... eine starke Verbindung

DECLARATION OF PERFORMANCE
DoP No. MKT-431 - en

1. Unique identification code of the product-type: **MKT Injection System VME**

2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):
ETA-13/0773, Annex A2 and A3
Batch number: see packaging of the product

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	bonded anchor
for use in	non-cracked concrete C20/25 – C50/60 (EN 206)
option	7
loading	static or quasi-static
material	reinforcement bar (B 500 B): covered sizes: Ø10, Ø12, Ø14, Ø16, Ø20, Ø25 zinc-plated steel: dry internal conditions only covered sizes: M10, M12, M16, M20, M24 stainless steel (marking A4): internal and external use without particular aggressive conditions covered sizes: M10, M12, M16, M20, M24 highly corrosion resistant steel (marking HCR): internal and external use with particular aggressive conditions covered sizes: M10, M12, M16, M20, M24
temperature range (if applicable)	Range I: -40 °C to +40 °C Range II: -40 °C to +60 °C Range III: -40 °C to +72 °C

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):
MKT Metall-Kunststoff-Technik GmbH & Co. KG
Auf dem Immel 2
D - 67685 Weilerbach

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2): --

6. System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V: **System 1**

7. In case of the declaration of performance concerning a construction product covered by a harmonised standard: --

8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

Deutsches Institut für Bautechnik, Berlin

issued

ETA-13/0773

on the basis of

ETAG 001-5

The notified body 1343-CPR performed under system 1:

(i) determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;
(ii) initial inspection of the manufacturing plant and of factory production control;
(iii) continuous surveillance, assessment and evaluation of factory production control.

and issued: Certificate of constancy of performance 1343-CPR-M550-18/08.14

9. Declared performance:

Essential Characteristics	**Design Method**	**Performance**		**Harmonized Technical Specification**
		Threaded rod	**Rebar**	
characteristic resistance for tension (static or quasi-static)	TR 029	Annex C1	Annex C3	ETAG 001
characteristic resistance for shear (static or quasi-static)	TR 029	Annex C2	Annex C4	
displacement for serviceability limit state	TR 029	Annex C5	Annex C6	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies: --

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

Stefan Weustenhagen
(General Manager)
Weilerbach, 01.03.2017

i.V.
Dipl.-Ing. Detlef Bigalke
(Head of product development)

Table C1: Characteristic values for **threaded rods** under **tension loads** in uncracked concrete

Anchor size threaded rod				**M 10**	**M 12**	**M 16**	**M 20**	**M24**
Steel failure								
Characteristic tension resistance, Steel, property class 4.6		$N_{Rk,s}$	[kN]	23	34	63	98	141
Characteristic tension resistance, Steel, property class 5.8		$N_{Rk,s}$	[kN]	29	42	78	122	176
Characteristic tension resistance, Steel, property class 8.8		$N_{Rk,s}$	[kN]	46	67	125	196	282
Characteristic tension resistance, Stainless steel A4 and HCR, property class 70		$N_{Rk,s}$	[kN]	41	59	110	171	247
Combined pull-out and concrete cone failure								
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	11	10	10	9,5	9,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	9,0	10	9,5	9,5	8,5
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,5	6,0	6,0	5,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,0	6,0	5,5
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	6,0	6,0	5,5	5,0	5,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,0	6,0	5,0	5,0	5,0
Increasing factor for concrete		ψ_c	C30/37	[-]	1,04			
			C40/50	[-]	1,08			
			C50/60	[-]	1,10			
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3		k_8		[-]	10,1			
Concrete cone failure								
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1		k_{ucr}		[-]	10,1			
Edge distance		$c_{cr,N}$		[mm]	$1{,}5\ h_{ef}$			
Spacing		$s_{cr,N}$		[mm]	$3{,}0\ h_{ef}$			
Splitting failure								
Edge distance		$c_{cr,sp}$		[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$			
Spacing		$s_{cr,sp}$		[mm]	$2\ c_{cr,sp}$			
Installation safety factor		$\gamma_2 = \gamma_{inst}$		[-]	1,0	1,2		

Injection System VME for concrete

Performances
Characteristic values of resistance for threaded rods under tension loads in uncracked concrete

Annex C1

Table C2: Characteristic values for **threaded rods** under **shear loads** in uncracked concrete

Anchor size threaded rod			**M 10**	**M 12**	**M 16**	**M 20**	**M24**
Steel failure without lever arm							
Characteristic shear resistance, Steel, property class 4.6	$V_{Rk,s}$	[kN]	12	17	31	49	71
Characteristic shear resistance, Steel, property class 5.8	$V_{Rk,s}$	[kN]	15	21	39	61	88
Characteristic shear resistance, Steel, property class 8.8	$V_{Rk,s}$	[kN]	23	34	63	98	141
Characteristic shear resistance, Stainless steel A4 and HCR, property class 70	$V_{Rk,s}$	[kN]	20	30	55	86	124
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k_2	[-]	0,8				
Steel failure with lever arm							
Characteristic bending moment, Steel, property class 4.6	$M^0_{Rk,s}$	[Nm]	30	52	133	260	449
Characteristic bending moment, Steel, property class 5.8	$M^0_{Rk,s}$	[Nm]	37	65	166	324	560
Characteristic bending moment, Steel, property class 8.8	$M^0_{Rk,s}$	[Nm]	60	105	266	519	896
Characteristic bending moment, Stainless steel A4 and HCR, property class 70	$M^0_{Rk,s}$	[Nm]	52	92	232	454	784
Concrete pry-out failure							
Factor k acc. to TR029 und k_3 acc. to CEN/TS 1992-4-5 Section 6.3.3	$k_{(3)}$	[-]	2,0				
Concrete edge failure							
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$				
Outside diameter of anchor	d_{nom}	[mm]	10	12	16	20	24
Installation safety factor[-]	$\gamma_2 = \gamma_{inst}$	[-]	1,0				

Table C3: Characteristic values for **rebar** under **tension loads** in uncracked concrete

Anchor size reinforcing bar				**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
Steel failure									
Characteristic tension resistance		$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$					
Combined pull-out and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	11	10	10	10	9,5	9,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	9,0	10	10	9,5	9,5	8,5
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,5	6,5	6,0	6,0	5,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,5	6,0	6,0	5,5
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	6,0	6,0	6,0	5,5	5,0	5,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,0	6,0	5,5	5,5	5,0	5,0
Increasing factor for concrete	C30/37	ψ_c	[-]	1,04					
	C40/50		[-]	1,08					
	C50/60		[-]	1,10					
Factor according to CEN/TS 1992-4-5 Section 6.2.2.3		k_8	[-]	10,1					
Concrete cone failure									
Factor according to CEN/TS 1992-4-5 Section 6.2.3.1		k_{ucr}	[-]	10,1					
Edge distance		$c_{cr,N}$	[mm]	$1,5\ h_{ef}$					
Spacing		$s_{cr,N}$	[mm]	$3,0\ h_{ef}$					
Splitting failure									
Edge distance		$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$					
Spacing		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$					
Installation safety factor		$\gamma_2 = \gamma_{inst}$	[-]	1,0	1,2				

Table C4: Characteristic values for **rebar** under **shear loads** in uncracked concrete

Anchor size reinforcing bar			**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
Steel failure without lever arm								
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0{,}50 \cdot A_s \cdot f_{uk}$					
Ductility factor according to CEN/TS 1992-4-5 Section 6.3.2.1	k_2	[-]	0,8					
Steel failure with lever arm								
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el} \cdot f_{uk}$					
Concrete pry-out failure								
Factor k acc. to TR029 und k_3 acc. to CEN/TS 1992-4-5 Section 6.3.3	$k_{(3)}$	[-]	2,0					
Concrete edge failure								
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef};\ 8\ d_{nom})$					
Outside diameter of anchor	d_{nom}	[mm]	10	12	14	16	20	25
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					

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Performances
Characteristic values of resistance for **rebar** under shear loads in uncracked concrete

Annex C4

Table C5: Displacements under tension loads [1] (threaded rod)

Anchor size threaded rod			M 10	M 12	M 16	M 20	M24
Temperature range 40°C/24°C for non-cracked concrete C20/25							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,020	0,024	0,029
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,052	0,061	0,079	0,096	0,114
Temperature range 72°C/43°C and 60°C/43°C for non-cracked concrete C20/25							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,023	0,028	0,033
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,091	0,111	0,131

[1] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: action bond strength
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C6: Displacement under shear load [1] (threaded rod)

Anchor size threaded rod			M10	M12	M16	M20	M24
Displacement	δ_{V0}-factor	[mm/(kN)]	0,06	0,05	0,04	0,04	0,03
Displacement	$\delta_{V\infty}$-factor	[mm/(kN)]	0,08	0,08	0,06	0,06	0,05

[1] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;

Table C7: Displacements under tension loads [1] (rebar)

Anchor size reinforcing bar			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
Temperature range 40°C/24°C for non-cracked concrete C20/25								
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,020	0,024	0,030
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,052	0,061	0,070	0,079	0,096	0,118
Temperature range 72°C/43°C and 60°C/43°C for non-cracked concrete C20/25								
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,020	0,023	0,028	0,034
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,081	0,091	0,111	0,136

[1] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: action bond strength
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C8: Displacement under shear load [1] (rebar)

Anchor size reinforcing bar			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
Displacement	δ_{V0}-factor	[mm/(kN)]	0,05	0,05	0,04	0,04	0,04	0,03
Displacement	$\delta_{V\infty}$-factor	[mm/(kN)]	0,08	0,07	0,06	0,06	0,05	0,05

[1] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;