performance determined										
Characteristic bending moment **C2**	$M^0_{Rk,s,seis,C2}$	[Nm]	no performance determined										

[1] This value may only be applied if $l_t \geq 0{,}5\ t_{fix,}$ (see Annex C5)

Injection System VMZ

Performance
Characteristic resistances for **seismic shear loading, VMZ-A**, performance category **C1** and **C2** (Design according to TR045)

Annex C7

Table C11: Displacements under tension loads, VMZ-A M8 – M12

Anchor size VMZ-A			**40 M8**	**50 M8**	**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Tension load in cracked concrete	N	[kN]	4,3	6,1	8,0	11,1	11,1	10,0	12,3	15,9	17,1	19,8	24,0
Displacement	δ_{N0}	[mm]	0,5	0,5	0,5	0,6	0,6	0,6	0,6	0,6	0,6	0,7	0,7
	$\delta_{N\infty}$	[mm]	1,3										
Tension load in non-cracked concrete	N	[kN]	4,3	8,5	11,1	15,6	15,6	14,1	17,2	19,0	24,0	23,8	23,8
Displacement	δ_{N0}	[mm]	0,2	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,6	0,6
	$\delta_{N\infty}$	[mm]	1,3										
Displacements under seismic tension loads **C2**													
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	-	-	1,0		1,0		1,3				
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	-	-	3,0		3,0		3,9				

Table C12: Displacements under tension loads, VMZ-A M16 – M24

Anchor size VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Tension load in cracked concrete	N	[kN]	14,6	18,4	24,0	30,0	34,7	21,1	38,0	44,9	38,0	48,5	57,9
Displacement	δ_{N0}	[mm]	0,7	0,7	0,7	0,8	1,2	0,7	0,8	0,8	0,8	0,9	0,9
	$\delta_{N\infty}$	[mm]	1,3				1,6	1,1	1,3		1,3		
Tension load in non-cracked concrete	N	[kN]	20,5	25,9	33,0	35,7	48,1	29,6	53,3	63,0	53,3	67,9	81,1
Displacement	δ_{N0}	[mm]	0,6	0,6	0,6	0,6	0,8	0,5	0,6	0,6	0,6	0,6	0,6
	$\delta_{N\infty}$	[mm]	1,3				1,6	1,1	1,3		1,3		
Displacements under seismic tension loads **C2**													
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	1,5					1,9			1,9		
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	4,4					4,5			4,5		

Table C13: Displacements under shear loads VMZ-A M8 – M12

Anchor size VMZ-A			**40 M8**	**50 M8**	**60 M10**	**75 M10**	**75 M12**	**70 M12**	**80 M12**	**95 M12**	**100 M12**	**110 M12**	**125 M12**
Shear load	V	[kN]	8,3		13,3		19,3						
Displacements	δ_{V0}	[mm]	2,4	2,5	2,9		3,3						
	$\delta_{V\infty}$	[mm]	3,6	3,8	4,4		5,0						
Displacements under seismic shear loads **C2**													
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	-	-	2,1		2,5						
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	-	-	3,7		5,1						

Table C14: Displacements under shear loads VMZ-A M16 – M24

Anchor size VMZ-A			**90 M16**	**105 M16**	**125 M16**	**145 M16**	**160 M16**	**115 M20**	**170 M20 (LG)**	**190 M20 (LG)**	**170 M24 (LG)**	**200 M24 (LG)**	**225 M24 (LG)**
Shear load	V	[kN]	36					44	75 (49)		89 (71)		
Displacements	δ_{V0}	[mm]	3,8					3,0	4,3 (3,0)		4,6 (3,5)		
	$\delta_{V\infty}$	[mm]	5,7					4,5	6,5 (4,5)		6,9 (5,3)		
Displacements under seismic shear loads **C2**													
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	2,9					3,5			3,7		
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	6,8					9,3			9,3		

Table C15: Characteristic values for **tension load, VMZ-IG , cracked concrete**
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-IG			**40 M6**	**50 M6**	**60 M8**	**75 M8**	**70 M10**	**80 M10**	**90 M12**	**105 M12**	**125 M12**	**115 M16**	**170 M16**	**170 M20**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0											
Steel failure														
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	15	16	19	29	35		67			52	125	108
	A4, HCR	[kN]	11		19	21	33		47			65	88	94
Partial safety factor	γ_{Ms}	[-]	1,5											
Pull-out														
Characteristic resistance $N_{Rk,p}$ in cracked concrete C20/25	50 °C / 80 °C [2]	[kN]	[1]											
	72 °C / 120 °C [2]	[kN]	5	7,5	12		16	20	20	30	50	30	60	75
Increasing factor	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$											
Concrete cone failure														
Effective anchorage depth	h_{ef}	[mm]	40	50	60	75	70	80	90	105	125	115	170	170
Factor acc. to CEN/TS 1992-4	k_{cr}	[-]	7,2											

[1] Pull-out failure is not decisive
[2] Maximum long term temperature / Maximum short term temperature

Table C16: Characteristic values for **tension load**, **VMZ-IG , non-cracked concrete**
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-IG			**40 M6**	**50 M6**	**60 M8**	**75 M8**	**70 M10**	**80 M10**	**90 M12**	**105 M12**	**125 M12**	**115 M16**	**170 M16**	**170 M20**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0											
Steel failure														
Characteristic tension resistance $N_{Rk,s}$	Steel, zinc plated	[kN]	15	16	19	29	35		67			52	125	108
	A4, HCR	[kN]	11		19	21	33		47			65	88	94
Partial safety factor	γ_{Ms}	[-]	1,5											
Pull-out														
Characteristic resistance $N_{Rk,p}$ in non-cracked concrete C20/25	50°C / 80°C [2]	[kN]	9	[1]	[1]									
	72°C / 120°C [2]	[kN]	6	9	16		16	25	25	35	50	40	75	95
Splitting														
Splitting for standard thickness of concrete (The higher resistance of Case 1 and Case 2 may be applied.)														
Standard thickness of concrete	$h_{std} \geq 2h_{ef}$	[mm]	100		120	150	140	160	180	200	250	230	340	340
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)														
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	9	16	20	20	[1]	40	50	50	[1]		[1]
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}											
Case 2														
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	$6h_{ef}$	$6h_{ef}$	$5h_{ef}$	$7h_{ef}$	$5h_{ef}$	$3h_{ef}$	$4h_{ef}$	$4h_{ef}$	$4h_{ef}$	$3h_{ef}$	$3h_{ef}$	$3h_{ef}$
Splitting for minimum thickness of concrete (The higher resistance of Case 1 and Case 2 may be applied.)														
Minimum thickness of concrete	$h_{min} \geq$	[mm]	80		100	110	110		130	150	160	160	220	220
Case 1 ($N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$)														
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$	[kN]	7,5	-	16		20	25	35	50	40	-	75	[1]
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}											
Case 2														
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	6 h_{ef}	7 h_{ef}	6 h_{ef}	7 h_{ef}	7 h_{ef}	6 h_{ef}	5 h_{ef}	5 h_{ef}	6 h_{ef}	5 h_{ef}	5,2h_{ef}	5,2h_{ef}
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_c	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$											
Concrete cone failure														
Effective anchorage depth	h_{ef}	[mm]	40	50	60	75	70	80	90	105	125	115	170	170
Factor acc. to CEN/TS 1992-4	k_{ucr}	[-]	10,1											

[1] Pull-out failure is not decisive
[2] Maximum long term temperature / Maximum short term temperature

Injection System VMZ

Performance
Characteristic values for tension loads, **VMZ-IG** , non-cracked concrete
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Annex C11

Table C17: Characteristic values for **shear load, VMZ-IG , cracked and non-cracked concrete**
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

Anchor size VMZ-IG			**40 M6**	**50 M6**	**60 M8**	**75 M8**	**70 M10**	**80 M10**	**90 M12**	**105 M12**	**125 M12**	**115 M16**	**170 M16**	**170 M20**
Installation safety factor	$\gamma_2=\gamma_{inst}$	[-]	1,0											
Steel failure without lever arm														
Characteristic shear resistance $V_{Rk,s}$ Steel, zinc plated		[kN]	8,0		9,5	15	18		34			26	63	54
Characteristic shear resistance $V_{Rk,s}$ A4, HCR		[kN]	5,5		9,5	10	16		24			32	44	47
Partial safety factor	γ_{Ms}	[-]	1,25											
Factor for ductility	k_2	[-]	1,0											
Steel failure with lever arm														
Characteristic bending moments $M^0_{Rk,s}$ Steel, zinc plated		[kN]	12		30		60		105			212	266	519
Characteristic bending moments $M^0_{Rk,s}$ A4, HCR		[kN]	8,5		21		42		74			187	187	365
Partial safety factor	γ_{Ms}	[-]	1,25											
Concrete pry-out failure														
Factor k acc ETAG 001, Annex C or k_3 acc. CEN/TS 1992-4	$k_{(3)}$	[-]	2											
Concrete edge failure														
Effective length of anchor in shear load	l_f	[mm]	40	50	60	75	70	80	90	105	125	115	170	170
Diameter of anchor	d_{nom}	[mm]	10		12		14		18			22	24	26

Table C18: Displacements under **tension loads, VMZ-IG**

Anchor size VMZ-IG			**40 M6**	**50 M6**	**60 M8**	**75 M8**	**70 M10**	**80 M10**	**90 M12**	**105 M12**	**125 M12**	**115 M16**	**170 M16**	**170 M20**
Tension load in **cracked** concrete	N	[kN]	4,3	6,1	8,0	11,1	10,0	12,3	14,6	18,4	24,0	21,1	38,0	38,0
Displacement	δ_{N0}	[mm]	0,5		0,5	0,6	0,6		0,7			0,7	0,8	0,8
Displacement	$\delta_{N\infty}$	[mm]	1,3									1,1	1,3	1,3
Tension load in **non-cracked** concrete	N	[kN]	4,3	8,5	11,1	15,6	14,1	17,2	20,5	25,9	33,0	29,6	53,3	53,3
Displacement	δ_{N0}	[mm]	0,2	0,4	0,4		0,4		0,6			0,5	0,6	0,6
Displacement	$\delta_{N\infty}$	[mm]	1,3									1,1	1,3	1,3

Table C19: Displacements under **shear loads, VMZ-IG**

Anchor size VMZ-IG			**40 M6**	**50 M6**	**60 M8**	**75 M8**	**70 M10**	**80 M10**	**90 M12**	**105 M12**	**125 M12**	**115 M16**	**170 M16**	**170 M20**
Shear load **Steel, zinc plated**	V	[kN]	4,6		5,4	8,4	10,1		19,3			14,8	35,8	30,7
Displacement	δ_{V0}	[mm]	0,4		0,5	0,4	0,5		1,2			0,8	1,9	1,2
Displacement	$\delta_{V\infty}$	[mm]	0,7		0,8	0,7	0,8		1,9			1,2	2,8	1,9
Shear load **Stainless steel A4 / HCR**	V	[kN]	3,2		5,4	5,9	9,3		13,5			18,5	25,2	26,9
Displacement	δ_{V0}	[mm]	0,3		0,5	0,3	0,5		0,9			1,0	1,4	1,1
Displacement	$\delta_{V\infty}$	[mm]	0,4		0,7	0,5	0,7		1,4			1,5	2,1	1,6

Injection System VMZ

Performance
Characteristic values for **shear load, VMZ-IG , cracked and non-cracked concrete**
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4), **Displacements**

Annex C12