... eine starke Verbindung

DECLARATION OF PERFORMANCE
DoP No. MKT-340 - en

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

2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):
ETA-17/0716, 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 uncracked concrete C20/25 - C50/60 (EN 206)	
Option	1	
Loading	static or quasi-static: : - threaded rod (M8-M30) - internally threaded anchor rod (IG-M6 to IG-M20) - reinforcing bar (Ø8 – Ø32) seismic category C1: - threaded rod M8 – M30 (except hot-dip galvanised) - reinforcing bar Ø8 – Ø32 seismic category C2: - threaded rod M12, (electroplated and sherardized (property class 8.8), A4 and HCR)	
Material	**Threaded rod: M8, M10, M12, M16, M20, M24, M27, M30**	
	zinc-plated steel (hot-dip galvanized steel, electroplated, sherardized)	dry internal conditions only
	stainless steel (A4):	internal and external use without particular aggressive conditions
	high corrosion resistant steel (HCR):	internal and external use with particular aggressive conditions
	Internally threaded anchor rod: IG-M6, IG-M8, IG-M10, IG-M12, IG-M16, IG-M20	
	steel, electroplated	dry internal conditions only
	stainless steel (A4):	internal and external use without particular aggressive conditions
	high corrosion resistant steel (HCR):	internal and external use with particular aggressive conditions
	Reinforcing bar (B500 B): Ø8, Ø10, Ø12, Ø14, Ø16, Ø20, Ø25, Ø28, Ø32	
Temperature range (if applicable)	Range I: -40°C to +80°C Range II: -40°C to +120°C Range III: -40°C to +160°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-17/0716

   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 550-20/08.14

9. Declared performance:

Essential characteristics	Design method	Performance			Harmonized technical specification
		Threaded rod	Internally threaded anchor rod	rebar	
characteristic resistance for tension	TR 029 CEN/TS 1992-4 TR 045	Annex C1 and C2	Annex C4	Annex C6	ETAG 001
characteristic resistance for shear	TR 029 CEN/TS 1992-4 TR 045	Annex C1 and C3	Annex C5	Annex C7	
displacement for serviceability limit state	TR 029, CEN/TS 1992-4	Annex C8	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:

Stefan Weustenhagen
(General Manager)
Weilerbach, 08.12.2017

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

Table C1: Characteristic **steel resistance** for **threaded rods** under tension and shear resistance

Threaded rod				**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M 24**	**M 27**	**M 30**
Steel failure											
Tension load											
Characteristic tension resistance	Steel, Property class 4.6 and 4.8	$N_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
	Steel, Property class 5.6 and 5.8	$N_{Rk,s}$	[kN]	18	29	42	78	122	176	230	280
	Steel, Property class 8.8	$N_{Rk,s}$	[kN]	29	46	67	125	196	282	368	449
	Stainless steel A4 and HCR, Property class 50	$N_{Rk,s}$	[kN]	18	29	42	79	123	177	230	281
	Stainless steel A4 and HCR, Property class 70	$N_{Rk,s}$	[kN]	26	41	59	110	171	247	-	-
Partial factor	Steel, Property class 4.6	$\gamma_{Ms,N}$	[-]	2,0							
	Steel, Property class 4.8	$\gamma_{Ms,N}$	[-]	1,5							
	Steel, Property class 5.6	$\gamma_{Ms,N}$	[-]	2,0							
	Steel, Property class 5.8	$\gamma_{Ms,N}$	[-]	1,5							
	Steel, Property class 8.8	$\gamma_{Ms,N}$	[-]	1,5							
	Stainless steel A4 and HCR, Property class 50	$\gamma_{Ms,N}$	[-]	2,86							
	Stainless steel A4 and HCR, Property class 70	$\gamma_{Ms,N}$	[-]	1,87						-	-
Shear load											
Steel failure <u>without</u> lever arm											
Characteristic shear resistance	Steel, Property class 4.6 and 4.8	$V_{Rk,s}$	[kN]	7	12	17	31	49	71	92	112
	Steel, Property class 5.6 and 5.8	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
	Steel, Property class 8.8	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
	Stainless steel A4 and HCR, Property class 50	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
	Stainless steel A4 and HCR, Property class 70	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	-	-
Steel failure <u>with</u> lever arm											
Characteristic bending moment	Steel, Property class 4.6 and 4.8	$M_{Rk,s}$	[Nm]	15	30	52	133	260	449	666	900
	Steel, Property class 5.6 and 5.8	$M_{Rk,s}$	[Nm]	19	37	65	166	324	560	833	1123
	Steel, Property class 8.8	$M_{Rk,s}$	[Nm]	30	60	105	266	519	896	1333	1797
	Stainless steel A4 and HCR, Property class 50	$M_{Rk,s}$	[Nm]	19	37	66	167	325	561	832	1125
	Stainless steel A4 and HCR, Property class 70	$M_{Rk,s}$	[Nm]	26	52	92	232	454	784	-	-
Partial factor	Steel, Property class 4.6	$\gamma_{Ms,V}$	[-]	1,67							
	Steel, Property class 4.8	$\gamma_{Ms,V}$	[-]	1,25							
	Steel, Property class 5.6	$\gamma_{Ms,V}$	[-]	1,67							
	Steel, Property class 5.8	$\gamma_{Ms,V}$	[-]	1,25							
	Steel, Property class 8.8	$\gamma_{Ms,V}$	[-]	1,25							
	Stainless steel A4 and HCR, Property class 50	$\gamma_{Ms,V}$	[-]	2,38							
	Stainless steel A4 and HCR, Property class 70	$\gamma_{Ms,V}$	[-]	1,56						-	-

Table C2: Characteristic values of **tension loads** for **threaded rods** under static, quasi-static action and seismic action C1 + C2

Threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure											
Characteristic tension resistance		$N_{Rk,s}$	[kN]	see Table C1							
		$N_{Rk,s,C1}$	[kN]	$1{,}0 \cdot N_{Rk,s}$							
		$N_{Rk,s,C2}$	[kN]	NPD		$1{,}0 \cdot N_{Rk,s}$	No Performance Determined (NPD)				
Partial factor		$\gamma_{Ms,N}$	[-]	see Table C1							
Combined pull-out and concrete failure											
Characteristic bond resistance in uncracked concrete C20/25											
Temperature range I: 80°C / 50°C		$\tau_{Rk,ucr}$	[N/mm²]	17	17	16	15	14	13	13	13
Temperature range II: 120°C / 72°C		$\tau_{Rk,ucr}$	[N/mm²]	15	14	14	13	12	12	11	11
Temperature range III: 160°C / 100°C		$\tau_{Rk,ucr}$	[N/mm²]	12	12	11	10	9,5	9,0	9,0	9,0
Characteristic bond resistance in cracked concrete C20/25											
Temperature range I: 80°C / 50°C		$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]	6,5	7,0	7,5	8,5	8,5	8,5	8,5	8,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		3,6	No Performance Determined (NPD)				
Temperature range II: 120°C / 72°C		$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]	5,5	6,0	6,5	7,5	7,5	7,5	7,5	7,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		3,1	No Performance Determined (NPD)				
Temperature range III: 160°C / 100°C		$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]	5,0	5,5	6,0	6,5	6,5	6,5	6,5	6,5
		$\tau_{Rk,C2}$	[N/mm²]	NPD		2,5	No Performance Determined (NPD)				
Increasing factors for concrete		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/TS1992-4-5	uncracked concrete	k_8	[-]	10,1							
	cracked concrete			7,2							
Concrete cone failure											
Factor according to CEN/TS1992-4-5	uncracked concrete	k_{ucr}	[-]	10,1							
	cracked concrete	k_{cr}	[-]	7,2							
Splitting failure											
Edge distance	$h/h_{ef} \geq 2{,}0$	$c_{cr,sp}$	[mm]	$1{,}0\ h_{ef}$							
	$2{,}0 > h/h_{ef} > 1{,}3$			$2 * h_{ef} (2{,}5 - h / h_{ef})$							
	$h/h_{ef} \leq 1{,}3$			$2{,}4\ h_{ef}$							
Spacing		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$							
Installation factor **Compressed air cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,0 (1,2)[1)]			1,2				
Installation factor **Manual cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,2			-				

[1)] Value in brackets for cracked concrete

Injection System VMH for concrete

Performance
Characteristic values of **tension loads** for **threaded rods**

Annex C2

Table C3: Characteristic values of **shear loads** for **threaded rods** under static, quasi-static action and seismic action C1 + C2

Threaded rod			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure <u>without</u> lever arm										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	see Table C1							
	$V_{Rk,s,C1}$	[kN]	$0{,}70 \cdot V_{Rk,s}$							
	$V_{Rk,s,C2}$	[kN]	NPD		$0{,}80 \cdot V_{Rk,s}$	No Performance Determined (NPD)				
Partial factor	$\gamma_{Ms,V}$	[-]	see Table C1							
Steel failure <u>with</u> lever arm										
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	see Table C1							
	$M^0_{Rk,s,C1}$	[Nm]	No Performance Determined (NPD)							
	$M^0_{Rk,s,C2}$	[Nm]								
Partial factor	$\gamma_{Ms,V}$	[-]	see Table C1							
Concrete pry-out failure										
Factor k acc. to TR 029 Factor k_3 acc. to CEN/TS 1992-4-5	$k_{(3)}$	[-]	2,0							
Installation factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							
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 factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							

Injection System VMH for concrete

Performance
Characteristic values of **shear loads** for **threaded rods**

Annex C3

Table C4: Characteristic values of **tension loads** for **internally threaded anchor rod** under static, quasi-static action

Internally threaded anchor rod				**IG-M 6**	**IG-M 8**	**IG-M 10**	**IG-M 12**	**IG-M 16**	**IG-M 20**
Steel failure [1]									
Characteristic tension resistance, Steel, strength class 5.8		$N_{Rk,s}$	[kN]	10	18	29	42	79	123
Partial factor		$\gamma_{Ms,N}$	[-]	1,5					
Characteristic tension resistance, Steel, strength class 8.8		$N_{Rk,s}$	[kN]	16	27	46	67	121	196
Partial factor		$\gamma_{Ms,N}$	[-]	1,5					
Characteristic tension resistance, Stainless steel A4 / HCR, strength class 70		$N_{Rk,s}$	[kN]	14	26	41	59	110	124 [3]
Partial factor		$\gamma_{Ms,N}$	[-]	1,87					2,86
Combined pull-out and concrete failure									
Characteristic bond resistance in <u>uncracked</u> concrete C20/25									
Temperature range I: 80°C / 50°C		$\tau_{Rk,ucr}$	[N/mm²]	17	16	15	14	13	13
Temperature range II: 120°C / 72°C		$\tau_{Rk,ucr}$	[N/mm²]	14	14	13	12	12	11
Temperature range III: 160°C / 100°C		$\tau_{Rk,ucr}$	[N/mm²]	12	11	10	9,5	9,0	9,0
Characteristic bond resistance in <u>cracked</u> concrete C20/25									
Temperature range I: 80°C / 50°C		$\tau_{Rk,cr}$	[N/mm²]	7,0	7,5	8,5	8,5	8,5	8,5
Temperature range II: 120°C / 72°C		$\tau_{Rk,cr}$	[N/mm²]	6,0	6,5	7,5	7,5	7,5	7,5
Temperature range III: 160°C / 100°C		$\tau_{Rk,cr}$	[N/mm²]	5,5	6,0	6,5	6,5	6,5	6,5
Increasing factors for concrete		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/TS1992-4-5	uncracked concrete	k_8	[-]	10,1					
	cracked concrete			7,2					
Concrete cone failure									
Factor according to CEN/TS1992-4-5	uncracked concrete	k_{ucr}	[-]	10,1					
	cracked concrete	k_{cr}	[-]	7,2					
Splitting failure									
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	1,0 h_{ef}					
	$2,0 > h/h_{ef} > 1,3$			2 * h_{ef} (2,5 – h / h_{ef})					
	$h/h_{ef} \leq 1,3$			2,4 h_{ef}					
Spacing		$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$					
Installation factor **Compressed air cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,0 (1,2)[2]			1,2		
Installation factor **Manual cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,2			-		

[1] Fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the internally threaded anchor rod. The characteristic tension resistance for steel failure of the given strength class are valid for the internally threaded anchor rod and the fastening element

[2] Value in brackets for cracked concrete

[3] For VMU-IG M20: Internally threaded rod: strength class 50; Fastening screws or threaded rods (incl. nut and washer): strength class 70

Table C5: Characteristic values of **shear loads** for **internally threaded anchor rod** under static and quasi-static action

Internally threaded anchor rod			**IG-M 6**	**IG-M 8**	**IG-M 10**	**IG-M 12**	**IG-M 16**	**IG-M 20**
Steel failure <u>without</u> lever arm[1)]								
Characteristic shear resistance Steel, strength class 5.8	$V_{Rk,s}$	[kN]	5	9	15	21	39	61
Partial factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic shear resistance Steel, strength class 8.8	$V_{Rk,s}$	[kN]	8	14	23	34	60	98
Partial factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic shear resistance Stainless steel A4 / HCR, strength class 70	$V_{Rk,s}$	[kN]	7	13	20	30	55	62 [2)]
Partial factor	$\gamma_{Ms,V}$	[-]	1,56					2,38
Steel failure <u>with</u> lever arm[1)]								
Characteristic bending moment, Steel, strength class 5.8	$M^0_{Rk,s}$	[Nm]	8	19	37	66	167	325
Partial factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic bending moment, Steel, strength class 8.8	$M^0_{Rk,s}$	[Nm]	12	30	60	105	267	519
Partial factor	$\gamma_{Ms,V}$	[-]	1,25					
Characteristic bending moment, Stainless steel A4 / HCR, strength class 70	$M^0_{Rk,s}$	[Nm]	11	26	53	92	234	643 [2)]
Partial factor	$\gamma_{Ms,V}$	[-]	1,56					2,38
Concrete pry-out failure								
Factor k acc. to TR 029 Factor 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]	10	12	16	20	24	30
Installation factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					

[1)] Fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the internally threaded anchor rod. The characteristic shear resistance for steel failure of the given strength class are valid for the internally threaded anchor rod and the fastening element

[2)] For VMU-IG M20: Internally threaded rod: strength class 50; Fastening screws or threaded rods (incl. nut and washer): strength class 70

Table C6: Characteristic values of **tension loads** for **rebar** under static, quasi-static action and seismic action C1

Reinforcing bar				**Ø 8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
Steel failure												
Characteristic tension resistance	$N_{Rk,s} = N_{Rk,s,C1}$	[kN]		$A_s \cdot f_{uk}$[1)]								
Cross section area	A_s	[mm²]		50	79	113	154	201	314	491	616	804
Partial factor	$\gamma_{Ms,N}$	[-]		1,4[2)]								
Combined pull-out and concrete failure												
Characteristic bond resistance in <u>uncracked</u> concrete C20/25												
Temperature range I: 80°C / 50°C	$\tau_{Rk,ucr}$	[N/mm²]		14	14	14	14	13	13	13	13	13
Temperature range II: 120°C / 72°C	$\tau_{Rk,ucr}$	[N/mm²]		13	12	12	12	12	11	11	11	11
Temperature range III: 160°C / 100°C	$\tau_{Rk,ucr}$	[N/mm²]		10	10	9,5	9,5	9,5	9,0	9,0	9,0	9,0
Characteristic bond resistance in <u>cracked</u> concrete C20/25												
Temperature range I: 80°C / 50°C	$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]		5,0	5,5	6,0	6,0	7,5	7,5	7,5	7,5	8,0
Temperature range II: 120°C / 72°C	$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]		4,5	5,0	5,0	5,5	6,5	6,5	6,5	6,5	7,0
Temperature range III: 160°C / 100°C	$\tau_{Rk,cr} = \tau_{Rk,C1}$	[N/mm²]		4,0	4,5	4,5	5,0	5,5	6,0	6,0	5,5	6,5
Increasing factor for concrete		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/TS1992-4-5	uncracked concrete	k_8	[-]	10,1								
	cracked concrete			7,2								
Concrete cone failure												
Factor according to CEN/TS1992-4-5	uncracked concrete	k_{ucr}	[-]	10,1								
	cracked concrete	k_{cr}	[-]	7,2								
Splitting failure												
Edge distance	$h/h_{ef} \geq 2,0$	$c_{cr,sp}$	[mm]	$1,0\ h_{ef}$								
	$2,0 > h/h_{ef} > 1,3$			$2 * h_{ef} (2,5 - h / h_{ef})$								
	$h/h_{ef} \leq 1,3$			$2,4\ h_{ef}$								
Spacing		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$								
Installation factor **Compressed air cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,0 (1,2)[3)]					1,2			
Installation factor **Manual cleaning**		$\gamma_2 = \gamma_{inst}$	[-]	1,2					-			

[1)] f_{uk} shall be taken from the specifications of reinforcing bars
[2)] in absence of nation regulation
[3)] Value in brackets for cracked concrete

Table C7: Characteristic values of **shear loads** for **rebar** under static, quasi-static action and seismic action C1

Reinforcing bar			**Ø 8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
Steel failure <u>without</u> lever arm											
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0{,}50 \cdot A_s \cdot f_{uk}$ [1)]								
	$V_{Rk,s,C1}$	[kN]	$0{,}37 \cdot A_s \cdot f_{uk}$ [1)]								
Cross section area	A_s	[mm²]	50	79	113	154	201	314	491	616	804
Partial factor	$\gamma_{Ms,V}$	[-]	1,5 [2)]								
Ductility factor according to CEN/TS 1992-4-5	k_2	[-]	0,8								
Steel failure <u>with</u> lever arm											
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el} \cdot f_{uk}$ [1)]								
	$M^0_{Rk,s,C1}$	[Nm]	No Performance Determined (NPD)								
Elastic section modulus	W_{el}	[mm³]	50	98	170	269	402	785	1534	2155	3217
Partial factor	$\gamma_{Ms,V}$	[-]	1,5 [2)]								
Concrete pry-out failure											
Factor k acc. to TR 029 Factor k_3 acc. to CEN/TS 1992-4-5	$k_{(3)}$	[-]	2,0								
Installation factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0								
Concrete edge failure											
Effective length of rebar	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$								
Outside diameter of rebar	d_{nom}	[mm]	8	10	12	14	16	20	25	28	32
Installation factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0								

[1)] f_{uk} shall be taken from the specifications of reinforcing bars
[2)] in absence of nation regulation

Table C8: **Displacements** under **tension loads**[1)] (threaded rod)

Threaded rod			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Uncracked concrete C20/25 under static and quasi-static action										
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,031	0,032	0,034	0,037	0,039	0,042	0,044	0,046
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,040	0,042	0,044	0,047	0,051	0,054	0,057	0,060
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,034	0,035	0,038	0,041	0,044	0,046	0,048
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,042	0,044	0,045	0,049	0,053	0,056	0,059	0,062
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,121	0,126	0,131	0,142	0,153	0,163	0,171	0,179
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,124	0,129	0,135	0,146	0,157	0,168	0,176	0,184
Cracked concrete C20/25 under static and quasi-static action										
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,081	0,083	0,085	0,090	0,095	0,099	0,103	0,106
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,104	0,107	0,110	0,116	0,122	0,128	0,133	0,137
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,084	0,086	0,088	0,093	0,098	0,103	0,107	0,110
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,108	0,111	0,114	0,121	0,127	0,133	0,138	0,143
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,312	0,321	0,330	0,349	0,367	0,385	0,399	0,412
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,321	0,330	0,340	0,358	0,377	0,396	0,410	0,424
Cracked concrete C20/25 under seismic action (C2)										
All temperature ranges	$\delta_{N,seis\ (DLS)}$ -factor	[mm/(N/mm²)]	(NPD)		0,120	No Performance Determined (NPD)				
	$\delta_{N,seis\ (ULS)}$ -factor	[mm/(N/mm²)]			0,140					

[1)] Calculation of the displacement

$\delta_{N0} = \delta_{N0}$- factor $\cdot \tau$; $\delta_{N,seis(DLS)} = \delta_{N,seis(DLS)}$-factor $\cdot \tau$; τ: acting bond stress for tension

$\delta_{N\infty} = \delta_{N\infty}$- factor $\cdot \tau$; $\delta_{N,seis(ULS)} = \delta_{N,seis(ULS)}$-factor $\cdot \tau$;

Table C9: **Displacements** under **shear load**[1)] (threaded rod)

Threaded rod			**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M24**	**M 27**	**M 30**
Uncracked and cracked concrete C20/25 under static and quasi-static action										
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 under seismic action (C2)										
All temperature ranges	$\delta_{V,seis(DLS)}$ -factor	[mm/(kN)]	(NPD)		0,27	No Performance Determined (NPD)				
	$\delta_{V,seis(ULS)}$ -factor	[mm/(kN)]			0,27					

[1)] Calculation of the displacement

$\delta_{V0} = \delta_{V0}$-factor $\cdot$ V; $\delta_{V,seis(DLS)} = \delta_{V,seis(DLS)}$- factor $\cdot$ V; V: acting shear load

$\delta_{V\infty} = \delta_{V\infty}$-factor $\cdot$ V; $\delta_{V,seis(ULS)} = \delta_{V,seis(ULS)}$- factor $\cdot$ V;

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Table C10: Displacements under tension load[1)] (internally threaded anchor rod)

Internally threaded anchor rod			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Uncracked concrete C20/25 under static and quasi-static action								
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,034	0,037	0,039	0,042	0,046
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,042	0,044	0,047	0,051	0,054	0,060
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,034	0,035	0,038	0,041	0,044	0,048
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,044	0,045	0,049	0,053	0,056	0,062
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,126	0,131	0,142	0,153	0,163	0,179
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,129	0,135	0,146	0,157	0,168	0,184
Cracked concrete C20/25 under static and quasi-static action								
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,083	0,085	0,090	0,095	0,099	0,106
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,107	0,110	0,116	0,122	0,128	0,137
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,086	0,088	0,093	0,098	0,103	0,110
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,111	0,114	0,121	0,127	0,133	0,143
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,321	0,330	0,349	0,367	0,385	0,412
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,330	0,340	0,358	0,377	0,396	0,424

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: acting bond stress for tension
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C11: Displacements under shear load[1)] (internally threaded anchor rod)

Internally threaded anchor rod			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Uncracked and cracked concrete C20/25 under static and quasi-static action								
All temperature ranges	δ_{V0}-factor	[mm/(kN)]	0,07	0,06	0,06	0,05	0,04	0,04
	$\delta_{V\infty}$-factor	[mm/(kN)]	0,10	0,09	0,08	0,08	0,06	0,06

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

Table C12: **Displacements** under **tension load**[1)] (rebar)

Rebar			**Ø 8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
Uncracked concrete C20/25 under static and quasi-static action											
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,031	0,032	0,034	0,035	0,037	0,039	0,043	0,045	0,048
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,040	0,042	0,044	0,045	0,047	0,051	0,055	0,058	0,063
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,032	0,034	0,035	0,036	0,038	0,041	0,045	0,047	0,050
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,042	0,044	0,045	0,047	0,049	0,053	0,057	0,060	0,065
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,121	0,126	0,131	0,137	0,142	0,153	0,164	0,172	0,186
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,124	0,129	0,135	0,141	0,146	0,157	0,169	0,177	0,192
Cracked concrete C20/25 under static and quasi-static action											
Temperature range I: 80°C / 50°C	δ_{N0}-factor	[mm/(N/mm²)]	0,081	0,083	0,085	0,087	0,090	0,095	0,099	0,103	0,108
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,104	0,107	0,110	0,113	0,116	0,122	0,128	0,133	0,141
Temperature range II: 120°C / 72°C	δ_{N0}-factor	[mm/(N/mm²)]	0,084	0,086	0,088	0,090	0,093	0,098	0,103	0,107	0,113
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,108	0,111	0,114	0,118	0,121	0,127	0,133	0,138	0,148
Temperature range III: 160°C / 100°C	δ_{N0}-factor	[mm/(N/mm²)]	0,312	0,321	0,330	0,340	0,349	0,367	0,385	0,399	0,425
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,321	0,330	0,340	0,349	0,358	0,377	0,396	0,410	0,449

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: acting bond stress for tension
$\delta_{N\infty} = \delta_{N\infty}\text{- factor} \cdot \tau$;

Table C13: **Displacements** under **shear load**[1)] (rebar)

Rebar			**Ø 8**	**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**	**Ø 28**	**Ø 32**
Cracked and uncracked concrete C20/25 under static and quasi-static action											
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
	$\delta_{V\infty}$-factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04	0,04

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