Leistungserklärung

Nr.: **4 - 031 - 160934 - 2022/01**

1.) Eindeutiger Kenncode des Produkttyps:

(033) Sormat Bolzenanker S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT Bolzenanker BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR

2.) Verwendungszweck:

033: Drehmomentkontrollierter Spreizanker in den Grüßen M8, M10, M12 und M16 zur Verwendung in Beton

3.) Hersteller:

EJOT Sormat Oy, Harjutie 5, 21290 RUSKO - Finnland

4.) System zur Bewertung und Überprüfung der Leistungsbeständigkeit:

System 1

5.)

Europäisches Bewertungsdokument	**EAD 330232-01-0601**
Europäisch Technische Bewertung:	**ETA 16/0934**
Technische Bewertungsstelle:	**ZAG - Slovenian National Building and Civil Engineering Institute**
Notifizierte Stelle:	**0809 - Eurofins Expert Services**

6.) Erklärte Leitung(en):

a) Mechanische Festigkeit und Standsicherheit (BWR 1) und Sicherheit bei der Nutzung (BWR 4)

Wesentliche Merkmale	Leistungswerte
Statische und quasi-statische Belastung	Anhänge C(1/7) und C(2/7)
Seismische Leistung	Anhänge C(6/7) und C(7/7)

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b) Brandschutz (BWR 2)

Wesentliche Merkmale	Leistungswerte
Die grundlegenden Arbeitsanforderungen für den Brandschutz sind in den Anhängen C(3/7) und C(4/7) aufgeführt.	

c) Hygiene, Gesundheit und Umweltschutz (BWR 3)

Wesentliche Merkmale	Leistungswerte

d) Schallschutz (BWR 5)

Wesentliche Merkmale	Leistungswerte

e) Energieeinsparung und Wärmeschutz (BWR 6)

Wesentliche Merkmale	Leistungswerte

f) Nachhaltige Nutzung der natürlichen Ressourcen (BWR 7)

Wesentliche Merkmale	Leistungswerte

Die Leistung des vorstehenden Produkts entspricht der erklärten Leitung/den erklärten Leistungen. Für die Erstellung der Leistungserklärung im Einklang mit der Verordnung (EU) Nr. 305/2011 ist allein der oben genannte Hersteller verantwortlich.

Unterzeichnet für den Hersteller und im Namen des Herstellers von:

Dr. Jens Weber / Geschäftsführung
(Name und Funktion)

Bad Laasphe, 02.08.2022
(Ort und Datum der Ausstellung)

(Unterschrift)

Table C1: Characteristic resistances under tension loads in case of static and quasi-static loading for design according EOTA TR 055 or

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR				**Anchor size**						
				M8-1 [1]	**M8-2**	**M10-1**	**M10-2**	**M12-1**	**M12-2**	**M16**
Steel failure										
Characteristic resistance	S-KA+ / BA-V Plus S-KAK+ / BA-F Plus	$N_{Rk,s}$	[kN]	15	15	26	26	39	39	73
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$N_{Rk,s}$	[kN]	15	15	26	26	40	40	73
Partial safety factor		γ_{Ms} [3]	[-]	1,4						
Pull-out failure										
Characteristic resistance in **cracked** concrete C20/25		$N_{Rk,p}$	[kN]	5	8,5	[1]	12	[2]	16	24
Characteristic resistance in **non-cracked** concrete C20/25		$N_{Rk,p}$	[kN]	8	11	12	19	[2]	25	36
Increasing factor for $N_{Rk,p}$		Ψ_C	C25/30	1,08	1,09	1,12	1,07	1,12	1,11	1,10
			C30/37	1,14	1,17	1,22	1,13	1,22	1,21	1,18
			C35/45	1,20	1,23	1,32	1,17	1,32	1,29	1,25
			C40/50	1,26	1,30	1,41	1,23	1,41	1,38	1,32
			C45/55	1,31	1,37	1,50	1,28	1,50	1,46	1,39
			C50/60	1,35	1,43	1,58	1,33	1,58	1,53	1,46
Partial safety factor		γ_{inst} [3]	[-]	1,0						
		γ_{Mp} [4]	[-]	1,5 [4]						
Concrete cone and splitting failure										
Effective anchorage depth		h_{ef}	[mm]	35	48	40	60	50	70	85
Factor for cracked concrete		k_{cr}	[-]	7,7						
Factor for non-cracked concrete		k_{ucr}	[-]	11,0						
Spacing		$s_{cr,N}$	[mm]	106	144	120	180	150	210	254
Edge distance		$c_{cr,N}$	[mm]	53	72	60	90	75	105	127
Spacing (splitting)		$s_{cr,sp}$	[mm]	170	192	160	240	200	280	340
Edge distance (splitting)		$c_{cr,sp}$	[mm]	85	96	80	120	100	140	170
Partial safety factor		γ_{Msp} [3]	[-]	1,5						

[1] For use in dry internal exposure and for statically indeterminate structural components
[2] Pull-out failure is not decisive
[3] In absence of other national regulations
[4] The installation safety factor of γ_{inst} = 1,0 is included

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR

Performance

Characteristic resistance under tension loads

Table C2: Characteristic resistances under shear loads in case of static and quasi-static loading for design according to EOTA TR 055 or

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR				Anchor size						
				M8-1 [1]	M8-2	M10-1	M10-2	M12-1	M12-2	M16
Steel failure without lever arm										
Characteristic resistance	S-KA+/ BA-V Plus S-KAK+/ BA-F Plus	$V_{Rk,s}$	[kN]	12,6	12,6	20,4	20,4	30,0	30,0	54,1
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR			15,8	15,8			34,4	34,4	68,6
Partial safety factor		γ_{Ms} [2]	[-]	1,25						
Factor for considering ductility		k_7	[-]	1,0						
Steel failure with lever arm										
Characteristic resistance	S-KA+/ BA-V Plus S-KAK+ / BA-F Plus	$M^0_{Rk,s}$	[Nm]	26,3	26,3	51	51	90	90	219,8
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR			25,1	25,1					214,8
Partial safety factor		γ_{Ms} [2]	[-]	1,25						
Concrete pryout failure										
k-factor		k_8	[-]	2,21	1,94	3,31	3,31	2,84	2,84	2,71
Partial safety factor		γ_{Mc} [2]	[-]	1,5						
Concrete edge failure										
Effective length of anchor under shear load		l_f	[mm]	35	48	40	60	50	70	85
Outside diameter of anchor		d_{nom}	[mm]	8	8	10		12		16
Partial safety factor		γ_{Mc} [2]	[-]	1,5						

[1] For use in dry internal exposure and for statically indeterminate structural components

[2] In absence of other national regulations

Table C3: Characteristic resistances under tension loads in case of fire exposure for design according to EOTA TR 020 or

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR				Anchor size						
				M8-1 [1]	M8-2	M10-1	M10-2	M12-1	M12-2	M16
Steel failure										
Characteristic resistance $N_{Rk,s,fi}$	S-KA+/ BA-V Plus, S-KAK+ / BA-F Plus	R30	[kN]	1,31	1,31	2,09	2,09	3,05	3,05	5,69
		R60	[kN]	1,05	1,05	1,66	1,66	2,40	2,40	4,47
		R90	[kN]	0,80	0,80	1,24	1,24	1,74	1,74	3,25
		R120	[kN]	0,67	0,67	1,02	1,02	1,41	1,41	2,64
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	R30	[kN]	3,92	3,92	6,66	6,66	10,25	10,25	19,09
		R60	[kN]	2,70	2,70	4,59	4,59	7,07	7,07	13,16
		R90	[kN]	1,48	1,48	2,52	2,52	3,88	3,88	7,23
		R120	[kN]	0,87	0,87	1,48	1,48	2,29	2,29	4,26
Pull-out failure										
Characteristic resistance $N_{Rk,p,fi}$		R30	[kN]	1,25	2,13	[2]	3,00	[2]	4,00	6,00
		R60	[kN]	1,25	2,13	[2]	3,00	[2]	4,00	6,00
		R90	[kN]	1,25	2,13	[2]	3,00	[2]	4,00	6,00
		R120	[kN]	1,00	1,70	[2]	2,40	[2]	3,20	4,80
Concrete cone and splitting failure [3]										
Characteristic resistance $N^0_{Rk,c,fi}$		R30	[kN]	1,25	2,87	1,82	5,02	3,18	7,38	11,98
		R60	[kN]	1,25	2,87	1,82	5,02	3,18	7,38	11,98
		R90	[kN]	1,25	2,87	1,82	5,02	3,18	7,38	11,98
		R120	[kN]	1,00	2,30	1,46	4,02	2,55	5,90	9,59
Spacing		$s_{cr,N,fi}$	[mm]	$4 \times h_{ef}$						
		s_{min}	[mm]	55	35	50	40	55	60	65
Edge distance		$c_{cr,N,fi}$	[mm]	$2 \times h_{ef}$						
		c_{min}	[mm]	Fire attack from one side: $c_{min} = 2 \times h_{ef}$						
				Fire attack from more than one side: $c_{min} \geq 300$ mm and $\geq 2 \times h_{ef}$						

[1] For use in dry internal exposure and for statically indeterminate structural components

[2] Pull-out isn't decisive

[3] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed

Design under fire exposure is performed according to the design method given in EOTA TR 020.

Under fire exposure usually cracked concrete is assumed. The design equations are given in EOTA TR 020 § 2.2.1.

In the absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

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Table C4: Characteristic resistances under shear loads in case of fire exposure for design according to EOTA TR 020 or

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR				Anchor size						
				M8-1 [1]	M8-2	M10-1	M10-2	M12-1	M12-2	M16
Steel failure without lever arm										
Characteristic resistance $V_{Rk,s,fi}$	S-KA+/ BA-V Plus, S-KAK+ / BA-F Plus	R30	[kN]	1,31	1,31	2,09	2,09	3,05	3,05	5,69
		R60	[kN]	1,05	1,05	1,66	1,66	2,40	2,40	4,47
		R90	[kN]	0,80	0,80	1,24	1,24	1,74	1,74	3,25
		R120	[kN]	0,67	0,67	1,02	1,02	1,41	1,41	2,64
	S-KAH+/ BA-E Plus S-KAH+ HCR / BA-E Plus HCR	R30	[kN]	3,92	3,92	6,66	6,66	10,25	10,25	19,09
		R60	[kN]	2,70	2,70	4,59	4,59	7,07	7,07	13,16
		R90	[kN]	1,48	1,48	2,52	2,52	3,88	3,88	7,23
		R120	[kN]	0,87	0,87	1,48	1,48	2,29	2,29	4,26
Steel failure with lever arm										
Characteristic resistance $M^0_{Rk,s,fi}$	S-KA+/ BA-V Plus, S-KAK+ / BA-F Plus	R30	[Nm]	0,38	0,38	1,12	1,12	2,62	2,62	6,66
		R60	[Nm]	0,34	0,34	0,97	0,97	1,97	1,97	4,99
		R90	[Nm]	0,26	0,26	0,75	0,75	1,70	1,70	4,33
		R120	[Nm]	0,19	0,19	0,60	0,60	1,31	1,31	3,33
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	R30	[Nm]	0,75	0,75	1,87	1,87	3,93	3,93	9,99
		R60	[Nm]	0,60	0,60	1,50	1,50	3,28	3,28	8,32
		R90	[Nm]	0,45	0,45	1,20	1,20	2,62	2,62	6,66
		R120	[Nm]	0,38	0,38	1,05	1,05	2,10	2,10	5,33
Concrete pryout failure										
k-factor		k_8	[-]	2,21	1,94	3,31	3,31	2,84	2,84	2,71
Characteristic resistance $V_{Rk,cp,fi}$		R30	[kN]	2,76	5,57	6,02	16,62	9,03	20,96	32,47
		R60	[kN]	2,76	5,57	6,02	16,62	9,03	20,96	32,47
		R90	[kN]	2,76	5,57	6,02	16,62	9,03	20,96	32,47
		R120	[kN]	2,21	4,46	4,83	13,31	7,24	16,76	25,99
Concrete edge failure										
The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by: $V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c}$ (≤ R90) $V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.										

[1] For use in dry internal exposure and for statically indeterminate structural components

Design under fire exposure is performed according to the design method given in EOTA TR 020.
Under fire exposure usually cracked concrete is assumed. The design equations are given in EOTA TR 020 § 2.2.1.
EOTA TR 020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \times h_{ef}$.
In the absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR

Performance

Characteristic shear resistance under fire exposure

Table C5: Displacements under tension loads for static and quasi-static loading

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR			**Anchor size**						
			M8-1 [1]	**M8-2**	**M10-1**	**M10-2**	**M12-1**	**M12-2**	**M16**
Cracked C20/25 – C50/60	**N**	**[kN]**	**2,4**	**4,1**	**4,3**	**5,7**	**6,1**	**7,6**	**11,4**
	δ_{N0}	[mm]	0,459	0,981	0,494	0,619	0,541	0,241	0,777
	$\delta_{N\infty}$	[mm]	0,653	1,470	0,976	1,367	0,981	1,263	2,211
Non-cracked C20/25 - C50/60	**N**	**[kN]**	**3,8**	**5,2**	**5,7**	**9,0**	**8,5**	**11,9**	**17,1**
	δ_{N0}	[mm]	0,094	0,188	0,064	0,270	0,052	0,105	0,135
	$\delta_{N\infty}$	[mm]	0,653	1,470	0,976	1,367	0,981	1,263	2,211

Table C6: Displacements under shear loads for static and quasi-static loading

Cracked and non-cracked concrete C20/25 - C50/60			**Anchor size**						
			M8-1 [1]	**M8-2**	**M10-1**	**M10-2**	**M12-1**	**M12-2**	**M16**
S-KA+/ BA-V Plus, S-KAK+ / BA-F Plus	**V**	**[kN]**	**7,2**	**7,2**	**10,5**	**10,5**	**16,4**	**16,4**	**30,9**
	δ_{V0}	[mm]	1,090	1,090	1,943	0,680	2,438	2,127	2,778
	$\delta_{V\infty}$	[mm]	1,635	1,635	2,914	1,020	3,657	3,191	4,167
S-KAH+ / BA-E Plus , S-KAH+ HCR / BA-E Plus HCR	**V**	**[kN]**	**9,0**	**9,0**	**10,5**	**10,3**	**16,4**	**16,4**	**39,2**
	δ_{V0}	[mm]	1,653	1,653	1,943	0,680	2,438	2,127	3,441
	$\delta_{V\infty}$	[mm]	2,480	2,480	2,914	1,020	3,657	3,191	5,162

[1] For use in dry internal exposure and for statically indeterminate structural components

Table C7: Characteristic resistances in case of seismic action for design acc. EOTA TR 045: Performance Category C1 and C2

Sormat through bolts S-KA+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-E Plus, BA-E Plus HCR				Anchor size			
				M8-2	M10-2	M12-2	M16
Tension - steel failure							
Characteristic resistance **C1**		$N_{Rk,s,seis,C1}$	[kN]	15,0	-	-	-
Characteristic resistance **C2**	S-KA+ / BA-V Plus	$N_{Rk,s,seis,C2}$	[kN]	15,0	26,0	39,0	73,0
	S-KAH+/ BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$N_{Rk,s,seis,C2}$	[kN]	15,0	26,0	40,0	73,0
Partial safety factor		$\gamma_{Ms,seis}$ [1]	[-]	1,4			
Tension - pull-out failure							
Characteristic resistance **C1**	S-KA+ / BA-V Plus	$N_{Rk,p,seis,C1}$	[kN]	8,5	-	-	-
	S-KAH+/ BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$N_{Rk,p,seis,C1}$	[kN]	8,4	-	-	-
Characteristic resistance **C2**	S-KA+/ BA-V Plus	$N_{Rk,p,seis,C2}$	[kN]	1,7	2,7	2,8	10,2
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$N_{Rk,p,seis,C2}$	[kN]	3,6	3,2	3,3	11,1
Partial safety factor		$\gamma_{Mp,seis}$ [1]	[-]	1,5 [2]			
Concrete cone and splitting failure [3]							
Effective anchorage depth		h_{ef}	[mm]	48	60	70	85
Partial safety factor		$\gamma_{Mc,seis}$ [1] $\gamma_{Msp,seis}$ [1]	[-]	1,5 [2]			
Shear - steel failure without lever arm							
Characteristic resistance **C1**	S-KA+ / BA-V Plus	$V_{Rk,s,seis,C1}$	[kN]	8,1	-	-	-
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$V_{Rk,s,seis,C1}$	[kN]	7,9	-	-	-
Characteristic resistance **C2**	S-KA+ / BA-V Plus	$V_{Rk,s,seis,C2}$	[kN]	9,5	8,5	13,8	30,7
	S-KAH+ / BA-E Plus S-KAH+ HCR / BA-E Plus HCR	$V_{Rk,s,seis,C2}$	[kN]	8,4	9,4	14,4	30,8
Partial safety factor		$\gamma_{Ms,seis}$ [1]	[-]	1,25			
Concrete pryout and concrete edge failure [3]							
Effective anchorage depth		h_{ef}	[mm]	48	60	70	85
Partial safety factor		$\gamma_{Mc,seis}$ [1]	[-]	1,5 [2]			

[1] In absence of other national regulations
[2] The installation safety factor of γ_2 = 1,0 is included
[3] For concrete cone, splitting, pryout and edge failure, see EOTA TR 045

Sormat through bolts S-KA+, S-KAK+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-F Plus, BA-E Plus, BA-E Plus HCR

Performance

Characteristic resistances under seismic action
Performance category C1 and C2

Table C8: Displacements in case of seismic action for design acc. EOTA TR 045: Performance Category C2

Sormat through bolts S-KA+, S-KAH+, S-KAH+ HCR / EJOT through bolts BA-V Plus, BA-E Plus, BA-E Plus HCR				**Anchor size**			
				M8-2	**M10-2**	**M12-2**	**M16**
Displacement under tension loads							
Displacement **DLS**	S-KA+ / BA-V Plus	$d_{N,seis}$	[mm]	4,6	3,1	5,6	4,0
	S-KAH+ / BA-E Plus, S-KAH+ HCR / BA-E Plus HCR	$d_{N,seis}$	[mm]	3,8	2,8	6,0	4,7
Displacement **ULS**	S-KA+ / BA-V Plus	$d_{N,seis}$	[mm]	11,5	10,7	16,7	14,0
	S-KAH+ / BA-E Plus, S-KAH+ HCR / BA-E Plus HCR	$d_{N,seis}$	[mm]	11,1	6,8	15,5	15,1
Displacement under shear loads							
Displacement **DLS**	S-KA+ / BA-V Plus	$d_{V,seis}$	[mm]	2,7	3,9	3,6	3,7
	S-KAH+ / BA-E Plus, S-KAH+ HCR / BA-E Plus HCR	$d_{V,seis}$	[mm]	2,7	4,5	4,7	3,9
Displacement **ULS**	S-KA+/ BA-V Plus	$d_{V,seis}$	[mm]	4,7	5,8	5,3	6,8
	S-KAH+ / BA-E Plus, S-KAH+ HCR / BA-E Plus HCR	$d_{V,seis}$	[mm]	4,8	7,6	7,5	7,7