

DECLARATION OF PERFORMANCE
DoP No. MKT-123 - en

1. Unique identification code of the product-type: **MKT Highload Anchor SZ**
2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):

ETA-02/0030, Annex A2
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	torque controlled expansion anchor (sleeve type)
for use in	cracked and non-cracked concrete C20/25 - C50/60 (EN 206)
option	1
loading	static or quasi-static; all sizes seismic, performance category C1 + C2 - sizes: SZ-B (12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20, 32/M24) SZ-S (12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20, 32/M24) SZ-SK (12/M8, 15/M10, 18/M12)
material	<u>zinc-plated steel:</u> dry internal conditions only - sizes: SZ-B (10/M6, 12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20, 32/M24) SZ-S (10/M6, 12/M8, 15/M10, 18/M12, 24/M16, 24/M16L, 28/M20, 32/M24) SZ-SK (10/M6, 12/M8, 15/M10, 18/M12) <u>stainless steel (marking A4):</u> internal and external use without particular aggressive conditions - sizes: SZ-B (12/M8, 15/M10, 18/M12, 24/M16) SZ-S (12/M8, 15/M10, 18/M12, 24/M16) SZ-SK (12/M8, 15/M10, 18/M12)
temperature range (if applicable)	--

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:

issued **Deutsches Institut für Bautechnik, Berlin**
ETA-02/0030
on the basis of **EAD 330232-00-0601**

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 550-9/08.14

9. Declared performance:

Essential Characteristics	Design Method	Performance		Harmonized Technical Specification
		Steel, zinc-plated	Stainless steel A4	
characteristic resistance for tension	FprEN 1992-4 and TR 055	Annex C1, C2	Annex C1, C3	EAD 330232-00-0601
characteristic resistance for shear	FprEN 1992-4 and TR 055	Annex C4	Annex C5	
characteristic resistance for seismic action	FprEN 1992-4 and TR 055	Annex C6	Annex C7	
displacement for serviceability limit state	FprEN 1992-4 and TR 055	Annex C9	Annex C10	
characteristic resistance under fire exposure	FprEN 1992-4 and TR 055	Annex C8	Annex C8	

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, 27.02.2018

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



Table C1: Characteristic values for **tension load, cracked concrete**, static or quasi-static action, **steel zinc plated**

Anchor size			10/M6	12/M8	15/M10	18/M12	24/M16	24/M16L	28/M20	32/M24
Installation safety factor	γ_{inst}	[-]	1,0							
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	16	29	46	67	126	126	196	282
Partial safety factor	γ_{Ms}	[-]	1,5							
Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	12	16	1)	1)	1)	1)	1)
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$							
Concrete cone failure										
Effective anchorage depth	h_{ef}	[mm]	50	60	71	80	100	115	125	150
Factor $k_1 =$	$k_{cr,N}$	[-]	7,7							

1) Pull-out is not decisive

Table C2: Characteristic values for **tension load, cracked concrete**, static or quasi-static action, **stainless steel A4**

Anchor size			12/M8	15/M10	18/M12	24/M16
Installation safety factor	γ_{inst}	[-]	1,0			
Steel failure						
SZ-B						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial safety factor	γ_{Ms}	[-]	1,5			
SZ-S and SZ-SK						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial safety factor	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	9	16	1)	1)
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	60	71	80	100
Factor $k_1 =$	$k_{cr,N}$	[-]	7,7			

1) Pull-out is not decisive

Highload Anchor SZ	Annex C1
Performance Characteristic values for tension load, cracked concrete , static or quasi-static action	

Table C3: Characteristic values for tension load, uncracked concrete, static or quasi-static action, steel zinc plated

Anchor size		10/M6	12/M8	15/M10	18/M12	24/M16	24/ M16L	28/M20	32/M24
Installation safety factor	γ_{inst} [-]	1,0							
Steel failure									
Characteristic resistance	$N_{Rk,s}$ [kN]	16	29	46	67	126	126	196	282
Partial safety factor	γ_{Ms} [-]	1,5							
Pull-out failure									
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$ [kN]	1)	20	1)	1)	1)	1)	1)	1)
Increasing factor for $N_{Rk,p}$	ψ_C [-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$							
Splitting failure (The higher resistance of case 1 and case 2 may be applied)									
Case 1									
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$ [kN]	12	16	25	30	40	70	50	70
Edge distance	$c_{cr,sp}$ [mm]	1,5 h_{ef}							
Increasing factor for $N^0_{Rk,sp}$	ψ_C [-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$							
Case 2									
Characteristic resistance in uncracked concrete	$N^0_{Rk,sp}$ [kN]	$\min(N_{Rk,p}; N^0_{Rk,c})$							
Edge distance	$c_{cr,sp}$ [mm]	2,5 h_{ef}					1,5 h_{ef}	2,5 h_{ef}	2 h_{ef}
Concrete cone failure									
Effective Anchorage depth	h_{ef} [mm]	50	60	71	80	100	115	125	150
Edge distance	$c_{cr,N}$ [mm]	1,5 h_{ef}							
Factor $k_1 =$	$k_{ucr,N}$ [-]	11,0							

1) Pull-out is not decisive

Highload Anchor SZ

Performance

Characteristic values for **tension load, uncracked concrete**, static or quasi-static action, **steel zinc plated**

Annex C2

Table C4: Characteristic values for **tension load, uncracked concrete**, static or quasi-static action, **stainless steel A4**

Anchor size			12/M8	15/M10	18/M12	24/M16
Installation safety factor	γ_{inst}	[-]	1,0			
Steel failure						
SZ-B						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial safety factor	γ_{Ms}	[-]	1,5			
SZ-S and SZ-SK						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial safety factor	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	16	25	35	1)
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Splitting failure						
Edge distance	$C_{cr,sp}$	[mm]	180	235	265	300
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	60	71	80	100
Edge distance	$C_{cr,N}$	[mm]	1,5 h_{ef}			
Factor $k_1 =$	$k_{ucr,N}$	[-]	11,0			

1) Pull-out is not decisive.

Highload Anchor SZ

Performance

Characteristic values for **tension loads, uncracked concrete**, static or quasi-static action, **stainless steel A4**

Annex C3

Table C5: Characteristic values of **shear load**, static or quasi-static action, **steel zinc plated**

Anchor size			10/M6	12/M8	15/M10	18/M12	24/M16	24/ M16L	28/M20	32/M24
Steel failure without lever arm										
SZ-B										
Characteristic resistance	$V^{0}_{Rk,s}$	[kN]	16	25	36	63	91	91	122	200
Factor	k_7	[-]	1,0							
SZ-S and SZ-SK										
Characteristic resistance	$V^{0}_{Rk,s}$	[kN]	18	30	48	73	126	126	150	200
Factor	k_7	[-]	1,0							
Partial safety factor	γ_{Ms}	[-]	1,25							
Steel failure with lever arm										
Characteristic resistance	$M^{0}_{Rk,s}$	[Nm]	12	30	60	105	266	266	519	898
Partial safety factor	γ_{Ms}	[-]	1,25							
Concrete pry-out failure										
Factor	k_8	[-]	1,8	2,0						
Concrete edge failure										
Effective length of anchor in shear loading	l_f	[mm]	50	60	71	80	100	115	125	150
Outside diameter of anchor	d_{nom}	[mm]	10	12	15	18	24	24	28	32

Highload Anchor SZ

Performance
 Characteristic values for **shear load**, static or quasi-static action,
steel zinc plated

Annex C4

Table C6: Characteristic values for **shear load**, static or quasi-static action, **stainless steel A4**

Anchor size			12/M8	15/M10	18/M12	24/M16
Steel failure without lever arm						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	24	37	62	92
SZ-B						
Factor	k_7	[-]	1,0			
Partial safety factor	γ_{Ms}	[-]	1,25			
SZ-S						
Factor	k_7	[-]	1,0			
Partial safety factor	γ_{Ms}	[-]	1,36			
SZ-SK						
Factor	k_7	[-]	0,8			-
Partial safety factor	γ_{Ms}	[-]	1,36			-
Steel failure with lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	232
SZ-B						
Partial safety factor	γ_{Ms}	[-]	1,25			
SZ-S and SZ-SK						
Partial safety factor	γ_{Ms}	[-]	1,56			
Concrete pry-out failure						
Factor	k_8	[-]	2,0			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	60	71	80	100
Outside diameter of anchor	d_{nom}	[mm]	12	15	18	24

Highload Anchor SZ

Performance
 Characteristic values for **shear load**, static or quasi-static action,
stainless steel A4

Annex C5

Table C7: Characteristic values for seismic action, Category C1 and C2, steel zinc plated

Anchor size			12/M8	15/M10	18/M12	24/M16	24/M16L	28/M20	32/M24
Tension load									
Installation safety factor	γ_{inst}	[-]	1,0						
Steel failure									
Characteristic tension resistance category C1	$N_{Rk,s,eq,C1}$	[kN]	29	46	67	126	126	196	280
Characteristic tension resistance category C2	$N_{Rk,s,eq,C2}$	[kN]	29	46	67	126	126	196	280
Partial safety factor	γ_{Ms}	[-]	1,5						
Pull-out failure									
Characteristic tension resistance category C1	$N_{Rk,p,eq,C1}$	[kN]	12	16	25	36	44,4	50,3	63,3
Characteristic tension resistance category C2	$N_{Rk,p,eq,C2}$	[kN]	5,4	16,4	22,6	29,0	41,2	43,6	63,3
Shear load									
Steel failure without lever arm									
SZ-B									
Characteristic shear resistance category C1	$V_{Rk,s,eq,C1}$	[kN]	18,0	27,1	43,4	51,9	51,9	96,4	160,1
Characteristic shear resistance category C2	$V_{Rk,s,eq,C2}$	[kN]	12,7	20,5	31,5	50,1	50,1	67,1	108,1
SZ-S									
Characteristic shear resistance category C1	$V_{Rk,s,eq,C1}$	[kN]	18,0	27,1	43,4	51,9	51,9	96,4	160,1
Characteristic shear resistance category C2	$V_{Rk,s,eq,C2}$	[kN]	12,7	20,5	31,5	69,3	69,3	67,1	108,1
SZ-SK									
Characteristic shear resistance category C1	$V_{Rk,s,eq,C1}$	[kN]	25,2	36,5	50,4	-	-	-	-
Characteristic shear resistance category C2	$V_{Rk,s,eq,C2}$	[kN]	19,2	29,3	39,4	-	-	-	-
Partial safety factor	γ_{Ms}	[-]	1,25						

Highload Anchor SZ

Performance
Characteristic values for seismic action, steel zinc plated

Annex C6

Table C8: Characteristic values for seismic action, Category C1 and C2, stainless steel A4

Anchor size			12/M8	15/M10	18/M12	24/M16
Tension load						
Installation safety factor	γ_{inst}	[-]	1,0			
Steel failure						
Characteristic tension resistance, category C1	$N_{Rk,s,eq,C1}$	[kN]	26	41	60	110
Characteristic tension resistance, category C2	$N_{Rk,s,eq,C2}$	[kN]	26	41	60	110
Partial safety factor SZ-B	γ_{Ms}	[-]	1,5			
Partial safety factor SZ-S and SZ-SK	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic tension resistance, category C1	$N_{Rk,p,eq,C1}$	[kN]	9	16	26	36
Characteristic tension resistance, category C2	$N_{Rk,p,eq,C2}$	[kN]	4,8	16,5	24,8	44,5
Shear load						
Steel failure without lever arm						
SZ-B						
Characteristic shear resistance, category C1	$V_{Rk,s,eq,C1}$	[kN]	9,6	13,3	25,4	75,4
Characteristic shear resistance, category C2	$V_{Rk,s,eq,C2}$	[kN]	9,7	14,0	18,0	32,2
Partial safety factor	γ_{Ms}	[-]	1,25			
SZ-S						
Characteristic shear resistance, category C1	$V_{Rk,s,eq,C1}$	[kN]	9,6	13,3	25,4	75,4
Characteristic shear resistance, category C2	$V_{Rk,s,eq,C2}$	[kN]	9,7	14,0	18,0	32,2
Partial safety factor	γ_{Ms}	[-]	1,36			
SZ-SK						
Characteristic shear resistance, category C1	$V_{Rk,s,eq,C1}$	[kN]	11,5	23,3	31,6	-
Characteristic shear resistance, category C2	$V_{Rk,s,eq,C2}$	[kN]	10,8	17,4	15,4	-
Partial safety factor	γ_{Ms}	[-]	1,36			-

Highload Anchor SZ

Performance
Characteristic values for **seismic action, stainless steel A4**

Annex C7

Table C9: Characteristic values under **fire exposure** in cracked and uncracked concrete C20/25 to C50/60

Anchor size		10/M6	12/M8	15/M10	18/M12	24/M16	24/ M16L	28/M20	32/M24	
Tension load										
Steel failure										
Steel zinc plated										
Characteristic resistance	R30	$N_{Rk,s,fi}$ [kN]	1,0	1,9	4,3	6,3	11,6	18,3	26,3	
	R60		0,8	1,5	3,2	4,6	8,6	13,5	19,5	
	R90		0,6	1,0	2,1	3,0	5,0	7,7	12,6	
	R120		0,4	0,8	1,5	2,0	3,1	4,9	9,2	
Stainless steel A4										
Characteristic resistance	R30	$N_{Rk,s,fi}$ [kN]	-	6,1	10,2	15,7	29,2	-	-	-
	R60		-	4,4	7,3	11,1	20,6	-	-	-
	R90		-	2,6	4,3	6,4	12,0	-	-	-
	R120		-	1,8	2,8	4,1	7,7	-	-	-
Shear load										
Steel failure without lever arm										
Steel zinc plated										
Characteristic resistance	R30	$V_{Rk,s,fi}$ [kN]	1,0	1,9	4,3	6,3	11,6	18,3	26,3	
	R60		0,8	1,5	3,2	4,6	8,6	13,5	19,5	
	R90		0,6	1,0	2,1	3,0	5,0	7,7	12,6	
	R120		0,4	0,8	1,5	2,0	3,1	4,9	9,2	
Stainless steel A4										
Characteristic resistance	R30	$V_{Rk,s,fi}$ [kN]	-	14,3	22,7	32,8	61,0	-	-	-
	R60		-	11,1	17,6	25,5	47,5	-	-	-
	R90		-	7,9	12,6	18,3	34,0	-	-	-
	R120		-	6,3	10,0	14,6	27,2	-	-	-
Steel failure with lever arm										
Steel zinc plated										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$ [Nm]	0,8	2,0	5,6	9,7	24,8	42,4	83,6	
	R60		0,6	1,5	4,1	7,2	18,3	29,8	61,9	
	R90		0,4	1,0	2,7	4,7	11,9	17,1	40,1	
	R120		0,3	0,8	1,9	3,1	6,6	10,7	29,2	
Stainless steel A4										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$ [Nm]	-	6,2	13,2	24,4	61,8	-	-	-
	R60		-	4,5	9,4	17,2	43,6	-	-	-
	R90		-	2,7	5,6	10,0	25,3	-	-	-
	R120		-	1,8	3,6	6,4	16,2	-	-	-

If pull-out is not decisive in equation D.4 and D.5, FprEN 1992-4:2016 $N_{Rk,p}$ must be replaced by $N^0_{Rk,c}$.

Highload Anchor SZ

Performance
Characteristic values under **fire exposure**

Annex C8

Table C10: Displacements under tension and shear load, steel zinc plated

Anchor size			10/ M6	12/ M8	15/ M10	18/ M12	24/ M16	24 /M16L	28/ M20	32/ M24
Tension load										
Tension load in cracked concrete	N	[kN]	2,4	5,7	7,6	12,3	17,1	21,1	24	26,2
Displacement	δ_{N0}	[mm]	0,5	0,5	0,5	0,7	0,8	0,7	0,9	1,4
	$\delta_{N\infty}$	[mm]	2,0	2,0	1,3	1,3	1,3	1,3	1,4	1,9
Tension load in uncracked concrete	N	[kN]	8,5	9,5	14,3	17,2	24	29,6	34	43
Displacement	δ_{N0}	[mm]	0,8	1,0	1,1		1,3		0,3	0,7
	$\delta_{N\infty}$	[mm]	3,4		1,7		2,3		1,4	0,7
Seismic action C2										
Displacement for DLS	$\delta_{N,eq}$ (DLS)	[mm]	-	3,3	3,0	5,0	3,0	3,0	4,0	5,3
Displacement for ULS	$\delta_{N,eq}$ (ULS)	[mm]	-	12,2	11,3	16,0	9,2	9,2	13,8	12,4
Shear load										
SZ-B										
Shear load in cracked and uncracked concrete	V	[kN]	9,1	14	20,7	35,1	52,1	52,1	77	86,6
Displacement	δ_{V0}	[mm]	2,5	2,1	2,7	3,0	5,1	5,1	4,3	10,5
	$\delta_{V\infty}$	[mm]	3,8	3,1	4,1	4,5	7,6	7,6	6,5	15,8
Seismic action C2										
Displacement for DLS	$\delta_{V,eq}$ (DLS)	[mm]	-	2,3	3,1	3,0	2,6	2,6	1,6	6,1
Displacement for ULS	$\delta_{V,eq}$ (ULS)	[mm]	-	4,8	6,4	6,1	6,6	6,6	4,8	9,5
SZ-S										
Shear load in cracked and uncracked concrete	V	[kN]	10,1	17,1	27,5	41,5	72	72	77	86,6
Displacement	δ_{V0}	[mm]	2,9	2,5	3,6	3,5	7,0	7,0	4,3	10,5
	$\delta_{V\infty}$	[mm]	4,4	3,8	5,4	5,3	10,5	10,5	6,5	15,8
Seismic action C2										
Displacement for DLS	$\delta_{V,eq}$ (DLS)	[mm]	-	2,3	3,1	3,0	3,3	3,3	1,6	6,1
Displacement for ULS	$\delta_{V,eq}$ (ULS)	[mm]	-	4,8	6,4	6,1	8,2	8,2	4,8	9,5
SZ-SK										
Shear load in cracked and uncracked concrete	V	[kN]	10,1	17,1	27,5	41,5	-	-	-	-
Displacement	δ_{V0}	[mm]	2,9	2,5	3,6	3,5	-	-	-	-
	$\delta_{V\infty}$	[mm]	4,4	3,8	5,4	5,3	-	-	-	-
Seismic action C2										
Displacement for DLS	$\delta_{V,eq}$ (DLS)	[mm]	-	3,1	3,9	3,9	-	-	-	-
Displacement for ULS	$\delta_{V,eq}$ (ULS)	[mm]	-	10,2	11,8	13,0	-	-	-	-

Highload Anchor SZ

Performance
Displacements under tension and shear load, steel zinc plated

Annex C9

Table C11: Displacements under tension and shear load, stainless steel A4

Anchor size			12/M8	15/M10	18/M12	24/M16
Tension load						
Tension load in cracked concrete	N	[kN]	4,3	7,6	12,1	17,0
Displacement	δ_{N0}	[mm]	0,5	0,5	1,3	0,5
	$\delta_{N\infty}$	[mm]	1,2	1,6	1,8	1,6
Tension load in uncracked concrete	N	[kN]	7,6	11,9	16,7	24,1
Displacement	δ_{N0}	[mm]	0,2	0,3	1,2	1,5
	$\delta_{N\infty}$	[mm]	1,1	1,1	1,1	1,1
Seismic action C2						
Displacement for DLS	$\delta_{N,eq (DLS)}$	[mm]	4,7	4,5	4,3	4,9
Displacement for ULS	$\delta_{N,eq (ULS)}$	[mm]	13,3	12,7	9,7	10,1
Shear load						
Shear load in cracked concrete	V	[kN]	13,9	21,1	34,7	50,8
Displacement	δ_{V0}	[mm]	3,4	4,9	4,8	6,7
	$\delta_{V\infty}$	[mm]	5,1	7,4	7,1	10,1
Seismic action C2						
SZ-B, SZ-S						
Displacement for DLS	$\delta_{V,eq (DLS)}$	[mm]	2,8	3,1	2,6	3,3
Displacement for ULS	$\delta_{V,eq (ULS)}$	[mm]	5,6	5,8	5,0	6,9
SZ-SK						
Displacement for DLS	$\delta_{V,eq (DLS)}$	[mm]	2,5	2,8	2,9	-
Displacement for ULS	$\delta_{V,eq (ULS)}$	[mm]	5,8	5,9	6,9	-

Highload Anchor SZ

Performance
Displacements under tension and shear load, **stainless steel A4**

Annex C10