

Declaration of Performance

MKT Injection system VMU Plus
for use in concrete

valid for

Injection anchor XV Plus

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DECLARATION OF PERFORMANCE
DoP No. MKT-321 - en

1. Unique identification code of the product-type: **MKT Injection System VMU plus**
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):
ETA-11/0415, 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	cracked and non-cracked concrete C20/25 - C50/60 (EN 206)
option	1
loading	static or quasi-static, seismic category C1
material	<u>hot-dip galvanized steel:</u> dry internal conditions only covered sizes: M8, M10, M12, M16, M20, M24, M27, M30 <u>zinc-plated steel:</u> dry internal conditions only covered sizes: M8, M10, M12, M16, M20, M24, M27, M30 <u>stainless steel (marking A4):</u> internal and external use without particular aggressive conditions covered sizes: M8, M10, M12, M16, M20, M24, M27, M30 <u>high corrosion resistant steel (marking HCR):</u> internal and external use with particular aggressive conditions covered sizes: M8, M10, M12, M16, M20, M24, M27, M30 <u>reinforcing bar (B500 B):</u> covered sizes: Ø8, Ø10, Ø12, Ø14, Ø16, Ø20, Ø25, Ø28, Ø32
temperature range (if applicable)	Range I: -40 °C to +40 °C Range II: -40 °C to +80 °C Range III: -40 °C to +120 °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-11/0415

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-M 550-10

9. Declared performance:

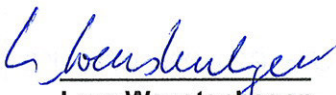
Essential Characteristics	Design Method	Performance		Harmonized Technical Specification
		threaded rod	rebar	
characteristic resistance for tension (static or quasi-static)	TR 029, CEN/TS 1992-4	Annex C1, C2	Annex C5, C6	ETAG 001
characteristic resistance for shear (static or quasi-static)	TR 029, CEN/TS 1992-4	Annex C3	Annex C7	
characteristic resistance for seismic C1	TR 045	Annex C4	Annex C8	
displacement for serviceability limit state	TR 029, CEN/TS 1992-4	Annex C9	Annex C10	

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:


Lore Weustenhagen
 (General Manager)
Weilerbach, 13.11.2015

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



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

Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel failure											
Characteristic tension resistance		N _{Rk,s}	[kN]	A _s · f _{uk}							
Combined pull-out and concrete cone failure											
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I: 40 °C/24 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	6,5	6,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	4,0	4,0	5,5	5,5	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,5	4,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,5	3,0	4,0	4,0	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	not admissible			
Increasing factor for τ _{Rk,cr}		ψ _c	C25/30	1,02							
			C30/37	1,04							
			C35/45	1,07							
			C40/50	1,08							
			C45/55	1,09							
			C50/60	1,10							
Factor according to CEN/TS 1992-4-5		k ₈	[-]	7,2							
Concrete cone failure											
Factor according to CEN/TS 1992-4-5		k _{cr}	[-]	7,2							
Edge distance		c _{cr,N}	[mm]	1,5 h _{ef}							
Axial distance		s _{cr,N}	[mm]	3,0 h _{ef}							
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2						
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4				not admissible			

Injection sytem VMU plus for concrete

Performance

Characteristic values for **threaded rods** under **tension loads** in **cracked concrete**

Annex C1

Table C2: Characteristic values for **threaded rods** under **tension loads** in **non-cracked concrete**

Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel failure											
Characteristic tension resistance		N _{Rk,s}	[kN]	A _s • 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	τ _{Rk,ucr}	[N/mm²]	10	12	12	12	12	11	10	9
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	7,5	8,5	8,5	8,5	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	7,5	9	9	9	9	8,5	7,5	6,5
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5	5,5	5,0
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	4,0	5,0	5,0	5,0	not admissible			
Increasing factor for τ _{Rk,ucr}		ψ _c	C25/30	1,02							
			C30/37	1,04							
			C35/45	1,07							
			C40/50	1,08							
			C45/55	1,09							
			C50/60	1,10							
Factor according to CEN/TS 1992-4-5		k ₈	[-]	10,1							
Concrete cone failure											
Factor according to CEN/TS 1992-4-5		k _{ucr}	[-]	10,1							
Edge distance		C _{cr,N}	[mm]	1,5 h _{ef}							
Axial distance		S _{cr,N}	[mm]	3,0 h _{ef}							
Splitting failure											
Edge distance for		C _{cr,sp}	[mm]	1,0 · h _{ef} ≤ 2 · h _{ef} ⋅ (2,5 - $\frac{h}{h_{ef}}$) ≤ 2,4 · h _{ef}							
Axial distance		S _{cr,sp}	[mm]	2 C _{cr,sp}							
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2						
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4				not admissible			

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Performance

Characteristic values for **threaded rods** under **tension loads** in **non-cracked concrete**

Annex C2

Table C3: Characteristic values for **threaded rods** under **shear loads** in **cracked and non-cracked concrete**

Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$							
Ductility factor according to CEN/TS 1992-4-5	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 TR 029 or k_3 acc. to CEN/TS 1992-4-5	$k_{(3)}$	[-]	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]	8	10	12	16	20	24	27	30
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							

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Characteristic value for **threaded rods** under **shear loads**

Annex C3

Table C4: Characteristic values for **threaded rods** under **seismic action**, category **C1**

Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Tension load											
Steel failure											
Characteristic tension resistance		N _{Rk,s,seis}	[kN]	A _s • f _{uk}							
Combined pull-out and concrete cone failure											
Characteristic bond resistance in concrete C20/25 to C50/60											
Temperature range I: 40 °C/24 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm ²]	2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,5
	flooded bore hole	τ _{Rk,seis}	[N/mm ²]	2,5	2,5	3,7	3,7	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm ²]	1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,1
	flooded bore hole	τ _{Rk,seis}	[N/mm ²]	1,6	1,9	2,7	2,7	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm ²]	1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4
	flooded bore hole	τ _{Rk,seis}	[N/mm ²]	1,3	1,6	2,0	2,0	not admissible			
Increasing factor for τ _{Rk,seis}		ψ _c	[-]	1,0							
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2						
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4				not admissible			
Shear load											
Steel failure without lever arm											
Characteristic shear resistance		V _{Rk,s,seis}	[kN]	0,35 • A _s • f _{uk}							
Steel failure with lever arm											
Characteristic bending moment		M ⁰ _{Rk,s,seis}	[Nm]	No Performance Determined (NPD)							

Injection sytem VMU plus for concrete**Performance**Characteristic values for **threaded rods** under **seismic action**, category **C1****Annex C4**

Table C5: Characteristic values for **rebar** under **tension loads** in **cracked concrete**

Rebar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic tension resistance		N _{Rk,s}	[kN]	A _s • f _{uk} ¹⁾								
Combined pull-out and concrete cone failure												
Characteristic bond resistance in cracked concrete C20/25												
Temperature range I: 40 °C/24 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	5,5	6,5	6,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	4,0	4,0	5,5	5,5	5,5	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,0	4,5	4,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,5	3,0	4,0	4,0	4,0	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,5	3,5
	flooded bore hole	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	3,0	not admissible			
Increasing factors for τ _{Rk,cr}		ψ _c	C25/30	1,02								
			C30/37	1,04								
			C35/45	1,07								
			C40/50	1,08								
			C45/55	1,09								
			C50/60	1,10								
Factor acc. to CEN/TS 1992-4-5		k ₈	[-]	7,2								
Concrete cone failure												
Factor acc. to CEN/TS 1992-4-5		k _{cr}	[-]	7,2								
Edge distance		c _{cr,N}	[mm]	1,5 h _{ef}								
Axial distance		s _{cr,N}	[mm]	3,0 h _{ef}								
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2							
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4					not admissible			

1) $f_{uk} = f_{tk} = k \cdot f_{yk}$ **Injection sytem VMU plus for concrete****Performance**Characteristic values for **rebar** under **tension loads** in **cracked concrete****Annex C5**

Table C6: Characteristic values for **rebar** under **tension loads** in **non-cracked concrete**

Rebar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic tension resistance		N _{Rk,s}	[kN]	A _s • f _{uk} ¹⁾								
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	τ _{Rk,ucr}	[N/mm²]	10	12	12	12	12	12	11	10	8,5
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	7,5	8,5	8,5	8,5	8,5	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	7,5	9	9	9	9	9	8,0	7,0	6,0
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	6,5	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,ucr}	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5	6,0	5,0	4,5
	flooded bore hole	τ _{Rk,ucr}	[N/mm²]	4,0	5,0	5,0	5,0	5,0	not admissible			
Increasing factors for τ _{Rk,ucr}		ψ _c	C25/30	1,02								
			C30/37	1,04								
			C35/45	1,07								
			C40/50	1,08								
			C45/55	1,09								
			C50/60	1,10								
Factor acc. to CEN/TS 1992-4-5		k ₈	[-]	10,1								
Concrete cone failure												
Factor acc. to CEN/TS 1992-4-5		k _{ucr}	[-]	10,1								
Edge distance		C _{cr,N}	[mm]	1,5 h _{ef}								
Axial distance		S _{cr,N}	[mm]	3,0 h _{ef}								
Splitting failure												
Edge distance for		C _{cr,sp}	[mm]	1,0·h _{ef} ≤ 2·h _{ef} $\left(2,5-\frac{h}{h_{ef}}\right) \leq 2,4 \cdot h_{ef}$								
Axial distance		S _{cr,sp}	[mm]	2 C _{cr,sp}								
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2							
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4					not admissible			

¹⁾ $f_{uk} = f_{tk} = k \cdot f_{yk}$

Injection sytem VMU plus for concrete

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Characteristic values for **rebar** under **tension loads** in **non-cracked concrete**

Annex C6

Table C7: Characteristic values for **rebar** under **shear loads** in **cracked and non-cracked concrete**

Rebar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm											
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0,50 \cdot A_s \cdot f_{uk}^{1)}$								
Ductility factor according to CEN/TS 1992-4-5	k_2	[-]	0,8								
Steel failure with lever arm											
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}^{1)}$								
Concrete pry-out failure											
Factor k acc. to TR 029 or k_3 acc. to CEN/TS 1992-4-5	$k_{(3)}$	[-]	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]	8	10	12	14	16	20	25	28	32
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0								

¹⁾ $f_{uk} = f_{tk} = k \cdot f_{yk}$

Injection sytem VMU plus for concrete

Performance

Characteristic values for **rebar** under **shear loads** in **cracked and non-cracked concrete**

Annex C7

Table C8: Characteristic values for **rebar** under **seismic action**, category **C1**

Rebar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Tension load												
Steel failure												
Characteristic tension resistance		N _{Rk,s,seis}	[kN]	A _s • f _{uk} ¹⁾								
Combined pull-out and concrete cone failure												
Characteristic bond resistance in concrete C20/25 to C50/60												
Temperature range I: 40 °C/24 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm²]	2,5	3,1	3,7	3,7	3,7	3,7	3,8	4,5	4,5
	flooded bore hole	τ _{Rk,seis}	[N/mm²]	2,5	2,5	3,7	3,7	3,7	not admissible			
Temperature range II: 80 °C/50 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm²]	1,6	2,2	2,7	2,7	2,7	2,7	2,8	3,1	3,1
	flooded bore hole	τ _{Rk,seis}	[N/mm²]	1,6	1,9	2,7	2,7	2,7	not admissible			
Temperature range III: 120 °C/72 °C	dry and wet concrete	τ _{Rk,seis}	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,0	2,1	2,4	2,4
	flooded bore hole	τ _{Rk,seis}	[N/mm²]	1,3	1,6	2,0	2,0	2,0	not admissible			
Increasing factor for τ _{Rk,seis}		ψ _c	[-]	1,0								
Installation safety factor (dry and wet concrete)		γ ₂ = γ _{inst}	[-]	1,0	1,2							
Installation safety factor (flooded bore hole)		γ ₂ = γ _{inst}	[-]	1,4					not admissible			
Shear load												
Steel failure without lever arm												
Characteristic shear resistance		V _{Rk,s,seis}	[kN]	0,35 • A _s • f _{uk} ¹⁾								
Steel failure with lever arm												
Characteristic bending moment		M ⁰ _{Rk,s,seis}	[Nm]	No Performance Determined (NPD)								

1) $f_{uk} = f_{tk} = k \cdot f_{yk}$ **Injection sytem VMU plus for concrete****Performance**Characteristic values for **rebar** under **seismic action**, category **C1****Annex C8**

Table C9: Displacements under tension loads¹⁾ (threaded rod)

Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete C20/25										
Temperature range I: 40 °C/24 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,021	0,023	0,026	0,031	0,036	0,041	0,045	0,049
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,030	0,033	0,037	0,045	0,052	0,060	0,065	0,071
Temperature range II: 80 °C/50 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Temperature range III: 120 °C/72 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Cracked concrete C20/25										
Temperature range I: 40 °C/24 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,090		0,070					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,105		0,105					
Temperature range II: 80 °C/50 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,219		0,170					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,255		0,245					
Temperature range III: 120 °C/72 °C	δ_{N0} -factor	[mm/(N/mm ²)]	0,219		0,170					
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,255		0,245					

¹⁾ Calculation of the displacement

$$\delta_{N0} = \delta_{N0}\text{-Faktor} \cdot \tau; \quad \tau: \text{acting bond stress for tension load}$$

$$\delta_{N\infty} = \delta_{N\infty}\text{-Faktor} \cdot \tau;$$

Table C10: Displacements under shear load¹⁾ (threaded rod)

Threaded rod			M 8	M 10	M 12	M 16	M 20	M24	M 27	M 30
Non-cracked concrete C20/25										
All temperature ranges	δ_{V0} -factor	[mm/(kN)]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
	$\delta_{V\infty}$ -factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
Cracked concrete C20/25										
All temperature ranges	δ_{V0} -factor	[mm/(kN)]	0,12	0,12	0,11	0,10	0,09	0,08	0,08	0,07
	$\delta_{V\infty}$ -factor	[mm/(kN)]	0,18	0,18	0,17	0,15	0,14	0,13	0,12	0,10

¹⁾ Calculation of the displacement

$$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V; \quad V: \text{acting shear load}$$

$$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V;$$

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Performance
Displacements (threaded rod)

Annex C9

Table C11: Displacements under tension load¹⁾ (rebar)

Rebar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked concrete C20/25											
Temperature range I: 40 °C/24 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,021	0,023	0,026	0,028	0,031	0,036	0,043	0,047	0,052
	δ _{N∞} -factor	[mm/(N/mm²)]	0,030	0,033	0,037	0,041	0,045	0,052	0,061	0,071	0,075
Temperature range II: 80 °C/50 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
	δ _{N∞} -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,181
Temperature range III: 120 °C/72 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
	δ _{N∞} -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,181
Cracked concrete C20/25											
Temperature range I: 40 °C/24 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,090				0,070				
	δ _{N∞} -factor	[mm/(N/mm²)]	0,105				0,105				
Temperature range II: 80 °C/50 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,219				0,170				
	δ _{N∞} -factor	[mm/(N/mm²)]	0,255				0,245				
Temperature range III: 120 °C/72 °C	δ _{N0} -factor	[mm/(N/mm²)]	0,219				0,170				
	δ _{N∞} -factor	[mm/(N/mm²)]	0,255				0,245				

¹⁾ Calculation of the displacement

δ_{N0} = δ_{N0}-Faktor · τ; τ: acting bond stress for tension load

δ_{N∞} = δ_{N∞}-Faktor · τ;

Table C12: Displacements under shear load¹⁾ (rebar)

Rebar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked concrete C20/25											
All temperature ranges	δ _{v0} -factor	[mm/(kN)]	0,06	0,05	0,05	0,04	0,04	0,04	0,03	0,03	0,03
	δ _{v∞} -factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04	0,04
Cracked concrete C20/25											
All temperature ranges	δ _{v0} -factor	[mm/(kN)]	0,12	0,12	0,11	0,11	0,10	0,09	0,08	0,07	0,06
	δ _{v∞} -factor	[mm/(kN)]	0,18	0,18	0,17	0,16	0,15	0,14	0,12	0,11	0,10

¹⁾ Calculation of the displacement

δ_{v0} = δ_{v0}-factor · V; V: acting shear load

δ_{v∞} = δ_{v∞}-factor · V;

Injection sytem VMU plus for concrete

Performance
Displacements (rebar)

Annex C10