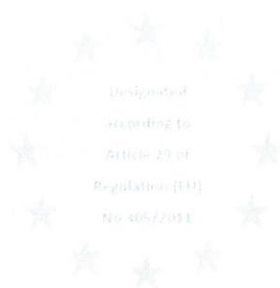




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European Technical Assessment

ETA-20/0446
of 19. 1. 2021

English version prepared by ZAG

General Part

**Technical Assessment Body issuing the
European Technical Assessment**

ZAG Ljubljana

Trade name of the construction product

Sormat Concrete Screw Anchor S-CSA+

**Product family to which the construction
product belongs**

**33: Concrete screw of size 8, 10 and 14
for use in cracked and non-cracked
concrete**

Manufacturer

**SORMAT OY
Harjutie 5
21290 Rusko
Finland
www.sormat.com**

Manufacturing plant

Sormat Plant 1

**This European Technical Assessment
contains**

**13 pages including 10 annexes, which form
an integral part of the document**

**This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of**

**EAD 330232-00-0601,
edition October 2016**

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Specific part

1 Technical description of the product

The Sormat Concrete Screw Anchor S-CSA+ is a concrete screw in sizes 8, 10 and 14 made of galvanised carbon steel. The fastener is screwed into a predrilled cylindrical hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

For the installed anchor see Figure given in Annex A1.

2 Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

The performances given in Chapter 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

The basic work requirements for mechanical resistance and stability are listed in Annexes C1, C2 and C5.

3.2 Safety in case of fire (BWR 2)

The basic work requirements for safety in case of fire are listed in Annexes C3 and C4.

3.3 General aspects relating to fitness for use

Durability and serviceability are only ensured if specifications of intended use according to Annex B1 are kept.



4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the decision 96/582/EC of the European Commission¹ the system of assessment and verification of constancy of performance (see Annex V to regulation (EU) No 305/2011) ¹ apply.

5 Technical details necessary for the implementation of the AVCP system, as provided for on the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in chapter 3 of EAD 330232-00-0601.

Issued in Ljubljana on 19. 1. 2021

Signed by:

Franc Capuder, M.Sc.

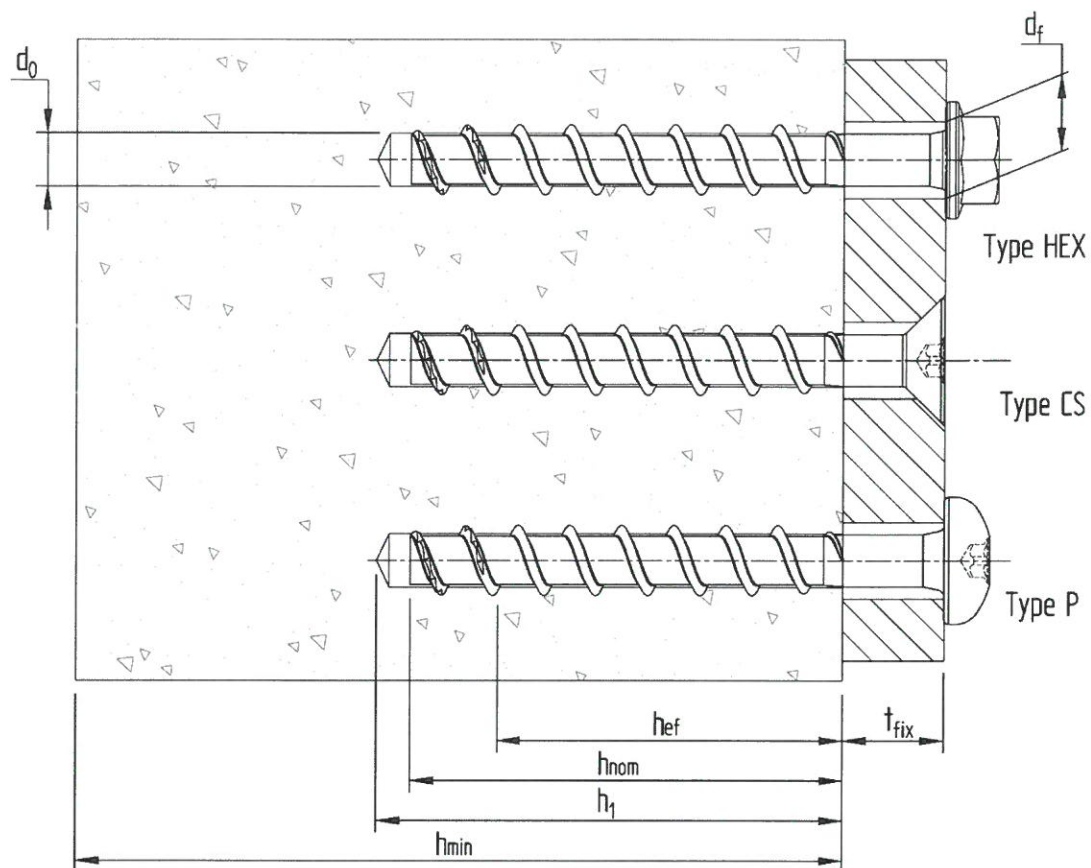
Head of Service of TAB



¹

Official Journal of the European Communities L 254 of 8.10.1996

SORMAT Concrete Screw Anchors S-CSA+ after installation



- d_0 = Drill hole diameter
- h_{nom} = Nominal embedment depth
- h_1 = Drill hole depth
- h_{min} = Minimum concrete member thickness
- t_{fix} = Fixture thickness
- d_f = Clearance hole diameter in fixture



Sormat Concrete Screw Anchor S-CSA+

Product description

Installation condition

Annex A1

Table A1: Materials and Types

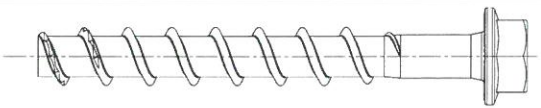
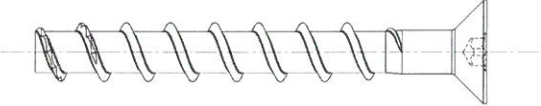
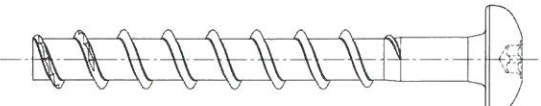
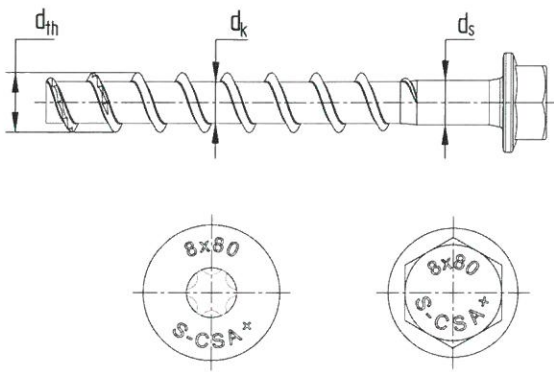
Material			f_{yk} [N/mm ²]	f_{uk} [N/mm ²]
Cold forged carbon steel, zinc electroplated according to EN ISO 4042 or with Multi Layer Coating, thickness $\geq 5\mu\text{m}$			640	800
Part	Designation	Description	Design	
1	S-CSA+ HEX	Hexagonal head version with combined washer		
2	S-CSA+ CS	Countersunk head version with T-drive		
3	S-CSA+ P	Pan head version with T-drive		

Table A2: Anchor dimensions and head marking

Anchor size			S-CSA+ 8	S-CSA+ 10	S-CSA+ 14
Nominal diameter	d_{nom}	[mm]	8	10	14
Thread outer diameter	d_{th}	[mm]	10,50	12,70	16,55
Core diameter	d_k	[mm]	7,30	9,15	13,00
Shaft diameter	d_s	[mm]	7,80	9,62	13,40
Stressed section	A_s	[mm ²]	42,43	65,76	132,73

Marking: Identifying mark: S
Anchor identity: CSA+
Nominal diameter: d_{nom}
Screw length: L
Example: S-CSA+ 8x80



Sormat Concrete Screw Anchor S-CSA+**Product description**

Materials, types and dimensions

Annex A2

Specifications of intended use

Anchorage subjected to:

- Static, quasi static load.
- Fire exposure.

Base materials:

- Cracked and non-cracked concrete.
- Reinforced and unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according to EN 206:2013+A1:2016.

Use conditions (Environmental conditions):

- The anchor may be used in concrete subject to dry internal conditions.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static and quasi-static actions are designed in accordance with EOTA TR 055, Edition December 2016 or EN 1992-4:2018.
- For application with resistance under fire exposure the anchorages are designed in accordance with the method given in EOTA TR 020, Edition May 2004.
- Verifiable calculation notes and drawings are prepared taking into account of the load to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply for.
- Check of concrete being well compacted, e.g. without significant voids.
- Cleaning of the hole of drilling dust.
- Anchor installation ensuring the specified embedment depth.
- Keeping of the edge distance and spacing to the specified values without minus tolerances.
- Positioning of the drill holes without damaging the reinforcement.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength non-shrinkage mortar. No shear or oblique tension loads are allowed in the direction of a not filled aborted hole.
- Observe the maximum installation torque given in Annex B2.

Sormat Concrete Screw Anchor S-CSA+

Intended use
Specifications

Annex B1

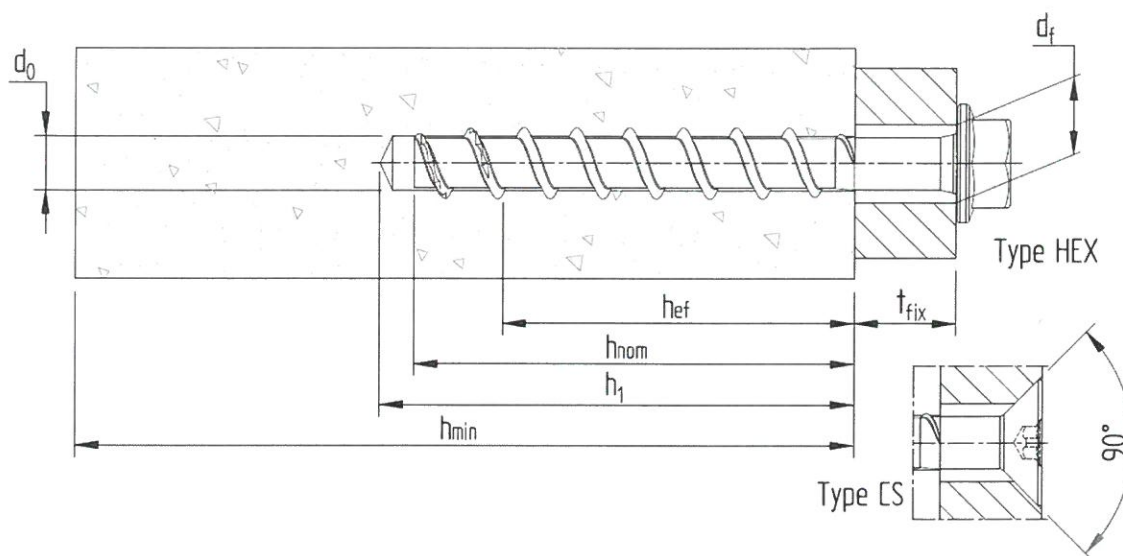


Table B1: Installation data

SORMAT Concrete Screw Anchor S-CSA+		Anchor size					
		S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
		8-1	8-2	10-1	10-2	14-1	14-2
Nominal embedment depth	h_{nom} [mm]	50	65	55	85	65	115
Drill hole diameter	d_0 [mm]	8		10		14	
Cutting diameter at the upper tolerance limit (maximum diameter bit)	$d_{cut,max} \leq$ [mm]	8,45		10,45		14,50	
Depth of drilled hole to deepest point	$h_1 \geq$ [mm]	60	75	65	95	75	125
Effective anchorage depth	h_{ef} [mm]	39,2	51,9	42,5	68,0	49,3	91,8
Diameter of clearance hole in the fixture	d_f [mm]	10,8 - 12,0		13,0 – 14,0		17,0 – 18,0	
Maximum installation torque	$T_{inst} \leq$ [Nm]	45		85		100	
Max installation torque for impact screw driver	T_{SD} [Nm]	290		650		650	

Table B2: Minimum thickness of concrete member, spacing and edge distance

SORMAT Concrete Screw Anchor S-CSA+		Anchor size					
		S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
		8-1	8-2	10-1	10-2	14-1	14-2
Minimum thickness of concrete member	h_{min} [mm]	100	115	100	130	120	150
Minimum spacing	s_{min} [mm]	35	35	40	40	60	60
Minimum edge distance	c_{min} [mm]	35	35	40	40	60	60

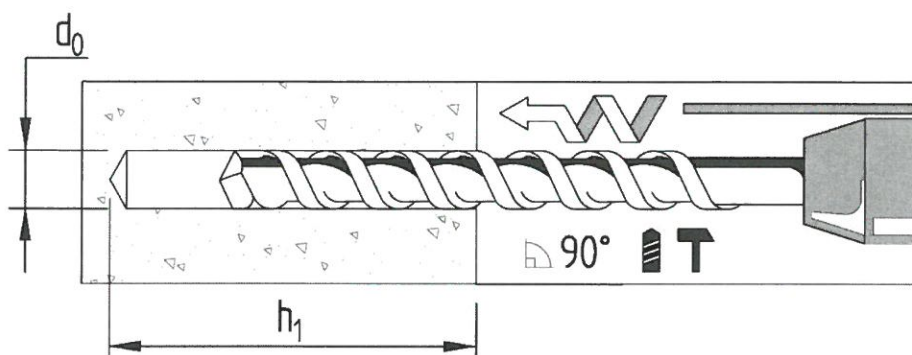
Sormat Concrete Screw Anchor S-CSA+

Intended use

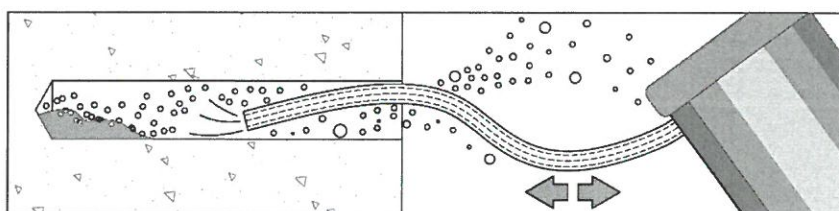
Installation data

Annex B2

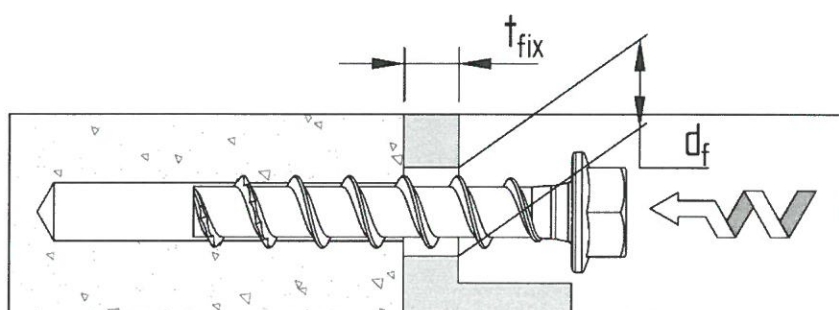
Installation instructions



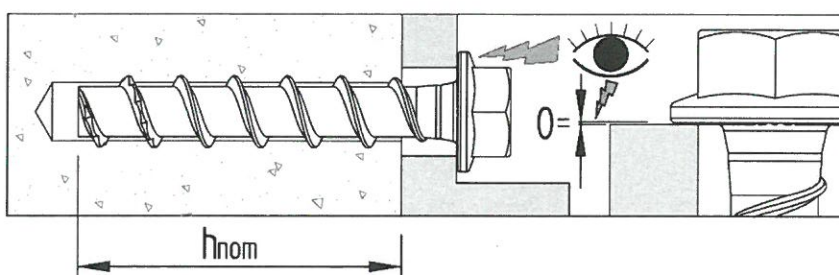
Make a cylindrical hole



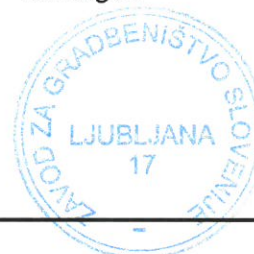
Clean the hole



Install the screw anchor by impact screwdriver or torque wrench



Ensure that the screw anchor head fully rests without any gap on the fixture and is not damaged



Sormat Concrete Screw Anchor S-CSA+

Intended use

Installation instructions

Annex B3

Table C1: Characteristic resistances under tension loads in case of static and quasi-static loading for design according EOTA TR 055 or EN 1992-4:2018

SORMAT Concrete Screw Anchor S-CSA+			Anchor size					
			S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
			8-1	8-2	10-1	10-2	14-1	14-2
Steel failure								
Characteristic resistance	N _{Rk,s}	[kN]	33,9		52,6		106,2	
Partial safety factor	γ _{Ms} ¹⁾	[-]	1,5					
Pull-out failure								
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	6,5	12	7,5	19	8,5	30
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	f ¹⁾	f ¹⁾	f ¹⁾	f ¹⁾	15	42
Increasing factor for N _{Rk,p}	Ψ _C	C25/30	1,07	1,07	1,06	1,06	1,08	1,10
		C30/37	1,13	1,14	1,12	1,12	1,14	1,19
		C35/45	1,19	1,19	1,17	1,17	1,20	1,27
		C40/50	1,24	1,24	1,21	1,21	1,26	1,34
		C45/55	1,28	1,29	1,25	1,25	1,31	1,41
		C50/60	1,32	1,33	1,29	1,28	1,35	1,47
Partial safety factor	γ _{inst}	[-]	1,0					
	γ _{Mp} ²⁾	[-]	1,5 ³⁾					
Concrete cone and splitting failure								
Effective anchorage depth	h _{ef}	[mm]	39,2	51,9	42,5	68,0	49,3	91,8
Factor for cracked concrete	k _{cr}	[-]	7,7					
Factor for non-cracked concrete	k _{ucr}	[-]	11,0					
Spacing	s _{cr,N}	[mm]	118	156	128	204	148	275
Edge distance	c _{cr,N}	[mm]	59	78	64	102	74	138
Spacing (splitting)	s _{cr,sp}	[mm]	118	176	128	232	148	275
Edge distance (splitting)	c _{cr,sp}	[mm]	59	88	64	116	74	138
Partial safety factor	γ _{Msp} ¹⁾	[-]	1,5 ³⁾					

¹⁾ Pull-out isn't decisive

²⁾ In absence of other national regulations

³⁾ The installation safety factor of $\gamma_{inst} = 1,0$ is included

Sormat Concrete Screw Anchor S-CSA+

Performance

Characteristic resistance under tension loads

Annex C1

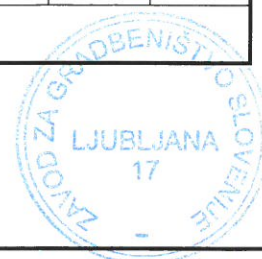


Table C2: Characteristic resistances under shear loads in case of static and quasi-static loading for design according to EOTA TR 055 or EN 1992-4:2018

SORMAT Concrete Screw Anchor S-CSA+			Anchor size					
			S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
			8-1	8-2	10-1	10-2	14-1	14-2
Steel failure without lever arm								
Characteristic resistance	V _{Rk,s}	[kN]	19,1	21,5	31,8	35,2	61,1	64,9
Partial safety factor	γ _{Ms} ¹⁾	[-]	1,25					
Factor for considering ductility	k ₇	[-]	0,8				1,0	
Steel failure with lever arm								
Characteristic resistance	M ⁰ _{Rk,s}	[Nm]	37	45	72	84	207	227
Partial safety factor	γ _{Ms} ¹⁾	[-]	1,25					
Concrete pryout failure								
k-factor	k ₈	[-]	3,4		3,0		3,3	
Partial safety factor	γ _{Mc} ¹⁾	[-]	1,5					
Concrete edge failure								
Effective length of anchor under shear load	l _f	[mm]	39,2	51,9	42,5	68,0	49,3	91,8
Outside diameter of anchor	d _{nom}	[mm]	8		10		14	
Cracked concrete without any edge reinforcement	ψ _{re,V}	[-]	1,0					
Cracked concrete with straight edge reinforcement > Ø12 mm			1,2					
Cracked concrete with edge reinforcement and closely spaced stirrups (a ≤ 100mm) or non-cracked concrete			1,4					
Partial safety factor	γ _{Mc} ¹⁾	[-]	1,5					

¹⁾ In absence of other national regulations



Sormat Concrete Screw Anchor S-CSA+

Performance

Characteristic resistance under shear loads

Annex C2

Table C3: Characteristic resistances under tension loads in case of fire exposure for design according to EOTA TR 020 or **EN 1992-4:2018**

SORMAT Concrete Screw Anchor S-CSA+				Anchor size					
				S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
				8-1	8-2	10-1	10-2	14-1	14-2
Steel failure									
Characteristic resistance $N_{Rk,s,fi}$	R30	[kN]	0,42		0,99		2,65		
	R60	[kN]	0,38		0,85		1,99		
	R90	[kN]	0,30		0,66		1,73		
	R120	[kN]	0,21		0,53		1,33		
Pull-out failure									
Characteristic resistance $N_{Rk,p,fi}$	R30	[kN]	1,63	3,00	1,88	4,75	2,13	7,50	
	R60	[kN]	1,63	3,00	1,88	4,75	2,13	7,50	
	R90	[kN]	1,63	3,00	1,88	4,75	2,13	7,50	
	R120	[kN]	1,30	2,40	1,50	3,80	1,70	6,00	
Concrete cone and splitting failure ¹⁾									
Characteristic resistance $N^0_{Rk,c,fi}$	R30	[kN]	1,66	3,34	2,03	6,57	2,94	13,90	
	R60	[kN]	1,66	3,34	2,03	6,57	2,94	13,90	
	R90	[kN]	1,66	3,34	2,03	6,57	2,94	13,90	
	R120	[kN]	1,33	2,67	1,62	5,25	2,35	11,12	
Spacing	$s_{cr,N,fi}$	[mm]	4 x h_{ef}						
	s_{min}	[mm]	35	35	40	40	60	60	
Edge distance	$c_{cr,N,fi}$	[mm]	2 x h_{ef}						
	c_{min}	[mm]	Fire attack from one side: $c_{min} = 2 \times h_{ef}$						
			Fire attack from more than one side: $c_{min} \geq 300 \text{ mm and } \geq 2 \times h_{ef}$						

¹⁾ 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.



Sormat Concrete Screw Anchor S-CSA+

Performance

Characteristic tension resistance under fire exposure

Annex C3

Table C4: Characteristic resistances under shear loads in case of fire exposure for design according to EOTA TR 020 or **EN 1992-4:2018**

SORMAT Concrete Screw Anchor S-CSA+			Anchor size					
			S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
			8-1	8-2	10-1	10-2	14-1	14-2
Steel failure without lever arm								
Characteristic resistance $V_{Rk,s,fi}$	R30	[kN]	0,42		0,99		2,65	
	R60	[kN]	0,38		0,85		1,99	
	R90	[kN]	0,30		0,66		1,73	
	R120	[kN]	0,21		0,53		1,33	
Steel failure with lever arm								
Characteristic resistance $M^0_{Rk,s,fi}$	R30	[Nm]	0,47	0,56	1,35	1,57	5,18	5,67
	R60	[Nm]	0,42	0,50	1,17	1,36	3,88	4,25
	R90	[Nm]	0,33	0,39	0,90	1,05	3,36	3,69
	R120	[Nm]	0,23	0,28	0,72	0,84	2,58	2,83
Concrete pryout failure								
k-factor	k_8	[-]	3,4		3,0		3,3	
Characteristic resistance $V_{Rk,cp,fi}$	R30	[kN]	5,64	11,36	6,09	19,71	9,70	45,87
	R60	[kN]	5,64	11,36	6,09	19,71	9,70	45,87
	R90	[kN]	5,64	11,36	6,09	19,71	9,70	45,87
	R120	[kN]	4,52	9,08	4,86	15,75	7,76	36,70
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:								
$V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c} \quad (\leq R90) \qquad V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c} \quad (R120)$								
with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.								

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 Concrete Screw Anchor S-CSA+

Performance

Characteristic shear resistance under fire exposure



Annex C4

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

SORMAT Concrete screw anchor S-CSA+			Anchor size					
			S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
			8-1	8-2	10-1	10-2	14-1	14-2
Cracked C20/25	N	[kN]	3,10	5,71	3,57	9,05	4,05	14,29
	δ_{N0}	[mm]	0,04	0,08	0,03	0,15	0,20	0,22
	$\delta_{N\infty}$	[mm]	0,65	0,94	0,48	0,89	1,65	1,52
Cracked C50/60	N	[kN]	4,09	7,60	4,61	11,58	5,46	21,00
	δ_{N0}	[mm]	0,05	0,13	0,09	0,14	0,24	0,32
	$\delta_{N\infty}$	[mm]	0,65	0,94	0,48	0,89	1,65	1,52
Non-cracked C20/25	N	[kN]	5,76	8,76	6,48	13,14	7,14	20,00
	δ_{N0}	[mm]	0,07	0,12	0,10	0,09	0,33	0,15
	$\delta_{N\infty}$	[mm]	0,65	0,94	0,48	0,89	1,65	1,52
Non-cracked C50/60	N	[kN]	9,10	13,85	10,26	20,76	9,64	29,40
	δ_{N0}	[mm]	0,17	0,26	0,07	0,33	0,17	0,23
	$\delta_{N\infty}$	[mm]	0,65	0,94	0,48	0,89	1,65	1,52

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

SORMAT Concrete screw anchor S-CSA+			Anchor size					
			S-CSA+ 8		S-CSA+ 10		S-CSA+ 14	
			8-1	8-2	10-1	10-2	14-1	14-2
Cracked and non-cracked concrete C20/25 - C50/60	V	[kN]	10,91	12,29	18,17	20,11	34,91	37,09
	δ_{V0}	[mm]	1,19	1,35	3,04	3,20	2,33	2,46
	$\delta_{V\infty}$	[mm]	1,79	2,02	4,56	4,80	3,50	3,69

Sormat Concrete Screw Anchor S-CSA+**Performance**

Displacements under tension and shear loads

**Annex C5**