

TELJESÍTMÉNYNYILATKOZAT
DoP Nr. MKT-311 - hu

1. A terméktípus egyedi azonosító kódja: **MKT Injektionssystem VMZ, VMZ-IG**
2. Típus-, tétel- vagy sorozatszám vagy egyéb ilyen elem, amely lehetővé teszi az építési termék azonosítását a 11. cikk (4) bekezdésében előírtaknak megfelelően:

ETA-04/0092, Melléklet A3, A5
Gyártási szám a csomagoláson vagy a címkén

3. Az építési terméknek a gyártó által meghatározott rendeltetése vagy rendeltetései az alkalmazandó harmonizált műszaki előírással összhangban:

általános típus	Nyomaték kontrollált ragasztott horgony
való használatra	Repedéses és repedésmentes betonban C20/25 - C50/60 (EN 206)
opció	1
terhelés	Statikus vagy kvázi-statikus, szeizmikus, kategória C1+C2 (Méretek VMZ: M10, M12, M16, M20, M24)
anyag	<p><u>Tűzhorganyzott vagy diffúziós horganyzott acél:</u> száraz belső használatra Méretek: VMZ: M8, M10, M12, M16, M20, M24</p> <p><u>Diffúziós horganyzott acél:</u> száraz belső használatra Méretek: VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Horganyzott acé:</u> száraz belső használatra Méretek: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Özsdamentes acél (jelölés A4):</u> belső és külső használatra nem különösen agresszív feltételek Méretek: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p> <p><u>Magas korrózióállóságú acél (jelölés HCR):</u> belső és kültéri alkalmazás különösen agresszív körülmények között Méretek: VMZ: M8, M10, M12, M16, M20, M24 VMZ-IG: M6, M8, M10, M12, M16, M20</p>
hőmérséklet tartomány, ha alkalmazható	terület I: -40 °C - +80 °C terület II: -40 °C - +120 °C

4. A gyártók neve, bejegyzett kereskedelmi neve, illetve bejegyzett védjegye, valamint értesítési címe a 11. cikk (5) bekezdésében előírtaknak megfelelően:

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

5. Adott esetben annak a meghatalmazott képviselőnek a neve és értesítési címe, akinek a megbízása körébe a 12. cikk (2) bekezdésében meghatározott feladatok tartoznak: --

6. Az építési termékek teljesítménye állandóságának értékelésére és ellenőrzésére szolgáló, az V. mellékletben szereplők szerinti rendszer vagy rendszerek: **rendszer 1**
7. Harmonizált szabványok által szabályozott építési termékekre vonatkozó gyártói nyilatkozat esetén: --
8. Olyan építési termékekre vonatkozó gyártói nyilatkozat esetén, amelyekre európai műszaki értékelést adtak ki:

Deutsches Institut für Bautechnik, Berlin

a következőt adta ki

ETA-04/0092

alapján

ETAG 001-5

A bejelentett termék tanúsító szervezet 1343-CPR tette, hogy a rendszer 1:

- i) a terméktípus meghatározása típusvizsgálat (ideértve a mintavételt is), típusszámítás, táblázatba foglalt értékek vagy a termék leíró dokumentációja alapján;
- ii) a gyártó üzem és az üzemi gyártásellenőrzés alapvizsgálata;
- iii) az üzemi gyártásellenőrzés folyamatos felügyelete, vizsgálata és értékelése.

és a következőt adta ki: a termék megfelelőségi tanúsítványa 1343-CPR-M 550-4

9. A nyilatkozat szerinti teljesítmény:

Alapvető tulajdonságok	Tervezési módszer	Teljesítmény		Harmonizált műszaki előírások
		VMZ-A	VMZ-IG	
karakterisztikus ellenállás húzásra	ETAG 001, Melléklet C CEN/TS 1992-4	Melléklet C1-C3	Melléklet C10, C11	ETAG 001
karakterisztikus ellenállás nyírásra	ETAG 001, Melléklet C CEN/TS 1992-4	Melléklet C4, C5	Melléklet C12	
karakterisztikus ellenállás szeizmikus kereslet	TR 045	Anhang C6, C7	--	
elmozdulás használhatósági határállapot	ETAG 001, Melléklet C CEN/TS 1992-4	Melléklet C8, C9	Melléklet C12	

Amennyiben a 37. és 38. cikknek megfelelően egyedi műszaki dokumentáció alkalmazására került sor, a termék által teljesített követelmények: --

10. Az 1. és 2. pontban meghatározott termék teljesítménye megfelel a 9. pontban feltüntetett, nyilatkozat szerinti teljesítménynek.

E teljesítménynyilatkozat kiadásáért kizárólag a 4. pontban meghatározott gyártó a felelős.

A gyártó nevében és részéről aláíró személy:


Lore Weustenhagen
(menedzser)
Weilerbach, 22.04.2015

i.V. 
Dipl.-Ing. Detlef Bigalke
(menedzser termékefejlesztés)



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}	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

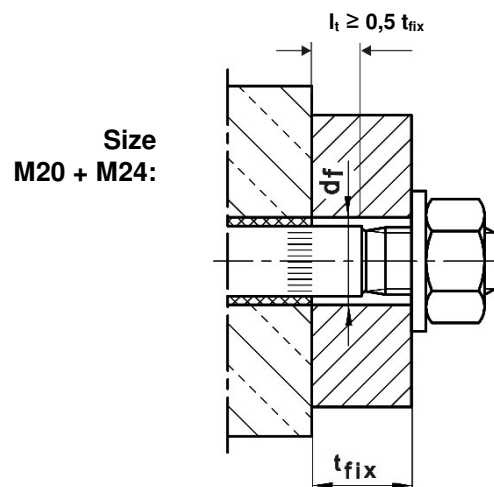
Characteristic values for **shear load, VMZ-A M8 – M12, cracked and non-cracked concrete**, static and quasi-static action
(Design method A according to ETAG 001, Annex C or CEN/TS 1992-4)

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