ETA

HOBSON SZ-S/SZ-B/SZ-SK
HEAVY DUTY ANCHOR

ETA 02/0030 (13/09/2019)

Option 1†

Seismic

Fire Resistant

† Suitable for use in Cracked and Non-Cracked Concrete.

... eine starke Verbindung

# DECLARATION OF PERFORMANCE

## DoP Nr.: **MKT-1.1-400_en**

◇ **Unique identification code of product-type:**   **Highload Anchor SZ**

◇ **Intended use/es:**   Mechanical anchor for use in concrete,
see Annex B

◇ **Manufacturer:**   MKT Metall-Kunststoff-Technik GmbH & Co.KG
Auf dem Immel 2
67685 Weilerbach

◇ **System or systems of assessment and
verification of constancy of performance:**   1

◇ **European Assessment Document:**   **EAD 330232-00-0601**
European Technical Assessment: **ETA-02/0030, 13.09.2019**
Technical Assessment Body: DIBt, Berlin
Notified body/ies: NB 2873 – Technische Universität Darmstadt

◇ **Declared performance/s:**

Essential characteristics	Performance
Mechanical resistance and stability (BWR 1)	
Characteristic resistance to tension load (static and quasi-static loading)	Annex C1 – C4
Characteristic resistance to shear load (static and quasi-static loading)	Annex C5 – C6
Characteristic resistance for seismic performance category C1+C2	Annex C7 – C8
Displacements	Annex C10 – C11
Durability	Annex B1
Safety in case of fire (BWR 2)	
Reaction to fire	Class A1
Resistance to fire	Annex C9

The performance of the product identified above is in conformity with the set of declared performance/s.
This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Stefan Weustenhagen
(General manager)
Weilerbach, 01.01.2021

p.p.

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

The original of this declaration of performance was written in German. In the event of deviations in the translation, the German version shall be valid.

Specification of intended use

Highload Anchor SZ, steel zinc plated	10/M6	12/M8	15/M10	18/M12	24/M16	24/ M16L	28/M20	32/M24
Static or quasi-static action				✓				
Seismic action (SZ-B and SZ-S)	-				C1 + C2			
Seismic action (SZ-SK)	-		C1 + C2				-	
Fire exposure				R 30 … R 120				

Highload Anchor SZ, stainless steel A4	12/M8	15/M10	18/M12	24/M16
Static or quasi-static action			✓	
Seismic action (SZ-B and SZ-S)		C1 + C2		
Seismic action (SZ-SK)		C1 + C2		-
Fire exposure		R30 … R120		

Base materials:
- Cracked and uncracked concrete
- Compacted, reinforced or unreinforced normal weight concrete (without fibers) according to EN 206:2013 + A1:2016
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions (zinc plated steel or stainless steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal conditions, if no particular aggressive conditions exist (stainless steel).

  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used.)

Design:
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e.g. position of the fastener relative to reinforcement or to supports, etc.).
- Design according to EN 1992-4:2018 and Technical Report TR055

Installation:
- Fastener installation carried out by appropriately qualified personnel and under the obligation of the person responsible for technical matters on site.
- Compliance with the effective anchorage depth. For fastenings with anchorage depths $h_{ef} > h_{ef,min}$ the usable thickness of fixture is reduced by $h_{ef} - h_{ef,min}$.
- Use as supplied by the manufacturer without replacing individual parts.
- Drilling of hole only by hammer drilling (use of vacuum drill bits is admissible)

Highload Anchor SZ	
Intended use Specification of intended use	**Annex B1**

Installation situation

Marking of setting depth for $h_{ef,min}$

$h_{ef,min}$

$t_{fix,max}$

h_1

h

$h_{ef,min} \leq h_{ef} \leq h_{ef,max}$

t_{fix}

h_1

h

$h_{ef,max}$

t_{fix}

h_1

h

Ø d_0
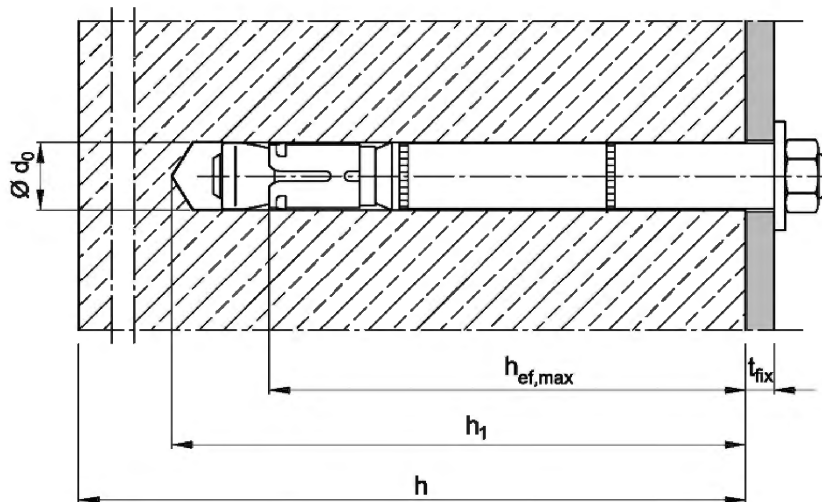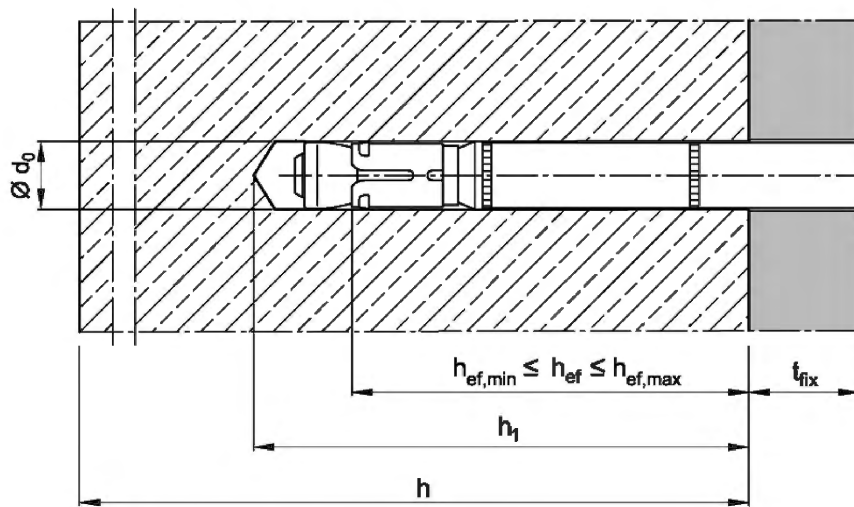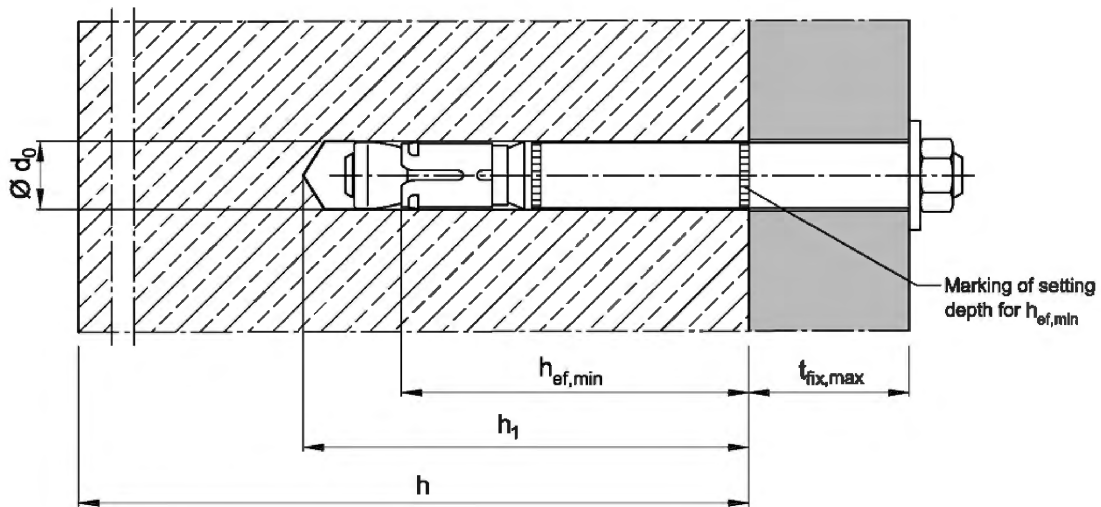
Highload Anchor SZ	
Intended use Installation situation	**Annex B2**

Table B1: Installation parameters, steel zinc plated

Fastener size			10/M6	12/M8	15/M10	18/M12	24/M16	24/M16L	28/M20	32/M24
Size of thread		[-]	M6	M8	M10	M12	M16	M16	M20	M24
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	50	60	71	80	100	115	125	150
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	76	100	110	130	114	150	185	210
Nominal diameter of drill bit	$d_0 =$	[mm]	10	12	15	18	24	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45	12,5	15,5	18,5	24,55	24,55	28,55	32,7
Depth of drill hole	$h_1 \geq$	[mm]	h_{ef} + 15	h_{ef} + 20	h_{ef} + 24	h_{ef} + 25	h_{ef} + 30	h_{ef} + 30	h_{ef} + 35	h_{ef} + 30
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	12	14	17	20	26	26	31	35
Thickness of countersunk washer SZ-SK	t_{sk}	[mm]	4	5	6	7	-	-	-	-
Minimum thickness of fixture SZ-SK	$t_{fix\,min}$ [2]	[mm]	8	10	14	18	-	-	-	-
Installation torque	T_{inst} (SZ-B, SZ-S)	[Nm]	15	30	50	80	160	160	280	280
	T_{inst} (SZ-SK)	[Nm]	10	25	55	70	-	-	-	-
Minimum thickness of member	h_{min}	[mm]	h_{ef} + 50	h_{ef} + 60	h_{ef} + 69	h_{ef} + 80	h_{ef} + 100	h_{ef} + 115	h_{ef} + 125	h_{ef} + 150
Minimum spacing [1] [3]	s_{min}	[mm]	50	50	60	70	100	100	125	150
cracked concrete	for $c \geq$	[mm]	50	80	120	140	180	180	300	300
Minimum edge distance [1] [3]	c_{min}	[mm]	50	55	60	70	100	100	200	150
cracked concrete	for $s \geq$	[mm]	50	100	120	160	220	220	350	300
Minimum spacing [1] [3]	s_{min}	[mm]	50	60	60	70	100	100	125	150
uncracked concrete	for $c \geq$	[mm]	80	100	120	140	180	180	300	300
Minimum edge distance [1] [3]	c_{min}	[mm]	50	60	60	70	100	100	200	150
uncracked concrete	for $s \geq$	[mm]	100	120	120	160	220	220	350	300

[1] Intermediate values by linear interpolation
[2] Depending on the existing shear load, the thickness of the fixture may be reduced to the thickness of the countersunk washer t_{sk} (see Annex A2). It must be verified that the present shear load can be transferred completely into the distance sleeve (bearing of hole).
[3] For fire exposure from more than one side c ≥ 300 mm or c_{min} ≥ 300 mm applies.

Highload Anchor SZ

Intended use
Installation parameters, **steel zinc plated**

Table B2: Installation parameters, stainless steel A4

Fastener size			12/M8	15/M10	18/M12	24/M16
Size of thread		[-]	M8	M10	M12	M16
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	60	71	80	100
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	100	110	130	150
Nominal diameter of drill bit	$d_0 =$	[mm]	12	15	18	24
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,5	15,5	18,5	24,55
Depth of drill hole	$h_1 \geq$	[mm]	$h_{ef} + 20$	$h_{ef} + 24$	$h_{ef} + 25$	$h_{ef} + 30$
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	17	20	26
Thickness of countersunk washer SZ-SK	t_{sk}	[mm]	5	6	7	-
Minimum thickness of fixture SZ-SK	$t_{fix\,min}$ [2]	[mm]	10	14	18	-
	T_{inst} (SZ-B)	[Nm]	35	55	90	170
Installation torque	T_{inst} (SZ-S)	[Nm]	30	50	80	170
	T_{inst} (SZ-SK)	[Nm]	17,5	42,5	50	-
Minimum thickness of member	h_{min}	[mm]	$h_{ef} + 60$	$h_{ef} + 69$	$h_{ef} + 80$	$h_{ef} + 100$
Minimum spacing [1] [3]	s_{min}	[mm]	50	60	70	80
cracked concrete	for c $\geq$	[mm]	80	120	140	180
Minimum edge distance [1] [3]	c_{min}	[mm]	50	60	70	80
cracked concrete	for s $\geq$	[mm]	80	120	160	200
Minimum spacing [1] [3]	s_{min}	[mm]	50	60	70	80
uncracked concrete	for c $\geq$	[mm]	80	120	140	180
Minimum edge distance [1] [3]	c_{min}	[mm]	50	85	70	180
uncracked concrete	for s $\geq$	[mm]	80	185	160	80

[1] Intermediate values by linear interpolation
[2] Depending on the existing shear load, the thickness of the fixture may be reduced to the thickness of the countersunk washer t_{sk}
(see Annex A2). It must be verified that the present shear load can be transferred completely into the distance sleeve (bearing of hole).
[3] For fire exposure from more than one side c $\geq$ 300 mm or $c_{min} \geq$ 300 mm applies.
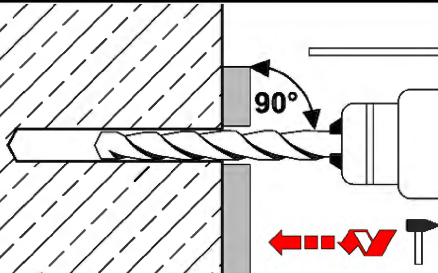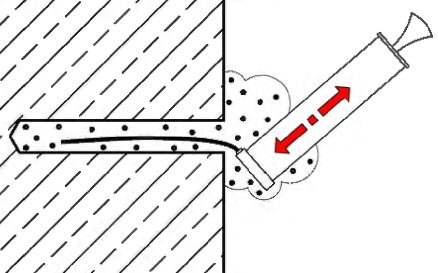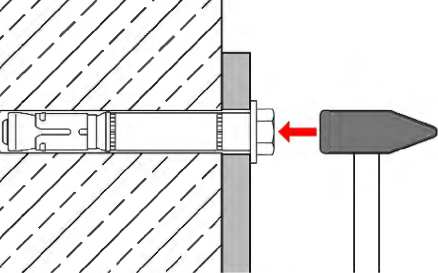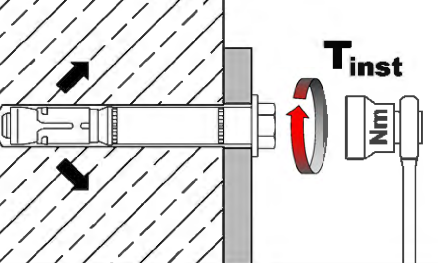
Highload Anchor SZ

Intended use
Installation parameters, **stainless steel A4**

Annex B4

Installation instructions

1		Drill hole perpendicular to concrete surface. If using a vacuum drill bit, proceed with step 3.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Drive in fastener.
4		Apply installation torque T_{inst}.

Highload Anchor SZ

Intended use
Installation instructions

Annex B5

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

Fastener size			10/M6	12/M8	15/M10	18/M12	24/M16	24/ M16L	28/M20	32/M24
Installation factor	γ_{inst}	[-]	1,0							
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	16	29	46	67	126	126	196	282
Partial factor	γ_{Ms}	[-]	1,5							
Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	12	16	25	36	44	50	65
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$							
Concrete cone failure										
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	50	60	71	80	100	115	125	150
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	76	100	110	130	114	150	185	210
Factor for cracked concrete	$k_1 = k_{cr,N}$	[-]	7,7							

Highload Anchor SZ

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

Annex C1

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

Fastener size			12/M8	15/M10	18/M12	24/M16
Installation factor	γ_{inst}	[-]	1,0			
Steel failure						
SZ-B						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial factor	γ_{Ms}	[-]	1,5			
SZ-S and SZ-SK						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial factor	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	9	16	25	36
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$			
Concrete cone failure						
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	60	71	80	100
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	100	110	130	150
Factor for cracked concrete	$k_1 = k_{cr,N}$	[-]	7,7			

Highload Anchor SZ

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

Annex C2

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

Fastener size			10/M6	12/M8	15/M10	18/M12	24/M16	24/M16L	28/M20	32/M24
Installation factor	γ_{inst}	[-]	1,0							
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	16	29	46	67	126	126	196	282
Partial factor	γ_{Ms}	[-]	1,5							
Pull-out failure										
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	17	20	30	36	50	1)	70	1)
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$					-	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$	-
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	[-]	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$							
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										
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	50	60	71	80	100	115	125	150
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	76	100	110	130	114	150	185	210
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}							
Factor for uncracked concrete	$k_1 = k_{ucr,N}$	[-]	11,0							

1) $N_{Rk,p} = N^0_{Rk,c}$ calculated with $h_{ef,min}$

Highload Anchor SZ	
Performance Characteristic values for **tension load, uncracked concrete,** static or quasi-static action, **steel zinc plated**	**Annex C3**

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

Fastener size			12/M8	15/M10	18/M12	24/M16
Installation factor	γ_{inst}	[-]	1,0			
Steel failure						
SZ-B						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial factor	γ_{Ms}	[-]	1,5			
SZ-S and SZ-SK						
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	60	110
Partial factor	γ_{Ms}	[-]	1,87			
Pull-out failure						
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	16	25	35	50
Increasing factor for $N_{Rk,p}$	ψ_C	[-]	$\left(\dfrac{f_{ck}}{20}\right)^{0,5}$			
Splitting failure						
Edge distance	$c_{cr,sp}$	[mm]	180	235	265	300
Concrete cone failure						
Minimum effective anchorage depth	$h_{ef,min}$	[mm]	60	71	80	100
Maximum effective anchorage depth	$h_{ef,max}$	[mm]	100	110	130	150
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}			
Factor for uncracked concrete	$k_1 = k_{ucr,N}$	[-]	11,0			

Highload Anchor SZ

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

Annex C4

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

Fastener 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
Ductility factor	k_7	[-]	1,0							
Partial factor	γ_{Ms}	[-]	1,25							
SZ-S and SZ-SK										
Characteristic resistance	$V^0_{Rk,s}$	[kN]	18	30	48	73	126	126	150	200
Ductility factor	k_7	[-]	1,0							
Partial factor	γ_{Ms}	[-]	1,25							
Steel failure with lever arm										
SZ-B, SZ-S und SZ-SK										
Anchorage depth	$h_{ef,min} \geq$	[mm]	50	60	71	80	100	115	125	150
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12	30	60	105	266	266	519	898
Partial factor	γ_{Ms}	[-]	1,25							
Anchorage depth	$h_{ef} \geq$	[mm]	64	73	90	106	138	138	158	188
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	40	58	119	234	529	529	847	1343
Partial factor	γ_{Ms}	[-]	1,25							
Concrete pry-out failure										
Pry-out factor	k_8	[-]	1,8 [1]	2,0						
Concrete edge failure										
Effective length of fastener in shear loading	l_f	[mm]	h_{ef}							
Outside diameter of fastener	d_{nom}	[mm]	10	12	15	18	24	24	28	32

[1] $k_8 = 2{,}0$ for $h_{ef} \geq 60$ mm

Highload Anchor SZ	
Performance Characteristic values for **shear load**, static or quasi-static action, **steel zinc plated**	**Annex C5**

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

Fastener 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						
Ductility factor	k_7	[-]		1,0		
Partial factor	γ_{Ms}	[-]		1,25		
SZ-S						
Ductility factor	k_7	[-]		1,0		
Partial factor	γ_{Ms}	[-]		1,36		
SZ-SK						
Ductility factor	k_7	[-]		0,8		-
Partial factor	γ_{Ms}	[-]		1,36		-
Steel failure with lever arm						
Anchorage depth	$h_{ef,min} \geq$	[mm]	60	71	80	100
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	232
SZ-B						
Partial factor	γ_{Ms}	[-]		1,25		
SZ-S and SZ-SK						
Partial factor	γ_{Ms}	[-]		1,56		
SZ-B, SZ-S and SZ-SK						
Anchorage depth	$h_{ef} \geq$	[mm]	73	90	106	138
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	103	211	374	847
Partial factor	γ_{Ms}	[-]		1,25		
Concrete pry-out failure						
Pry-out factor	k_8	[-]		2,0		
Concrete edge failure						
Effective length of fastener in shear loading	l_f	[mm]		h_{ef}		
Outside diameter of fastener	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 C6

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

Fastener size			12/M8	15/M10	18/M12	24/M16	24/M16L	28/M20	32/M24
Tension load									
Installation factor	γ_{inst}	[-]			1,0				
Steel failure									
Characteristic resistance category **C1**	$N_{Rk,s,eq,C1}$	[kN]	29	46	67	126	126	196	282
Characteristic resistance category **C2**	$N_{Rk,s,eq,C2}$	[kN]	29	46	67	126	126	196	282
Partial factor	γ_{Ms}	[-]			1,5				
Pull-out failure									
Characteristic resistance category **C1**	$N_{Rk,p,eq,C1}$	[kN]	12	16	25	36	44,4	50,3	63,3
Characteristic 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 resistance category **C1**	$V_{Rk,s,eq,C1}$	[kN]	18,0	27,1	43,4	51,9	51,9	96,4	160,1
Characteristic 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 resistance category **C1**	$V_{Rk,s,eq,C1}$	[kN]	18,0	27,1	43,4	51,9	51,9	96,4	160,1
Characteristic 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 resistance category **C1**	$V_{Rk,s,eq,C1}$	[kN]	25,2	36,5	50,4	-	-	-	-
Characteristic resistance category **C2**	$V_{Rk,s,eq,C2}$	[kN]	19,2	29,3	39,4	-	-	-	-
Factor for annular gap	α_{gap}	[-]			0,5				
Partial factor	γ_{Ms}	[-]			1,25				

Highload Anchor SZ

Performance
Characteristic values for **seismic action, steel zinc plated**

Annex C7

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

Fastener size			12/M8	15/M10	18/M12	24/M16
Tension load						
Installation factor	γ_{inst}	[-]		1,0		
Steel failure						
Characteristic resistance, category **C1**	$N_{Rk,s,eq,C1}$	[kN]	26	41	60	110
Characteristic resistance, category **C2**	$N_{Rk,s,eq,C2}$	[kN]	26	41	60	110
Partial factor **SZ-B**	γ_{Ms}	[-]		1,5		
Partial factor **SZ-S and SZ-SK**	γ_{Ms}	[-]		1,87		
Pull-out failure						
Characteristic resistance, category **C1**	$N_{Rk,p,eq,C1}$	[kN]	9	16	26	36
Characteristic 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 resistance, category **C1**	$V_{Rk,s,eq,C1}$	[kN]	9,6	13,3	25,4	75,4
Characteristic resistance, category **C2**	$V_{Rk,s,eq,C2}$	[kN]	9,7	14,0	18,0	32,2
Partial factor	γ_{Ms}	[-]		1,25		
SZ-S						
Characteristic resistance, category **C1**	$V_{Rk,s,eq,C1}$	[kN]	9,6	13,3	25,4	75,4
Characteristic resistance, category **C2**	$V_{Rk,s,eq,C2}$	[kN]	9,7	14,0	18,0	32,2
Partial factor	γ_{Ms}	[-]		1,36		
SZ-SK						
Characteristic resistance, category **C1**	$V_{Rk,s,eq,C1}$	[kN]	11,5	23,3	31,6	-
Characteristic resistance, category **C2**	$V_{Rk,s,eq,C2}$	[kN]	10,8	17,4	15,4	-
Partial factor	γ_{Ms}	[-]		1,36		-
Factor for annular gap	α_{gap}	[-]		0,5		

Highload Anchor SZ

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

Annex C8

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

Fastener 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 bending 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 bending 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	-	-	-

Highload Anchor SZ	**Annex C9**
Performance Characteristic values under **fire exposure**	

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

Fastener 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 C10

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

Fastener 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 and 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 C11