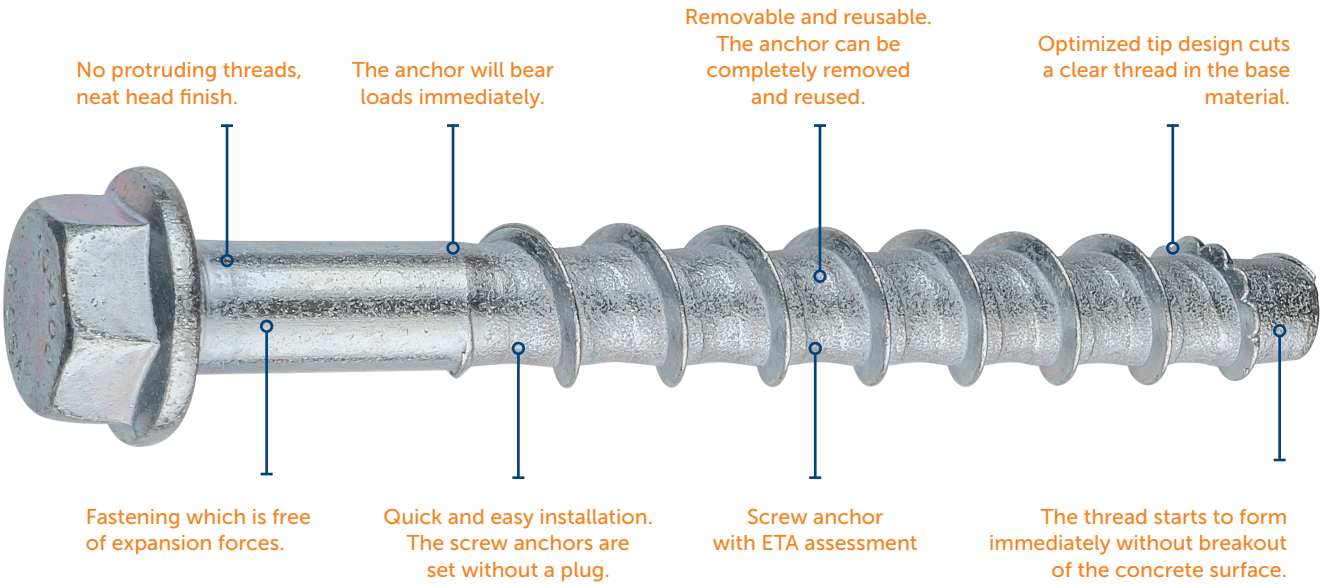
SORMAT

CONCRETE SCREW

PRODUCT DATA SHEET

ETA-ASSESSED, HIGH PERFORMANCE CONCRETE SCREWS FROM FINLAND



CONCRETE SCREWS S-CSA+

The S-CSA+ concrete screws are very easy and quick to install. Requires neither additional tools nor operations. It is able to take high loads even with relatively small spacings and edge distances. It is removable and reusable and therefore fits also well for temporary fixings.

Description

- Self-tapping, approved screw anchors for push-through installations.
- No expansion forces allowing for relatively small edge distances and spacings.
- ZP (zinc electro plated) for dry indoor use.
- ML (Multi Layer) corrosion protection coating tested 2016 hours in SST acc. ISO 9227 and then fulfills the requirements for the neutral salt spray test with the corrosion class "C3 very high" according to DIN EN ISO 12944-6:2018-06.
- A4 Stainless Steel with hardened carbon steel tip, coated
- Combines the benefits of undercut and chemical anchors requiring neither additional tools and operations nor hardening time.
- The concrete screw is installed directly through the fixture into the bore hole only by screwing. By doing so, the thread is cutting itself into the concrete and that way creating a mechanical interlock over the total anchorage depth.

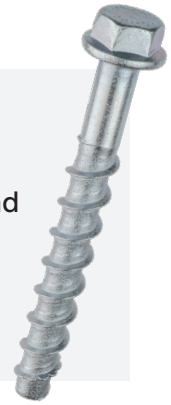
BASE MATERIALS

Approved for			Also suitable for	
Cracked concrete	Uncracked concrete	Hollow concrete slab	Solid clay brick	Solid sand -lime brick

TYPES

S-CSA+ HEX

Concrete screw with hexagonal head and flange. Sizes 8, 10, 14.



S-CSA+ HEX

Concrete screw with hexagonal head and flange. Sizes 5, 6.
Size 5 without T-drive.

S-CSA+ HEX WOF

Concrete screw with hexagonal head without flange. Size 14.

S-CSA+ CS

Concrete screw with countersunk head and T-drive. Sizes 5, 6, 8 ,10.

S-CSA+ P (FL)

Concrete screw with flat panhead. Size 6.

S-CSA+ P

Concrete screw with pan head and T-drive. Size 6.

S-CSA+ I

Concrete screw with combined internal thread M8 / M10. Size 6.

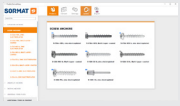
S-CSA+ E

Concrete screw with external thread M8. Size 6.

S-CSA A4

Stainless steel concrete screws, sizes 6, 8 and 10.

ASSESSMENTS / CERTIFICATIONS / APPLICATIONS

Description of document		Authority/ Laboratory	ID	Additional info
European Technical Assessment		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-20/0446 (S-CSA+ 6, 8, 10, 14)	EAD 330232-02-0601, Option 1
European Technical Assessment		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-17/1009 (S-CSA+, S-CSA A4)	Concrete screw of size 6 for multiple use in non-structural applications, EAD 330747-00-0601, (Part 6)
European Technical Assessment		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-22/0413 (S-CSA A4)	EAD 330232-01-0601, Option 1
General construction technique permit DIBt	RE USE	DIBt	Z-21.8-2136	S-CSA+ 10 & 14 mm for temporary fastenings in concrete
Seismic resistance		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-20/0446 (S-CSA+ 6, 8, 10, 14)	EN 1992-4
Fire resistance		ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-20/0446 ETA-17/1009 ETA-22/0413	EN 1992-4
YouTube installation videos	YouTube	EJOT Sormat Oy		Sormat Concrete screw installation video
Sormat Trustfix anchor calculation software		Sormat Oy / S&P Software Consulting		TrustFIX anchor calculation
CAD-blocks for AutoCAD		EJOT Sormat Oy		Blocks installation instructions for AutoCAD
ProdLib		ProdLib Oy	prodlib.com/ library/sormat	CAD block library

Additional information concerning all given data in the product data sheet

1. Load figures include the partial safety factors as per assessments and a partial safety factor on the action of $\gamma_F = 1.4$. Load figures apply for a rebar spacing $s \geq 15$ cm or alternatively for a rebar spacing $s \geq 10$ cm in combination with a rebar diameter of $d_s \leq 10$ mm.

2. If spacings or edge distances become smaller than the characteristic figures ($s_{cr,N}$ / $c_{cr,N}$) a calculation as per EN 1992-4 needs to be carried out. For more details, see ETA-20/0446, ETA-17/1009 and ETA-22/0413.

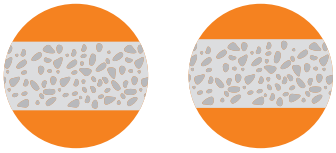
3. Concrete is considered uncracked when the value of tension within the concrete is $\sigma_L + \sigma_R \leq 0$. In the absence of detailed verification $\sigma_R = 3$ N/mm^2 can be assumed (σ_L equals the tension within the concrete as a result of external loads, forces on anchor included; σ_R equals the tension coming from shrinkage or creep of the concrete, as well as displacements of supports or temperature variations).

4. Shear load figures apply for an anchor without influence of a concrete edge. For shear loads close to an edge ($c \leq 10 \times h_{ef}$), concrete edge failure has to be checked as per EN 1992-4.

STATIC AND QUASI-STATIC LOADS S-CSA+

The data of these tables is based on:

- Material cold forged carbon steel
- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2.
- Installation has been done correctly.
- No influence of edge distances and spacings (see page 19).
- Respect of minimum base material thickness (see page 19).



Characteristic resistances

		S-CSA 5		S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
		-	-	PART 6	PART 6	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1
Effective anchorage depth h_{ef}	[mm]	19,0	27,5	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68,0	49,3	66,3	91,8
Nominal anchorage depth h_{nom}	[mm]	35	45	35	40	40	55	50	65	55	70	85	65	85	115
Uncracked concrete															
Tension N_{Rk}	[kN]	2,4	3,5	4,0	4,0	7,0	9,7	12,1	18,4	13,6	20,2	27,6	15,8	26,6	43,3
Shear V_{Rk}	[kN]	2,4	3,5	9,4*	9,4*	9,4*	9,4*	19,1*	19,1*	31,8*	31,8*	31,8*	56,2	61,1*	61,1*
Cracked concrete															
Tension N_{Rk}	[kN]	NA	NA	4,0	4,0	3,5	4,8	6,8	12,5	7,9	10,3	19,3	9,0	16,6	30,2
Shear V_{Rk}	[kN]	NA	NA	9,4*	9,4*	9,4*	9,4*	19,1*	19,1*	28,6	31,8*	31,8*	39,3	61,3	61,1*

* Failure mode = steel

Design resistances

		S-CSA 5		S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
		-	-	PART 6	PART 6	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1
Effective anchorage depth h_{ef}	[mm]	19,0	27,5	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68,0	49,3	66,3	91,8
Nominal anchorage depth h_{nom}	[mm]	35	45	35	40	40	55	50	65	55	70	85	65	85	115
Uncracked concrete															
Tension N_{Rd}	[kN]	1,6	2,3	2,7	2,7	4,7	6,5	8,0	12,3	9,1	13,5	18,4	10,5	17,7	28,8
Shear V_{Rd}	[kN]	1,6	2,3	7,5*	7,5*	7,5*	7,5*	15,3*	15,3*	25,4*	25,4*	25,4*	37,5	48,9*	48,9*
Cracked concrete															
Tension N_{Rd}	[kN]	NA	NA	2,7	2,7	2,3	3,2	4,5	8,3	5,3	6,9	12,9	6	11,1	20,1
Shear V_{Rd}	[kN]	NA	NA	7,5*	7,5*	7,5*	7,5*	15,3*	15,3*	19,1	25,4*	25,4*	26,2	40,9	48,9*

* Failure mode = steel

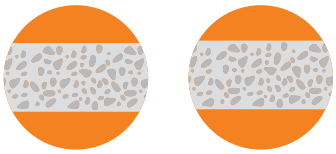
Recommended loads

		S-CSA 5		S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
		-	-	PART 6	PART 6	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1
Effective anchorage depth h_{ef}	[mm]	19,0	27,5	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68,0	49,3	66,3	91,8
Nominal anchorage depth h_{nom}	[mm]	35	45	35	40	40	55	50	65	55	70	85	65	85	115
Uncracked concrete															
Tension N_{Rec}	[kN]	1,1	1,7	1,9	1,9	3,3	4,6	5,7	8,8	6,5	9,6	13,1	7,5	12,6	20,6
Shear V_{Rec}	[kN]	1,1	1,7	5,4*	5,4*	5,4*	5,4*	10,9*	10,9*	18,2*	18,2*	18,2*	26,8	34,9*	34,9*
Cracked concrete															
Tension N_{Rec}	[kN]	NA	NA	1,9	1,9	1,7	2,3	3,2	6	3,8	4,9	9,2	4,3	7,9	14,4
Shear V_{Rec}	[kN]	NA	NA	5,4*	5,4*	5,4*	5,4*	10,9*	10,9*	13,6	18,2*	18,2*	18,7	29,2	34,9*

* Failure mode = steel

STATIC AND QUASI-STATIC LOADS S-CSA A4

The data of these tables is based on:
- Material cold forged stainless steel A4, hardened steel tip
- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2.
- Installation has been done correctly.
- No influence of edge distances and spacings (see page 20).
- Respect of minimum base material thickness (see page 20).



Characteristic resistances

			S-CSA A4 6			S-CSA A4 8		S-CSA A4 10	
			PART 6	OPT 1		OPT 1		OPT 1	
Effective anchorage depth h_{ef}		[mm]	31,9	34,0	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth h_{nom}		[mm]	40	45	55	50	65	55	85
Uncracked concrete	Tension N_{Rk}	[kN]	6,0	6,0	9,5	8,5	16,6	11,0	25,4
	Shear V_{Rk}	[kN]	13,4*	14,3*	14,3*	24,3*	24,3*	29,4*	29,4*
Cracked concrete	Tension N_{Rk}	[kN]	6,0	2,5	3,5	3,0	8,5	2,5	9,0
	Shear V_{Rk}	[kN]	12,4	14,3*	14,3*	24,3*	24,3*	29,4*	29,4*

* Failure mode = steel

Design resistances

			S-CSA A4 6			S-CSA A4 8		S-CSA A4 10	
			PART 6	OPT 1		OPT 1		OPT 1	
Effective anchorage depth h_{ef}		[mm]	31,9	34,0	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth h_{nom}		[mm]	40	45	55	50	65	55	85
Uncracked concrete	Tension N_{Rd}	[kN]	4,0	4,0	6,3	5,7	11,1	7,3	16,9
	Shear V_{Rd}	[kN]	8,9*	9,5*	9,5*	16,2*	16,2*	19,6*	19,6*
Cracked concrete	Tension N_{Rd}	[kN]	4,0	1,7	2,3	2,0	5,7	1,7	6,0
	Shear V_{Rd}	[kN]	8,3	9,5*	9,5*	14,3	16,2*	18,5	19,6

* Failure mode = steel

Recommended loads

			S-CSA A4 6			S-CSA A4 8		S-CSA A4 10	
			PART 6	OPT 1		OPT 1		OPT 1	
Effective anchorage depth h_{ef}		[mm]	31,9	34,0	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth h_{nom}		[mm]	40	45	55	50	65	55	85
Uncracked concrete									
Uncracked concrete	Tension N_{Rec}	[kN]	2,9	2,9	4,5	4,0	7,9	5,2	12,1
	Shear V_{Rec}	[kN]	6,4*	6,8*	6,8*	11,6*	11,6*	14,0*	14,0*
Cracked concrete									
Cracked concrete	Tension N_{Rec}	[kN]	2,9	1,2	1,7	1,4	4,0	1,2	4,3
	Shear V_{Rec}	[kN]	5,9	6,8*	6,8*	10,2	11,6*	13,2	14,0*

* Failure mode = steel

The partial safety factor for action is γ = 1.4.

BASIC LOADING DATA FOR PRECAST PRE-STRESSED HOLLOW CORE SLABS

The data of these tables is based on:

- Concrete C30/37 to C50/60
- Installation has been done correctly.
- The data of these tables is based on ETA-17/1009 (S-CSA+ 6, S-CSA A4 6).

Characteristic resistances

			S-CSA+ 6 (S-CSA A4 6)		
Nominal anchorage depth	h_{nom}	[mm]	35 / 40 (40)		
Flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 40
Load for all directions	F_{Rk}	[kN]	2,5 (2,0)	3,5 (3,0)	5,0 (5,5)
Char. bending resistance	$M^0_{Rk,s}$	[Nm]		16,0	
Edge distance	$c_{cr} = c_{min}$	[mm]		100	
Spacing	$s_{cr} = s_{min}$	[mm]		100	

Design resistances

			S-CSA+ 6 (S-CSA A4 6)		
Nominal anchorage depth	h_{nom}	[mm]	35 / 40 (40)		
Flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 40
Load for all directions	F_{Rd}	[kN]	1,7 (1,3)	2,3 (2)	3,3 (3,7)
Design bending resistance	$M_{Rd,s}$	[Nm]		12,8	
Edge distance	$c_{cr} = c_{min}$	[mm]		100	
Spacing	$s_{cr} = s_{min}$	[mm]		100	

Recommended loads

			S-CSA+ 6 (S-CSA A4 6)		
Nominal anchorage depth	h_{nom}	[mm]	35 / 40 (40)		
Flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 40
Load for all directions	F_{rec}	[kN]	1,2 (1,0)	1,7 (1,4)	2,4 (2,6)
Rec. bending load	M_{rec}	[Nm]		9,1	
Edge distance	$c_{cr} = c_{min}$	[mm]		100	
Spacing	$s_{cr} = s_{min}$	[mm]		100	

The partial safety factor for action is $\gamma = 1.4$.

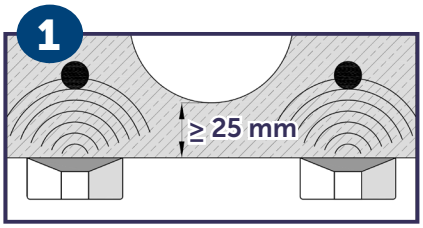
Requirements for multiple anchoring

The definition of redundant fastening according to Member States is given in the EAD 330747 § 1.2.1. In Absence of definition by Member State the following default values may be taken.

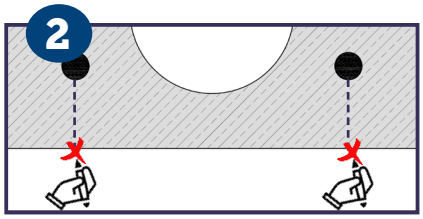
Minimum number of fixing points	Minimum number of anchors per fixing point	Maximum design load of action N_{Sd} per fixing point
3	**1**	**2 kN**
4	**1**	**3 kN**

The value N_{Sd} migth be increased if in the design it is shown that the requirements on the strength and stiffness of the fixture in the serviceability and ultimate states after the failure of one anchor are fulfilled.

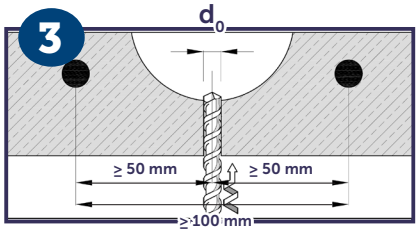
INSTALLATION INSTRUCTIONS IN PRE-STRESSED HOLLOW CORE SLABS



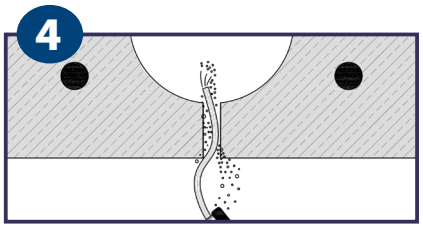
1. Locate rebars by means of suitable detector



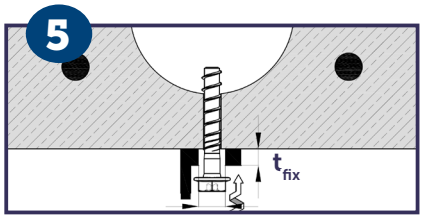
2. Mark rebar location



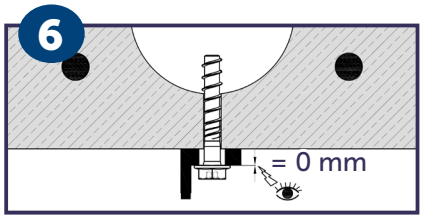
3. Make a cylindrical hole



4. Clean the hole

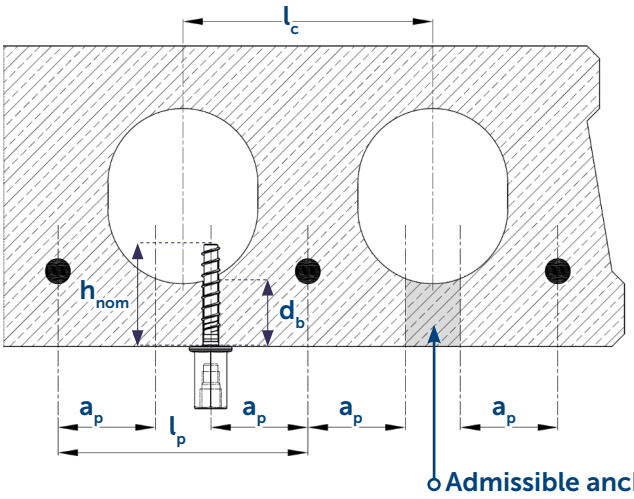


5. Install the screw anchor very gently by screwdriver or torque wrench. Avoid overtightening.



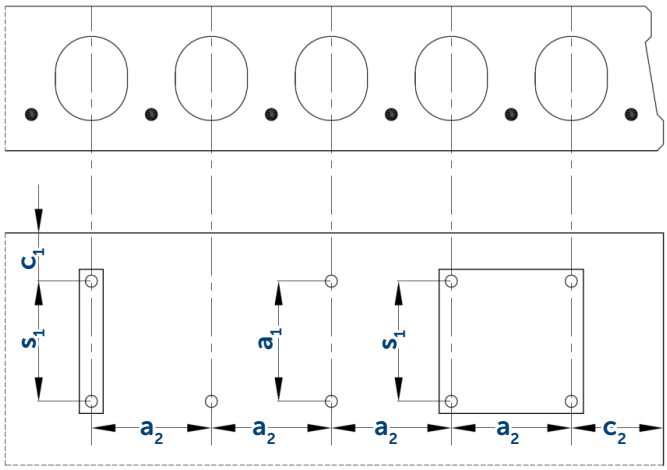
6. Ensure that the screw anchor head fully rests without any gap on the fixture and is not damaged

Admissible anchor position in pre-stressed hollow core slabs



Core distance	$l_c \geq 100$ mm
Pre-stressing steel distance	$l_p \geq 100$ mm
Distance between anchor position and prestressing steel	$a_p \geq 50$ mm

Minimum spacing and edge distance of anchors and distance between anchor groups in pre-stressed hollow core slabs



Minimum edge distance	$c_{min} \geq 100$ mm
Minimum anchor spacing	$s_{min} \geq 100$ mm
Minimum distance between anchor groups	$a_{min} \geq 100$ mm

c1, c2 **edge distance**
s1, s2 **anchor spacing**
a1, a2 **distance between anchor groups**

BASIC LOADING DATA FOR PRECAST PRE-STRESSED HOLLOW CORE SLABS S-CSA+ 14

The data of these tables is based on:

- Concrete C30/37 to C50/60 (uncracked)
- Installation has been done correctly.
- No edge distance and spacing influence
- For single anchor
- For temporary application
- Prior to every reuse, the wear of the thread shall be verified with an appropriate checking gauge (CG+)
- Ratio core width/web thickness ≤ 5,3

Installation position for temporary fastening in hollow core slab:

- Top position of the slab is allowed.
- Anchor to be installed within position of ± 10 mm of the thickest section of the solid part.

Design resistances: Concrete C30/37

			S-CSA+		
			14		
Nominal anchorage depth	h_{nom}	(mm)	65	85	115
Drill hole depth	h1 ≥	(mm)	75	95	125
Tension	N_{Rd}	(kN)	12,4	19,7	29,5
Shear	V_{Rd}	(kN)	13,9	21,7	29,4

Recommended loads: Concrete C30/37

			S-CSA +		
			14		
Nominal anchorage depth	h_{nom}	(mm)	65	85	115
Drill hole depth	h1 ≥	(mm)	75	95	125
Tension	N_{Rec}	(kN)	8,9	14,1	21,0
Shear	V_{Rec}	(kN)	9,9	15,5	21,0

Design resistances: Concrete C50/60

			S-CSA+		
			14		
Nominal anchorage depth	h_{nom}	(mm)	65	85	115
Drill hole depth	h1 ≥	(mm)	75	95	125
Tension	N_{Rd}	(kN)	15,3	22,6	39,4
Shear	V_{Rd}	(kN)	17,9	28,0	38,0

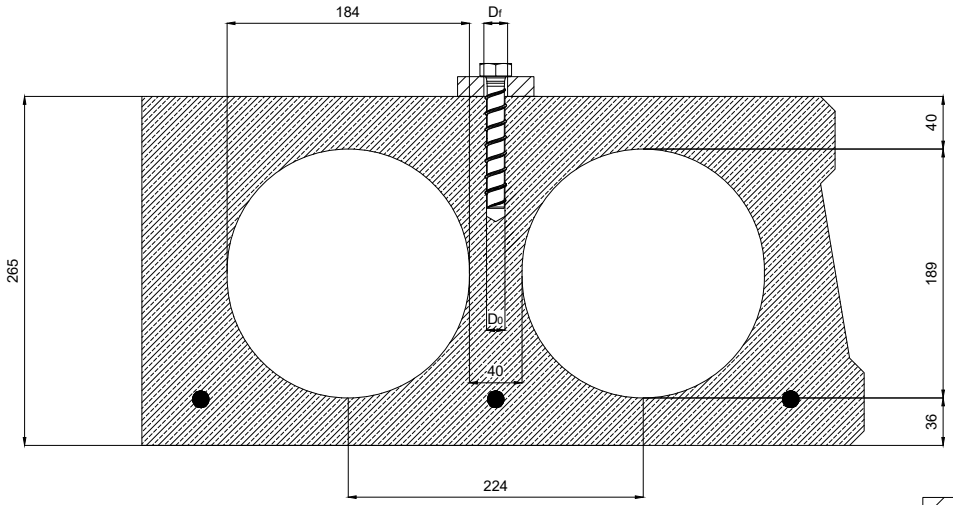
Recommended loads: Concrete C50/60

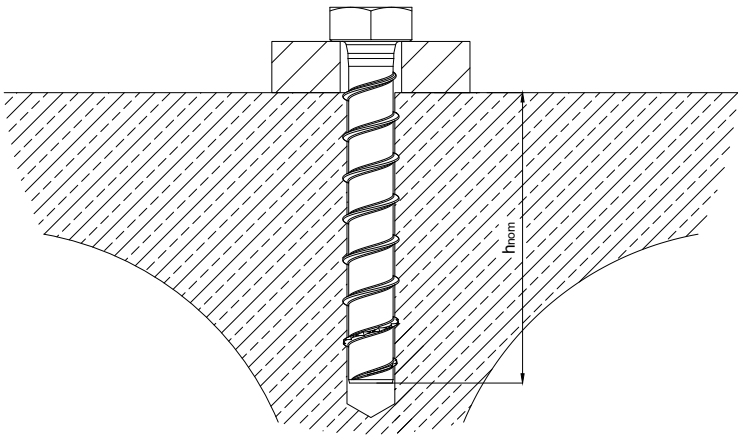
			S-CSA +		
			14		
Nominal anchorage depth	h_{nom}	(mm)	65	85	115
Drill hole depth	h1 ≥	(mm)	75	95	125
Tension	N_{Rec}	(kN)	10,9	16,1	28,1
Shear	V_{Rec}	(kN)	12,8	20,0	27,1

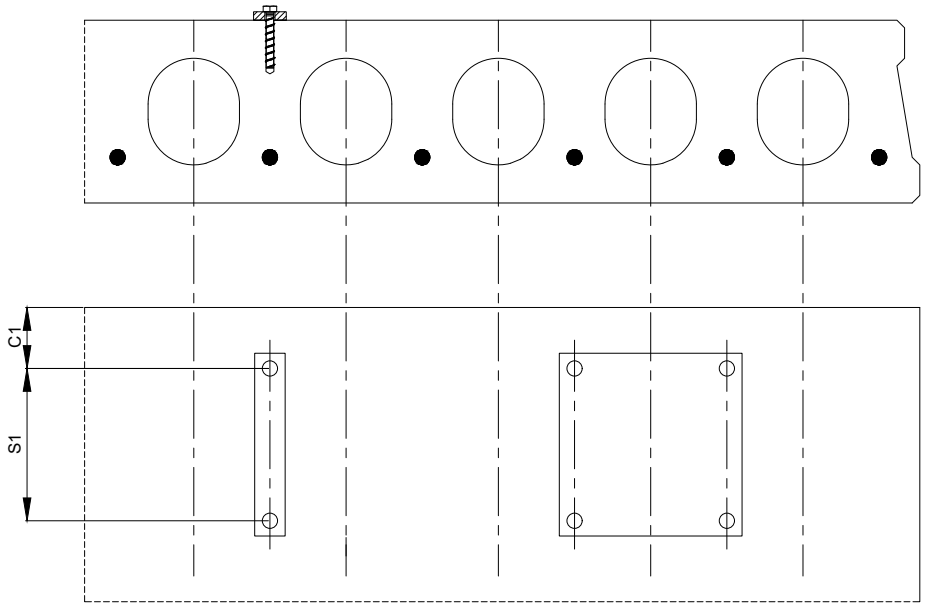
INSTALLATION INSTRUCTIONS IN PRE-STRESSED HOLLOW CORE SLABS S-CSA+ 14

Anchor spacing and edge distances

			S-CSA+		
			14		
Nominal anchorage depth	h_{nom}	(mm)	65	85	115
Minimum spacing	s_{min}	(mm)	60		
Minimum edge distance	c_{min}	(mm)	60		
Characteristic spacing	s_{cr}	(mm)	3 h_{ef}		
Characteristic edge distance	c_{cr}	(mm)	1,5 h_{ef}		







SEISMIC RESISTANCE

Design acc. EN 1992-4 Performance category C1

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2
- Installation has been done correctly
- No influence of edge distances and spacings
- Respect of minimum base material thickness
- α_{gap} = 0,5 (used without seismic filling washer, concerns only the shear values)
- ETA-20/0446 (S-CSA+)

Characteristic resistances

Anchor size		6-2	8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**42,5**	**51,9**	**68,0**	**91,8**
Cracked concrete					
Tension $N_{Rk,\,seis}$	[kN]	**4,8**	**10,9**	**16,4**	**25,7**
Shear $V_{Rk,\,seis}$	[kN]	**3,7***	**6,5***	**9,7***	**26,0***

Design resistances

Anchor size		6-2	8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**42,5**	**51,9**	**68,0**	**91,8**
Cracked concrete					
Tension $N_{Rd,\,seis}$	[kN]	**3,2**	**7,3**	**10,9**	**17,2**
Shear $V_{Rd,\,seis}$	[kN]	**3,0***	**5,2***	**7,8***	**20,8***

Recommended loads

Anchor size		6-2	8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**42,5**	**51,9**	**68,0**	**91,8**
Cracked concrete					
Tension $N_{Rec,\,seis}$	[kN]	**2,3**	**5,2**	**7,8**	**12,3**
Shear $V_{Rec,\,seis}$	[kN]	**2,1***	**3,7***	**5,5***	**14,8***

α_{seis} and α_{gap} included as per EOTA TR 045. The values don't consider any filling of the annular gap between the anchor and the fixture.

* Failure mode = steel

SEISMIC RESISTANCE

Design acc. EN 1992-4 Performance category C2

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2
- Installation has been done correctly
- No influence of edge distances and spacings
- Respect of minimum base material thickness
- α_{gap} = 1,0 (used with seismic filling washer, concerns only the shear values)
- ETA-20/0446 (S-CSA+)

Characteristic resistances

Anchor size		8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**51,9**	**68,0**	**91,8**
Cracked concrete				
Tension $N_{Rk,\ seis}$	[kN]	**1,9**	**3,8**	**6,9**
Shear $V_{Rk,\ seis}$	[kN]	**13,6***	**24,6***	**41,5***

Design resistances

Anchor size		8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**51,9**	**68,0**	**91,8**
Cracked concrete				
Tension $N_{Rd,\ seis}$	[kN]	**1,3**	**2,5**	**4,6**
Shear $V_{Rd,\ seis}$	[kN]	**10,9***	**19,7***	**33,2***

Recommended loads

Anchor size		8-2	10-3	14-3
Effective anchorage depth h_{ef}	[mm]	**51,9**	**68,0**	**91,8**
Cracked concrete				
Tension $N_{Rec,\ seis}$	[kN]	**0,9**	**1,8**	**3,3**
Shear $V_{Rec,\ seis}$	[kN]	**7,8***	**14,1***	**23,7***

α_{seis} and α_{gap} included as per EN 1992-4. The shear values consider filling of the annular gap between the anchor and the fixture.

* Failure mode = steel

FILLING WASHER

For seismic applications
Installation with S-CSA+ concrete screw

When selecting a S-CSA+ concrete screw, please note that the use of the Filling Washer reduces the fixture thickness t_{fix} of the concrete screw

1. Mount matching Filling Washer additionally to Concrete Screw

2. Drive in Concrete Screw with Filling Washer until the anchorage depth h_{nom} is reached

3. Stick mixer reducer tip on static mixer nozzle.
Adhesive tape can be used if necessary.

4. Fill the annular gap between Concrete screw and fixture through the hole of the Filling Washer until resin leaks out of this hole.

Please observe installation instructions of injection resin. Load may only be applied after the curing time of the injection resin is reached.

Filling Washer is used for filling the gap between fixture and concrete screw after it has been set.

After installation, Sormat injection resin is injected using the mixer reducer tip (included) until resin seeps out.

S-CSA+ concrete screw	8	10	14
Filling washer size	26x12x5	28x14x5	34x17x5
Reduction of fixture thickness t_{fix}	t_{fix} -5 mm	t_{fix} -5 mm	t_{fix} -5 mm

FIRE RESISTANCE S-CSA+

Design under fire exposure is performed according to the design method given in EN 1992-4.

The data of these tables is based on: ETA-20/0446 and ETA-17/1009

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm²
- Values cannot be used with hollow core slabs
- Installation has been done correctly.
- No influence of edge distances and spacings (see page 19)
- Respect of minimum base material thickness (see page 19)

Characteristic resistances, S-CSA+

			S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
			PART 6	PART 6	OPT 1	OPT 1	OPT 1		OPT 1			OPT 1		
Effective anchorage depth h_{ef}		[mm]	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68,0	49,3	66,3	91,8
Nominal anchorage depth h_{nom}		[mm]	35	40	40	55	50	65	55	70	85	65	85	115
Fire Exposure R30	Tension $N_{Rk,\,fi}$	[kN]	0,24	0,24	0,24	0,24	0,42	0,42	0,95	0,95	0,95	2,13	2,65	2,65
	Shear $V_{Rk,\,fi}$	[kN]	0,24	0,24	0,24	0,24	0,42	0,42	0,95	0,95	0,95	2,65	2,65	2,65
Fire Exposure R60	Tension $N_{Rk,\,fi}$	[kN]	0,22	0,22	0,22	0,22	0,38	0,38	0,83	0,83	0,83	1,99	1,99	1,99
	Shear $V_{Rk,\,fi}$	[kN]	0,22	0,22	0,22	0,22	0,38	0,38	0,83	0,83	0,83	1,99	1,99	1,99
Fire Exposure R90	Tension $N_{Rk,\,fi}$	[kN]	0,17	0,17	0,17	0,17	0,29	0,29	0,64	0,64	0,64	1,73	1,73	1,73
	Shear $V_{Rk,\,fi}$	[kN]	0,17	0,17	0,17	0,17	0,29	0,29	0,64	0,64	0,64	1,73	1,73	1,73
Fire Exposure R120	Tension $N_{Rk,\,fi}$	[kN]	0,12	0,12	0,12	0,12	0,21	0,21	0,51	0,51	0,51	1,33	1,33	1,33
	Shear $V_{Rk,\,fi}$	[kN]	0,12	0,12	0,12	0,12	0,21	0,21	0,51	0,51	0,51	1,33	1,33	1,33

The recommended loads under fire exposure include a safety factor for resistance under fire exposure $\gamma_{M,fi}$ = 1,0 and the partial safety factor for action $\gamma_{F,fi}$ = 1,0. The partial safety factors for action shall be taken from national regulations.

FIRE RESISTANCE S-CSA A4

Design under fire exposure is performed according to the design method given in EN 1992-4.

The data of these tables is based on: ETA-22/0413

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2
- Values cannot be used with hollow core slabs
- Installation has been done correctly.
- No influence of edge distances and spacings (see page 20)
- Respect of minimum base material thickness (see page 20)

Characteristic resistances, S-CSA A4

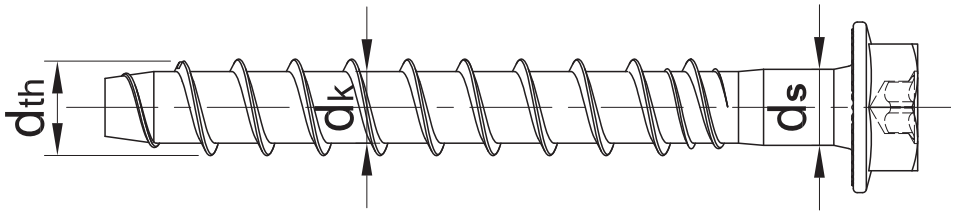
			S-CSA A4 6		S-CSA A4 8		S-CSA A4 10	
			OPT 1		OPT 1		OPT 1	
Effective anchorage depth h_{ef}		[mm]	34,0	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth h_{nom}		[mm]	45	55	50	65	55	85
Fire Exposure R30	Tension $N_{Rk,\,fi}$	[kN]	0,24	0,24	0,75	0,85	1,70	1,70
	Shear $V_{Rk,\,fi}$	[kN]	0,24	0,24	0,85	0,85	1,70	1,70
Fire Exposure R60	Tension $N_{Rk,\,fi}$	[kN]	0,22	0,22	0,68	0,68	1,36	1,36
	Shear $V_{Rk,\,fi}$	[kN]	0,22	0,22	0,68	0,68	1,36	1,36
Fire Exposure R90	Tension $N_{Rk,\,fi}$	[kN]	0,17	0,17	0,51	0,51	1,09	1,09
	Shear $V_{Rk,\,fi}$	[kN]	0,17	0,17	0,51	0,51	1,09	1,09
Fire Exposure R120	Tension $N_{Rk,\,fi}$	[kN]	0,12	0,12	0,42	0,42	0,95	0,95
	Shear $V_{Rk,\,fi}$	[kN]	0,12	0,12	0,42	0,42	0,95	0,95

The recommended loads under fire exposure include a safety factor for resistance under fire exposure $\gamma_{M,fi}$ = 1,0 and the partial safety factor for action $\gamma_{F,fi}$ = 1,0. The partial safety factors for action shall be taken from national regulations.

MATERIALS AND DIMENSIONS

Material quality and coating S-CSA+

Part	
Coating ZP	Zinc electroplated according to EN ISO 4042 ≥ 5 µm
Coating ML	Multi Layer coating ≥ 8 µm

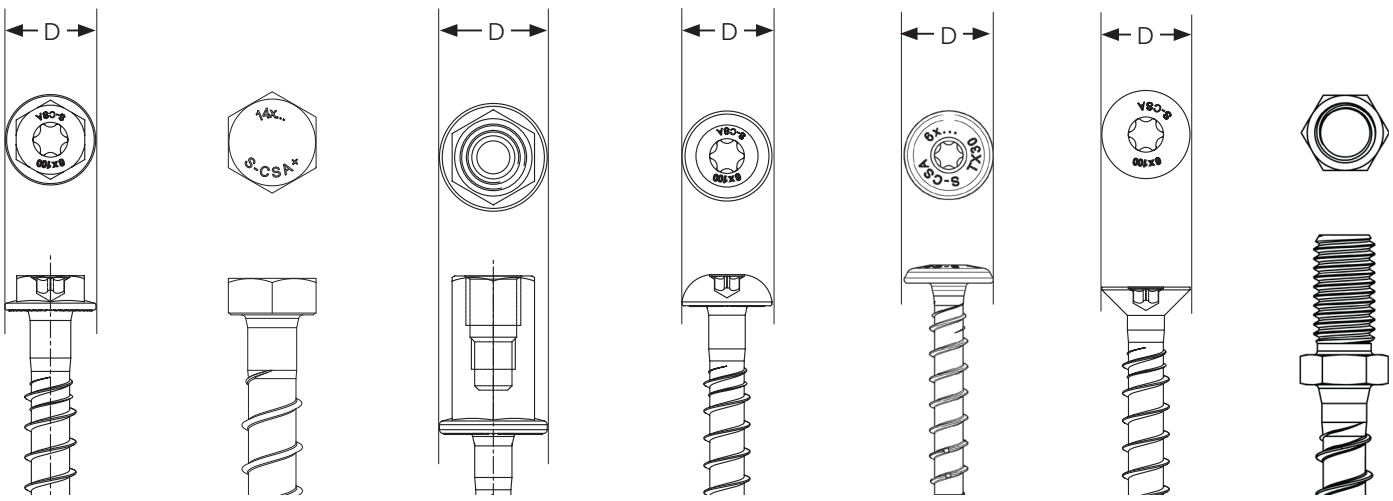


Mechanical properties S-CSA+

Specification			S-CSA 5		S-CSA+ 6			S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
Effective anchorage depth	h_{ef}	[mm]	19	27,5	27,6	31,9	42,5	39,2	51,9	42,5	55,3	68	49,3	66,3	91,8
Nominal anchorage depth	h_{nom}	[mm]	35	45	35	40	55	50	65	55	70	85	65	85	115
Nominal Tension strength	F_{uk}	[N/mm²]	800		800			800		800			800		
Char. bending resistance	$M^0_{Rk,s}$	[Nm]	8,6		16			37	37	69	69	69	207	207	207
Design bending resistance	$M_{Rd,s}$	[Nm]	5,7		12,8			29,6	29,6	52,2	55,2	55,2	165,6	165,6	165,6
Recommended bending resistance	M_{rec}	[Nm]	4,1		9,1			21,1	21,1	39,4	39,4	35,4	118,3	118,3	118,3

Specification			S-CSA 5	S-CSA+ 6	S-CSA+ 8	S-CSA+ 10	S-CSA+ 14
Nominal diameter	d_{nom}	[mm]	5,0	6,0	8,0	10,0	14,0
Thread outer diameter	d_{th}	[mm]	6,12	7,45	10,50	12,70	16,55
Core diameter	d_k	[mm]	4,50	5,55	7,30	9,15	13,00
Shaft diameter	d_s	[mm]	4,9	5,88	7,80	9,62	13,40
Stressed section	A_s	[mm²]	15,9	24,19	42,43	65,76	132,73
Diameter of flange HEX	D	[mm]	11,5	16,5	17,5	20,5	28/29,5
Diameter of flange I	D	[mm]	-	14,2	-	-	-
Diameter of pan head P (P FL)	D	[mm]	-	14,5 (17,4)	-	-	-
Diameter of countersunk CS	D	[mm]	9,8	14	18,2	-	-

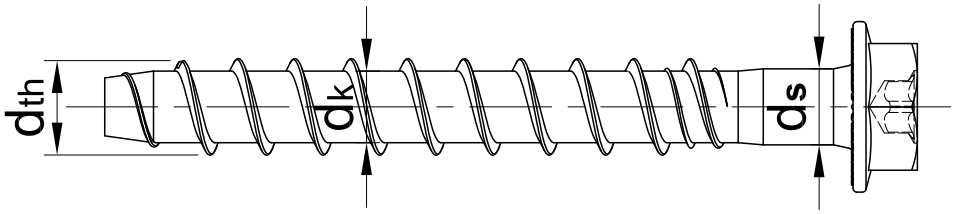
HEX HEX WOF I P P FL CS E



MATERIALS AND DIMENSIONS

Material quality and coating S-CSA A4

Part	
Material	Cold forged stainless steel A4, hardened steel tip

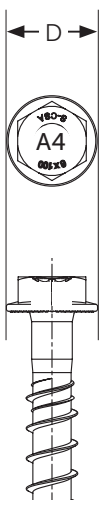


Mechanical properties

Specification			S-CSA A4 6		S-CSA A4 8		S-CSA A4 10	
Effective anchorage depth	h_{ef}	[mm]	34	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth	h_{nom}	[mm]	45	55	50	65	55	85
Nominal Tension strength	F_{uk}	[N/mm²]	800		800		705	
Char. bending resistance	$M^0_{Rk,s}$	[Nm]	19,4		45,6		75,1	
Design bending resistance	$M_{Rd,s}$	[Nm]	12,9		30,4		50,1	
Recommended bending resistance	M_{rec}	[Nm]	9,2		21,7		35,8	

Specification			S-CSA A4 6	S-CSA A4 8	S-CSA A4 10
Nominal diameter	d_{nom}	[mm]	6	8	10
Thread outer diameter	d_{th}	[mm]	7,45	9,9	11,9
Core diameter	d_k	[mm]	5,55	7,35	9,3
Shaft diameter	d_s	[mm]	5,9	7,85	9,67
Stressed section	A_s	[mm²]	24,19	42,43	67,93
Diameter of flange HEX	D	[mm]	16,5	17,5	20,5
Diameter of pan head P	D	[mm]	14,5	-	-
Diameter of countersunk CS	D	[mm]	14	-	-
Diameter of flange I	D	[mm]	14,2	-	-

HEX



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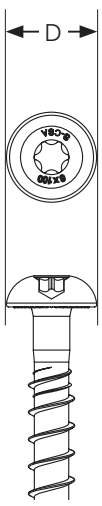
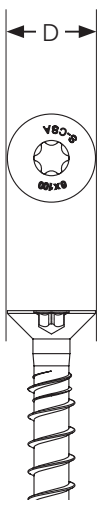
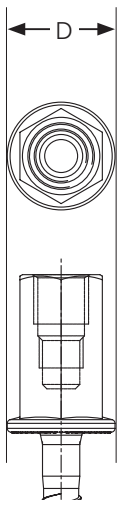


CS



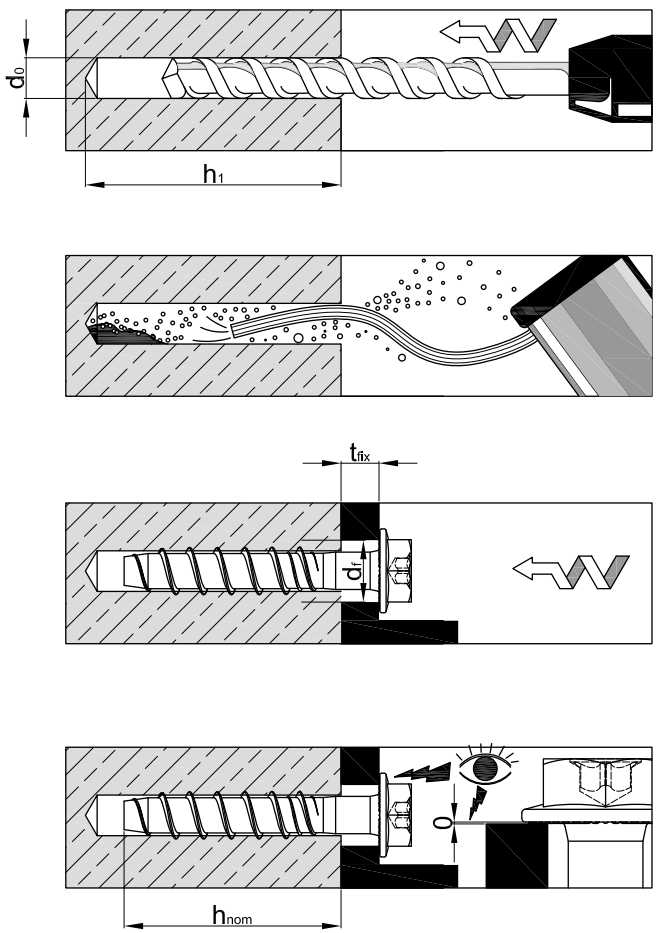
I



INSTALLATION INSTRUCTIONS

Installation equipment

Specification	S-CSA 5	S-CSA+ 6	S-CSA+ 8	S-CSA+ 10	S-CSA+ 14	S-CSA 6 A4	S-CSA 8 A4	S-CSA 10 A4
Rotary hammer	750...1200 r.p.m / 1.8 ...3.3 J							
Drill bit	SDS+ 2-CUT or 4-CUT sizes 5, 6, 8, 10, 14 mm							
Socket (SW) [mm]	8	13	13	15	21 or 24	13	13	15
T-drive / Torx	T25	T30	T45	-	-	-	-	-
Additional tools	air pump/compressor, torque wrench, impact screw driver							



NOTES:

CONCRETE AND HOLLOW CORE SLAB

- Concrete strength is C20/25 to C50/60
  Hollow core slabs C30/37 to C50/60
- No significant voids in concrete.
- Concrete is well compacted.
- Thickness of concrete is according PDS installation data.

INSTALLATION

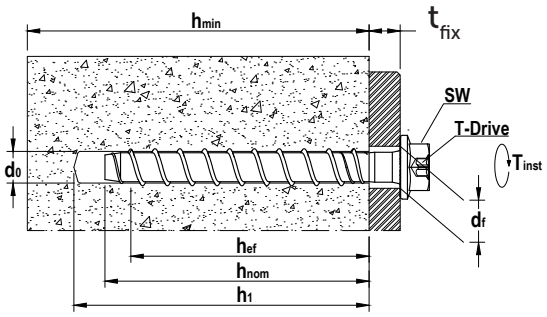
Edge distances and spacing are according PDS installation data.

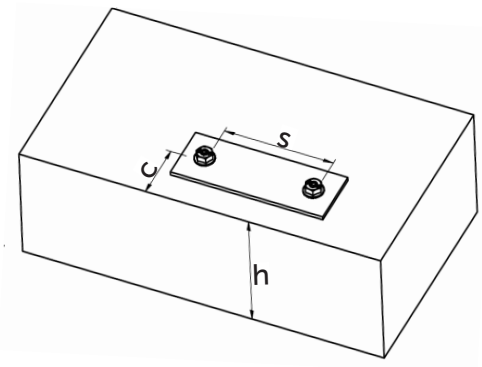
- Use proper air pump or compressor.
- Drill hole is deep enough (mentioned h_1 in PDS installation data).
- All dust should be cleaned from the hole to avoid screw jamming during installation.
- Pay special attention to cleaning, especially when installing downwards.
- In case of aborted hole, drilling 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.

OTHER BASE MATERIALS

- Concrete screw can be used also in other base materials such as solid clay brick and solid sand-lime brick.

INSTALLATION S-CSA+





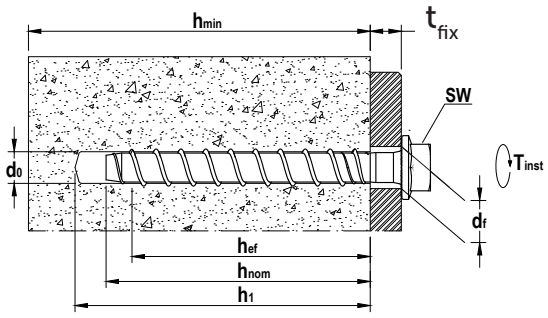
Installation data S-CSA+

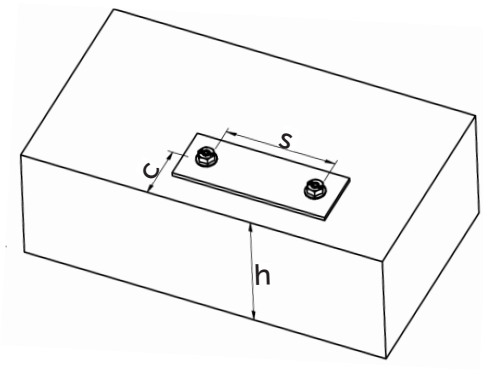
Specification			S-CSA 5		S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
Assessment			-	-	PART 6	PART 6	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1	OPT 1
Drill hole diameter	d_0	[mm]	**5**		**6**				**8**		**10**			**14**		
Cutting diameter at the upper tolerance limit (max. diam. bit)	$d_{cut,max} \leq$	[mm]	5,40		6,40				8,45		10,45			14,50		
Depth of drilled hole to deepest point	$h_{1 \geq}$	[mm]	45	55	45	50	50	65	60	75	65	80	95	75	95	125
Effective anchorage depth	h_{ef}	[mm]	19,0	27,5	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68	49,3	66,3	91,8
Nominal anchorage depth	h_{nom}	[mm]	35	45	35	40	40	55	50	65	55	70	85	65	85	115
Diameter of clearance hole in the fixture	d_f	[mm]	6,3-7,0		7,7-9,0				10,8-12,0		13,0-14,0			17,0-18,0		
Max. torque, manual	T_{inst}	[Nm]	12		14				45		85			100		
Max. torque. impact screw driver	T_{SD}	[Nm]	-		90				290		650			650		
Width across flats	SW	[mm]	8		13				13		15			21 / 24		
T-drive (in types HEX, CS and P)	T-drive		CS	T25	T30				T45		-			-		

Minimum thickness of concrete member, spacing and edge distance S-CSA+

Cracked and uncracked concrete			S-CSA 5		S-CSA+ 6				S-CSA+ 8		S-CSA+ 10			S-CSA+ 14		
Assessment			-	-	PART 6		OPT 1		OPT 1		OPT 1			OPT 1		
Effective anchorage depth	h_{ef}	[mm]	19,0	27,5	27,6	31,9	29,8	42,5	39,2	51,9	42,5	55,3	68	49,3	66,3	91,8
Nominal anchorage depth	h_{nom}	[mm]	35	45	35	40	40	55	50	65	55	70	85	65	85	115
Minimum thickness of base material	h_{min}	[mm]	80	80	80	80	80	92,7	100	112,7	100	112,8	125,5	120	137	162,5
Minimum spacing	s_{min}	[mm]	35	35	35	35	35	35	35	35	40	40	40	60	60	60
Minimum edge distance	c_{min}	[mm]	35	35	30	35	35	35	35	35	40	40	40	60	60	60
Critical **spacing** for splitting failure and concrete cone failure (in case characteristic loading affects)	$s_{cr,sp}$	[mm]	53	83	110	96	ETA-20/0446									
	$s_{cr,N}$	[mm]	53	83	83	96	89	128	118	156	128	165	204	148	198	275
Critical **edge distance** for splitting failure and concrete cone failure (in case characteristic loading affects)	$c_{cr,sp}$	[mm]	27	41	55	48	ETA-20/0446									
	$c_{cr,N}$	[mm]	27	41	41	48	44	64	59	78	64	82	102	74	99	138

INSTALLATION S-CSA A4





Installation data S-CSA A4

Specification			S-CSA A4 6			S-CSA A4 8		S-CSA A4 10	
Assessment			PART 6	OPT 1		OPT 1		OPT 1	
Drill hole diameter	d_0	[mm]	**6**	**6**		**8**		**101**	
Cutting diameter at the upper tolerance limit (max. diam. bit)	$d_{cut,max} \leq$	[mm]	6,4	6,4		8,45		10,45	
Depth of drilled hole to deepest point	$h_{1} \geq$	[mm]	50	55	65	60	75	65	95
Effective anchorage depth	h_{ef}	[mm]	31,9	34	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth	h_{nom}	[mm]	40	45	55	50	65	55	85
Diameter of clearance hole in the fixture	d_f	[mm]	7,7-9,0	≤ 9		≤ 12		≤ 14	
Max. torque, manual	$T_{inst} \leq$	[Nm]	14	14		40		75	
Max. torque. impact screw driver	T_{SD}	[Nm]	90	90		290		360	
Width across flats	SW	[mm]	13	13		13		15	
T-drive (in types CS and P)	T-drive		T30	T30		-		-	

Minimum thickness of concrete member, spacing and edge distance S-CSA A4

Cracked and uncracked concrete			S-CSA A4 6			S-CSA A4 8		S-CSA A4 10	
Assessment			PART 6	OPT 1		OPT 1		OPT 1	
Effective anchorage depth	h_{ef}	[mm]	31,9	34	42,5	35,8	48,5	39,1	64,6
Nominal anchorage depth	h_{nom}	[mm]	40	45	55	50	65	55	85
Minimum thickness of base material	h_{min}	[mm]	80	80	100	100	100	100	100
Minimum spacing	s_{min}	[mm]	35	35	35	35	35	40	40
Minimum edge distance	c_{min}	[mm]	35	35	35	35	35	40	40
Critical **spacing** for splitting failure and concrete cone failure (in case characteristic loading affects)	$s_{cr,sp}$	[mm]	120	136,0	127,5	121,7	165,0	195,5	184,5
	$s_{cr,N}$	[mm]	96	102,0	127,5	107,4	145,5	117,3	193,8
Critical **edge distance** for splitting failure and concrete cone failure (in case characteristic loading affects)	$c_{cr,sp}$	[mm]	60	68,0	63,8	60,9	82,5	97,8	92,3
	$c_{cr,N}$	[mm]	48	51,0	63,8	53,7	72,8	58,7	96,9

S-CSA+ 10 & 14 REUSABILITY

DIBt Z-21.8-2136 approves the reuse of the S-CSA+ concrete screw, 10 and 14 mm diameter in combination with the CG+ checking gauge. The checking gauge is a tool for measuring the reusability of the S-CSA+ 10 & 14 concrete screw for temporary applications. The checking must be performed before each reuse.

Field of application

S-CSA+ 10 and 14 shall only be applied for temporary fastening of construction site equipment, such as shoring props, fall protection devices or scaffolds. After it has been unscrewed, the fastener may be reused in other drill holes. However, a drilled hole shall not be reused after the fastener has been removed. Reusability of the fastener shall be checked prior to every use, both visually as well as with a checking gauge in accordance with installation parameters. Installed fasteners shall be checked for visible damage (for example due to corrosion) on an ongoing basis and replaced if required. The fastener may be used in cracked and uncracked concrete. The fastener is intended for temporary use in internal and external conditions.

Installation

S-CSA+ 10 and 14 is only intended for temporary application in a single drilled hole. After it has been removed, it may be reused in other drilled holes. However, it may not be screwed into the same drilled hole for a second time. Prior to every reuse, the wear of the thread shall be verified with an appropriate checking gauge (CG+). The fastener shall only be reused under the condition that it will penetrate the sleeve only so far that it does not protrude at the rear of the sleeve (see page 22). Screws which are visibly damaged, e.g. due to corrosion, shall not be reused. The fastener may be screwed in using an impact screw driver. To prevent the screw from spinning, the screw driver with a power output in the upper range shall be equipped with an automatic cut-off device, e.g. via a depth stop.

The fastener is installed correctly if
- the base plate (fixture) is screwed flush against the concrete without an intermediate layer,
- the fastener head is fully in contact with the base plate,
- the fastener cannot easily be turned further,
- the anchorage depth h_{nom} is adhered to.

Anchor size			S-CSA+ 10			S-CSA+ 14		
Nominal anchorage depth	h_{nom}	[mm]	55	70	85	65	85	115
Design resistance for concrete with a compressive strength F_{ck} cylinder ≥ 8 N/mm²	F_{Rd} [1)]	[kN]	2,00	4,67	6,33	3,00	5,67	12,00
Design resistance for concrete with a compressive strength F_{ck} cylinder ≥ 12 N/mm²	F_{Rd} [1)]	[kN]	3,00	5,67	8,67	4,00	6,67	13,33
Design resistance for concrete with a compressive strength F_{ck} cylinder ≥ 16 N/mm²	F_{Rd} [1)]	[kN]	4,33	6,33	11,33	5,00	7,33	16,00
Design resistance for concrete with a compressive strength F_{ck} cylinder ≥ 20 N/mm²	F_{Rd} [1)]	[kN]	5,33	6,67	13,33	6,00	8,00	18,67

[1)] Design resistance incl. partial safety factor.

S-CSA+ 10 & 14 REUSABILITY

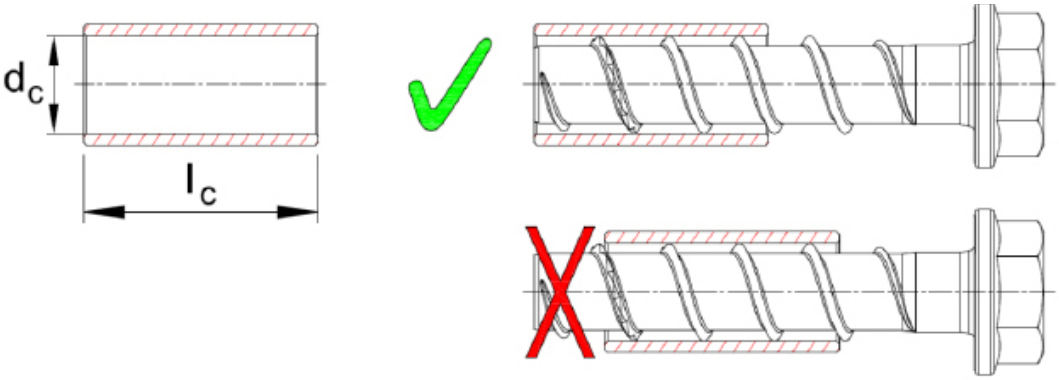
Checking gauge CG+

Gauge CG+ 10

Gauge inner diameter d_c 12,1 [mm]
Length l_c 30 [mm]

Gauge CG+ 14

Gauge inner diameter d_c 15,8 [mm]
Length l_c 40 [mm]



CONCRETE SCREWS

DELIVERY PROGRAM

● Option 1 ● Part 6

S-CSA HEX		Size	t_{fix}	ETA
	5	5x40	5	-
		5x50	5	-

Zinc plated

S-CSA+ HEX		Size	t_{fix}	ETA
	6	6x35	1	●
		6x45	5/10	●
		6x50	10/15	●
		6x60	5/20	● ●
		6x70	15/30	● ●
		6x80	25/40	● ●
		6x100	45/60	● ●
		6x120	65/80	● ●
		6x140	85/100	● ●
	8	8x55	5	●
		8x70	5/20	●
		8x80	15/30	●
		8x90	25/40	●
		8x100	35/50	●
		8x120	55/70	●
		8x140	75/90	●
		8x200	135/150	●
		8x240	175/190	●
	10	10x60	5	●
		10x70	15	●
		10x80	10/25	●
		10x90	5/35	●
		10x100	15/45	●
		10x120	35/65	●
		10x140	55/85	●
		10x160	75/105	●
		10x200	115/145	●
		10x240	155/185	●
	14	14x75 SW21	10	●
		14x100 SW21	15/35	●
		14x130 SW21	15/65	●
		14x150 SW21	35/85	●
		14x80 SW24 (WOF) *	15	●
		14x110 SW24 *	25/45	●
		14x130 SW24 *	15/65	●

Zinc plated or Multi Layer coating, * = Only ZP

S-CSA+ 10 & 14 checking gauge for re-usability

S-CSA CS		Size	t_{fix}	ETA
	5	5x50	5	-
		5x75	30	-
		5x100	55	-

Zinc plated

S-CSA+ CS		Size	t_{fix}	ETA
	6	6x45	5/10	●
		6x50	10/15	●
		6x60	5/20	● ●
		6x80	25/40	● ●
		6x100	45/60	● ●
		6x120	65/80	● ●
	8	8x60	10	●
		8x80	15/30	●
		8x100	35/50	●
	10	10x70	15	●
		10x90	5/35	●
		10x100	15/45	●
		10x120	35/65	●

Zinc plated, Multi Layer coating

S-CSA+ P (L)		Size	t_{fix}	ETA
	6	6x35	1	●
		6x45	5/10	●
		6x60	5/20	● ●

Zinc plated, L = Low pan head

S-CSA+ P (FL)		Size	t_{fix}	ETA
		6x40	5	●
		6x60	5/20	● ●

Zinc plated, Multi Layer, FL = Flat panhead

S-CSA+ I		Size	ETA
	6	6x35 M8/M10x30 *	•
		6x45 M8/M10x30	•
		6x60 M8/M10x30	• •

Zinc plated, * = Also ML

S-CSA+ E		Size	ETA
	6	6x35 M8x16	•
		6x60 M8x16	• •

Zinc plated

S-CSA HEX A4		Size	t_{fix}	ETA
	6	6x50	5	• •
		6x60	5/15	• •
		6x70	15/25	• •
		6x80	25/35	• •
	8	8x55	5	•
		8x70	5/20	•
		8x80	15/30	•
		8x100	35/50	•
	10	10x90	5/35	•
		10x100	15/45	•
		10x120	35/65	•

Stainless Steel A4, hardened tip, coated

S-CSA P A4		Size	t_{fix}	ETA
		6x50	5	• •
		6x60	5/15	• •
		6x80	25/35	• •
		6x100	45/55	• •

Stainless Steel A4, hardened tip, coated

S-CSA CS A4		Size	t_{fix}	ETA
		6x50	5	• •
		6x60	5/15	• •
		6x70	15/25	• •
		6x100	45/55	• •

Stainless Steel A4, hardened tip, coated

S-CSA I A4		Size	ETA
		6x50 M8/M10x30	• •

Stainless Steel A4, hardened tip, coated