

**IZJAVA O SVOJSTVIMA
DoP-br. MKT-311 - hr**

1. Jedinstvena identifikacijska oznaka vrste proizvoda: **MKT injekcijski sustav VMZ i VMZ-IG**
2. Tip, serija ili serijski broj ili bilo koji drugi element kojim se omogućuje identifikacija građevnog proizvoda, kako je potrebno sukladno članku 11. stavku 4.:

**ETA-04/0092, dodatak A3 i A5
Broj proizvodne serije: pogledajte pakiranje**

3. Namjeravana uporaba ili uporabe građevnog proizvoda, u skladu s primjenjivim usklađenim tehničkim specifikacijama, kako je predvidio proizvođač:

Vrsta proizvoda	vezivna sidra
Za uporabu u	napuknuti i nenapuknuti beton C20/25 - C50/60 (EN 206)
Izbor	1
Opterećenje	statički ili kvazi-statički, seizmički, kategorija C1+C2 (veličine VMZ: M10, M12, M16, M20, M24)
Materijal	<p><u>Vruće cinčani ili difuzijski pocinčano čelik:</u> samo u suhim interijerima važeće dimenzije: VMZ: M8, M10, M12, M16, M20, M24</p> <p><u>Difuzijski pocinčano čelik:</u> samo u suhim interijerima važeće dimenzije: VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Galvanski pocinčani čelik</u> samo u suhim interijerima važeće dimenzije: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Nehrđajući čelik (oznaka A4):</u> u unutarnjim i vanjskim prostorima, bez posebno agresivnih uvjeta važeće dimenzije: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Vrlo otporno na koroziju (oznaka HCR)</u> u unutarnjim i vanjskim prostorima s posebno agresivnih uvjeta važeće dimenzije: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p>
Raspon temperature (možda)	Područje I: -40 °C za +80 °C Područje II: -40 °C za +120 °C

4. Ime, registrirani trgovački naziv ili registrirani žig i kontaktna adresa proizvođača, kako je potrebno sukladno članku 11. stavku 5.:

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

5. Prema potrebi, ime i kontaktna adresa ovlaštenog predstavnika čije ovlaštenje obuhvaća zadatke poblize označene u članku 12. stavku 2.: --

6. Sustav ili sustavi ocjenjivanja i provjere stalnosti svojstava građevnog proizvoda, kako je utvrđeno u Prilogu V. : **Sustav 1**

7. U slučaju Izjave o svojstvima u vezi s građevnim proizvodom obuhvaćenim usklađenom normom: --

8. U slučaju izjave o svojstvima koja se odnosi na građevni proizvod za koji je izdana europska tehnička ocjena:

Deutsches Institut für Bautechnik, Berlin

izdan:

ETA-04/0092

na temelju

ETAG 001-5

Ovlaštena kuća izdaje: 1343-CPR, prema sustavu 1:

- i) utvrđivanja vrste proizvoda na temelju ispitivanja tipa (uključujući uzorkovanje), izračuna tipa, tabličnih vrijednosti ili opisne dokumentacije proizvoda;
- ii) početnu inspekciju proizvodnog pogona i kontrolu tvorničke proizvodnje;
- iii) stalni nadzor, ocjenjivanje i vrednovanje kontrole tvorničke proizvodnje.

i izdano: **Certifikat o stalnosti svojstva 1343-CPR-M 550-4**

9. Objavljeno svojstvo:

Bitne značajke	Metoda	Svojstva		Usklađena tehnička specifikacija
		VMZ-A	VMZ-IG	
Karakteristična otpornost na vlačne sile	ETAG 001, Dodatak C CEN/TS 1992-4	Dodatak C1-C3	Dodatak C10, C11	ETAG 001
Karakteristična otpornost sile na odrez	ETAG 001, Dodatak C CEN/TS 1992-4	Dodatak C4, C5	Dodatak C12	
Karakteristična otpornost na seizmička opterećenja	TR 045	Dodatak C6, C7	--	
Pomak u korištenju	ETAG 001, Dodatak C CEN/TS 1992-4	Dodatak C8, C9	Dodatak C12	

U slučaju kada je sukladno članku 37. ili 38. upotrijebljena specifična tehnička dokumentacija, zahtjevi s kojima je proizvod usklađen: --

10. Svojstvo proizvoda utvrđeno u točkama 1. i 2. u skladu je s objavljenim svojstvom u točki 9.

Ova izjava o svojstvima objavljena je pod isključivom odgovornošću proizvođača identificiranog u točki 4.

Za proizvođača i u njegovo ime potpisao:


Lore Weustenhagen
(Managing Director)
Weilerbach, 22.04.2015

i.V. 
Dipl.-Ing. Detlef Bigalke
(Head of Product Development)



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				
	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 ¹⁾	1 ¹⁾			40	1 ¹⁾	50	50	
	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 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)													
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	7,5	9	16	20	20	20	1 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}	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 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)													
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[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 $N_{Rk,sp}^0$	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

Injection System VMZ

Performance

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

Annex C2

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 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)													
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[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 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)													
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	35	50	40	50	71	-	75	75	1)		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 $N_{Rk,sp}^0$	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

Injection System VMZ

Performance

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)**

Annex C3

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

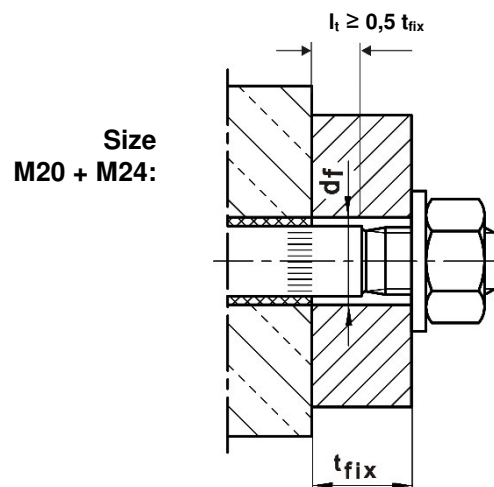
Characteristic values for **shear load, VMZ-A M8 – M12, cracked and non-cracked concrete**, static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

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	Steel, zinc plated [kN]	63					70	149 ¹⁾ (98)		178 ¹⁾ (141)		
$V_{Rk,s}$	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	Steel, zinc plated [Nm]	266					392	519		896		
$M^0_{Rk,s}$	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 $l_f \geq 0,5 t_{fix}$



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 °C / 80 °C ¹⁾	[kN]	14,5		14,5				30,6	
		72 °C / 120 °C ¹⁾	[kN]	10,9		10,9				20,0	
Characteristic resistance C2	$N_{Rk,p,seis,C2}$	50 °C / 80 °C ¹⁾	[kN]	7,4		7,4				8,7	
		72 °C / 120 °C 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 °C / 80 °C ¹⁾	[kN]	30,6		43,7		30,6	88,2			90,7	
		72 °C / 120 °C ¹⁾	[kN]	20,0		38,5		20,0	55,8			59,3	
Characteristic resistance C2	$N_{Rk,p,seis,C2}$	50 °C / 80 °C ¹⁾	[kN]	13,5	16,1	26,1		16,1	59,7			59,7	
		72 °C / 120 °C ¹⁾	[kN]	10,0	12,0	19,5		11,0	44,4			44,4	

¹⁾ Maximum long term temperature / Maximum short term temperature

Injection System VMZ	Annex C6
Performance Characteristic resistances for seismic tension loading, VMZ-A , performance category C1 and C2 (Design according to TR045)	

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		

Injection System VMZ

Performance

Displacements under tension loads, **VMZ-A**

Annex C8

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				

Injection System VMZ

Performance
Displacements under shear loads, **VMZ-A**

Annex C9

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

Injection System VMZ

Performance

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

Annex C10

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 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)															
Characteristic resistance in concrete C20/25	$N_{Rk,sp}^0$	[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]	6 h_{ef}	6 h_{ef}	5 h_{ef}	7 h_{ef}	5 h_{ef}	3 h_{ef}	4 h_{ef}	4 h_{ef}	4 h_{ef}	3 h_{ef}	3 h_{ef}	3 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]	80	100	110	110	130	150	160	160	220	220			
Case 1 ($N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$)															
Characteristic resistance in concrete C20/25	$N_{Rk,sp}^0$	[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}	5,2 h_{ef}	5,2 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]	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		
	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			
	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
	$\delta_{N\infty}$	[mm]	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
	$\delta_{N\infty}$	[mm]	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
	$\delta_{V\infty}$	[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
	$\delta_{V\infty}$	[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