SORMAT

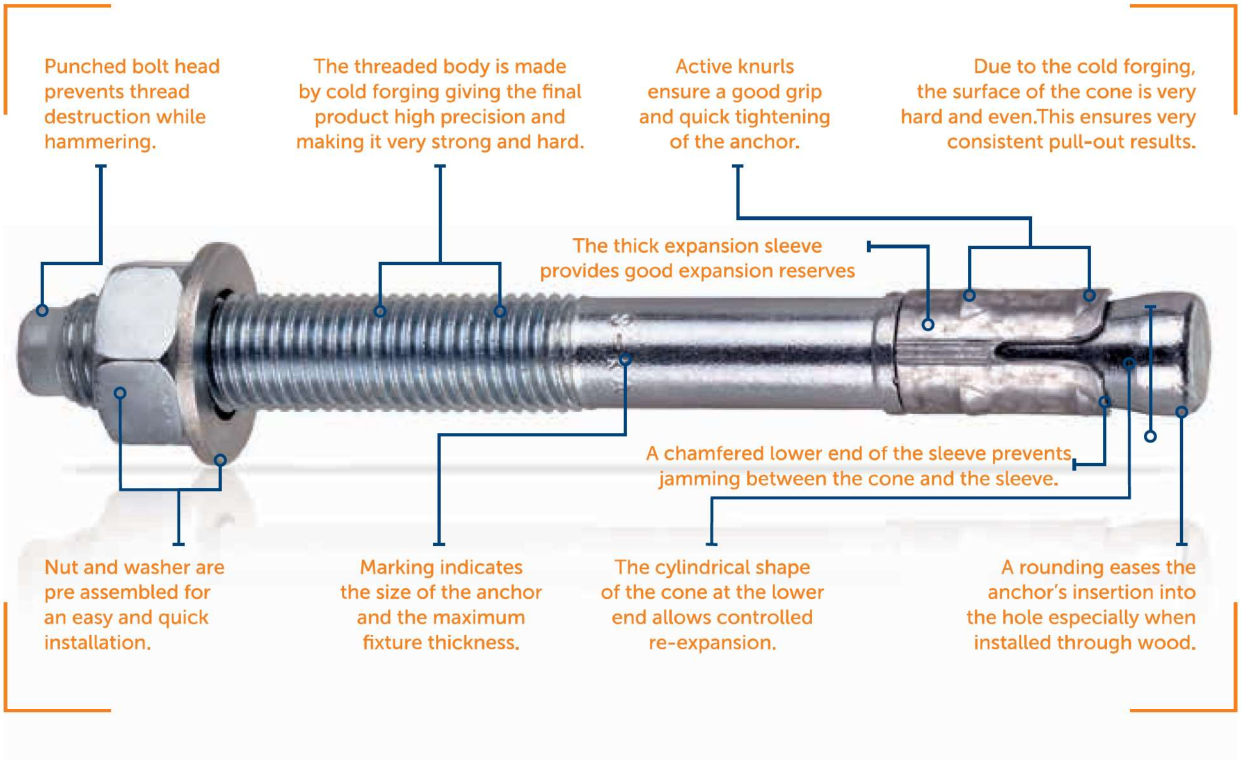
S-KA | S-KAK | S-KAH A4 | S-KAH HCR | S-KAR A2 | HHA A2

PRODUCT DATA SHEET

THROUGH BOLTS

S-KA, S-KAK, S-KAH, S-KAH HCR THROUGH BOLT

Premium-quality through bolts for fixing in cracked and non-cracked concrete



THROUGH BOLT

The through bolt is a torque-controlled expansion anchor for use in cracked and non-cracked concrete. It is also suitable for installation in hard base materials such as solid brick (max. M8) or natural stone. The anchor is preassembled and can be installed directly through the fixture.

It is available

- in zinc electroplated steel for indoor and dry applications.
- in hot dip galvanized steel for damp interiors with occasional exposure to condensation and slightly corrosive outside environments.
- in stainless steel for outdoor applications subject to humidity, as well as installation in industrial and maritime environments.
- in HCR stainless steel for aggressive conditions, chloride atmosphere and atmosphere with chemical pollution such as tunnels, swimming pools etc.

Benefits

- Fixing in cracked and non-cracked concrete, also suitable for hard materials such a natural stone, solid clay brick
- Torque-controlled expansion anchors for pre-, push-through and distance installations
- When torque is applied the expansion clip expands developing frictional grip into the hole.
- Anchor diameter and max. fixture thickness marked on the body.
- Variable range of coatings and materials such a ZP, HDG, stainless steel A2, A4 and HCR 1.4529/1.4565 which supports for anchor selecting in different applications
- Sormat Through bolts are manufactured reliably in Finland since 1970s

S-KA carbon steel

Zinc electroplated acc. EN ISO 4042, t ≥ 5 µm

Dry indoor conditions, indoor with temporary condensation

S-KAK carbon steel

Hot dip galvanized acc. EN ISO 10684, t ≥ 40 µm

Humid indoor use, outdoor inland rural areas only

S-KAH A4 stainless steel

A4 for indoor, outdoor, industrial use
and maritime climate

S-KAH A4 recommended when fire or corrosion resistance is required.

S-KAH HCR stainless steel

HCR for extremely corrosive conditions,

such as high chlorine concentrations (swimming halls) road tunnels and desulphurization plants.

S-KAR A2 stainless steel

A2 for dry and humid indoor use, outdoor in rural areas only

Suitable for minings and for fixing very thick fixtures, such a thermal insulation and wood structures to concrete

HHA A2 stainless steel

A2 for dry and humid indoor use, outdoor in rural areas only

Hammer hook anchor for suspension in tunnels and mines

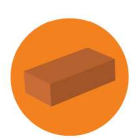
Base materials

Approved for

Cracked
concrete

Non-cracked
concrete

Also suitable for



Solid
clay brick
(M8 max)

Natural
stone

APPROVALS / CERFICATIONS / APPLICATIONS

Description of document		Authority/ Laboratory	ID	Additional info
European Technical Assessment		VTT EXPERT SERVICES LTD, Espoo	ETA-08/0173	ETAG 001, Annex C / CEN/TS 1992-4
Fire resistance		VTT EXPERT SERVICES LTD, Espoo	ETA-08/0173	EOTA TR 020 / ETAG 001, Annex C / CEN/TS 1992-4
Seismic resistance		VTT EXPERT SERVICES LTD, Espoo	ETA-08/0173	EOTA TR 045:C1
Russian Technical Approval	РОССТРОЙ	FAU FCS	TC 4635-15	Technical approval FAU FCS 31.07.2015
Sormat Trustfix anchor calculation software		Sormat Oy / S&P Software Consulting		TrustFIX anchor calculation
Through bolts CAD-blocks for AutoCAD		Sormat Oy	file format: .dwg	Blocks installation instructions for AutoCAD
Through bolts components for TEKLA Structures		Sormat Oy		Tekla structures components instructions + instructions video
YouTube installation videos		Sormat Oy	V5-Z_NbntmQ rf37gw9T98k	Sormat S-KA through bolt installation video

Additional information concerning all given data in the product data sheet

1. Sizes M8, M10, M12 and M16 with standard anchorage depth are included in ETA-approval, see ETA-08/0173. Sizes M6, M20 and all values with reduced effective anchorage depth (h_{hef}) are manufacturer's recommendations.

2. Load figures include the partial safety factors as per approvals 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.

3. If spacings or edge distances become smaller than the characteristic figures ($S_{cr,N}$ / $C_{cr,N}$) a calculation as per ETAG, Annex C, design method A needs to be carried out. For more details, see ETA-approval ETA-08/0173.

4. Concrete is considered non-cracked 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).

5. 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 ETAG, Annex C, Design Method A.

STATIC AND QUASI-STATIC LOADS

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm².
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Characteristic resistances

Anchor size		M6		M8		M10		M12		M16		M20
Effective anchorage depth h_{ef}	[mm]	25	35	30	45	30	60	55	70	60	85	110
Non-cracked concrete												
Tensile N_{Rk}												
S-KA/S-KAK	[kN]	4,0	4,5	6,5	9,0	8,8	16,0	16,4	20,0	24,9	35,0	49,9
S-KAH/S-KAH HCR	[kN]	4,0	4,5	6,5	9,0	8,8	16,0	16,4	20,0	24,9	35,0	49,9
Shear V_{Rk}												
S-KA/S-KAK	[kN]	3,1	4,8	10,1	10,1	10,1	18,0	17,2	23,0	23,5	44,0	58,2
S-KAH/S-KAH HCR	[kN]	3,1	4,8	10,7	10,7	10,1	17,0	-	25,0	-	47,0	58,2
Cracked concrete												
Tensile N_{Rk}												
S-KA/S-KAK	[kN]	-	-	-	5,0	-	9,0	-	12,0	-	20,0	-
S-KAH/S-KAH HCR	[kN]	-	-	-	5,0	-	9,0	-	12,0	-	20,0	-
Shear V_{Rk}												
S-KA/S-KAK	[kN]	-	-	-	10,0	-	18,0	-	23,0	-	44,0	-
S-KAH/S-KAH HCR	[kN]	-	-	-	11,0	-	17,0	-	25,0	-	47,0	-

Design resistances

Anchor size		M6		M8		M10		M12		M16		M20
Effective anchorage depth h_{ef}	[mm]	25	35	30	45	30	60	55	70	60	85	110
Non-cracked concrete												
Tensile N_{Rd}												
S-KA/S-KAK	[kN]	2,2	2,5	3,6	5,0	4,9	8,9	9,1	11,1	13,8	23,3	27,7
S-KAH/S-KAH HCR	[kN]	2,2	2,5	3,6	5,0	4,9	8,9	9,1	11,1	13,8	23,3	27,7
Shear V_{Rd}												
S-KA/S-KAK	[kN]	2,1	2,5	6,7	8,0	8,3	14,4	11,5	18,4	15,7	35,2	36,4
S-KAH/S-KAH HCR	[kN]	2,1	2,5	7,1	8,8	8,3	13,6	-	20,0	-	37,6	36,4
Cracked concrete												
Tensile N_{Rd}												
S-KA/S-KAK	[kN]	-	-	-	2,8	-	5,0	-	6,7	-	13,3	-
S-KAH/S-KAH HCR	[kN]	-	-	-	2,8	-	5,0	-	6,7	-	13,3	-
Shear V_{Rd}												
S-KA/S-KAK	[kN]	-	-	-	7,3	-	14,4	-	18,4	-	35,2	-
S-KAH/S-KAH HCR	[kN]	-	-	-	7,3	-	13,6	-	20,0	-	37,6	-

STATIC AND QUASI-STATIC LOADS

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2.
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Recommended loads

Anchor size		M6		M8		M10		M12		M16		M20
Effective anchorage depth h_{ef}	[mm]	**25**	**35**	**30**	**45**	**30**	**60**	**55**	**70**	**60**	**85**	**110**
Non-cracked concrete												
Tensile N_{Rec}												
S-KA/S-KAK	[kN]	**1,6**	**1,8**	**2,6**	**3,6**	**3,5**	**6,3**	**6,5**	**7,9**	**9,9**	**16,7**	**19,8**
S-KAH/S-KAH HCR	[kN]	**1,6**	**1,8**	**2,6**	**3,6**	**3,5**	**6,3**	**6,5**	**7,9**	**9,9**	**16,7**	**19,8**
Shear V_{Rec}												
S-KA/S-KAK	[kN]	**1,5**	**1,8**	**4,8**	**5,7**	**5,9**	**10,3**	**8,2**	**13,1**	**11,2**	**25,1**	**26,0**
S-KAH/S-KAH HCR	[kN]	**1,5**	**1,8**	**5,1**	**6,3**	**5,9**	**9,7**	**-**	**14,3**	**-**	**26,9**	**26,0**
Cracked concrete												
Tensile N_{Rec}												
S-KA/S-KAK	[kN]	-	-	-	**2,0**	-	**3,6**	-	**4,8**	-	**9,5**	-
S-KAH/S-KAH HCR	[kN]	-	-	-	**2,0**	-	**3,6**	-	**4,8**	-	**9,5**	-
Shear V_{Rec}												
S-KA/S-KAK	[kN]	-	-	-	**5,2**	-	**10,3**	-	**13,1**	-	**25,1**	-
S-KAH/S-KAH HCR	[kN]	-	-	-	**5,2**	-	**9,7**	-	**14,3**	-	**26,9**	-

SEISMIC RESISTANCE

Design acc. EOTA TR 045: Performance category C1

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm².
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Characteristic resistances

Anchor size		M8	M10	M12	M16
Effective anchorage depth h_{ef}	[mm]	**45**	**60**	**70**	**85**
Cracked concrete					
Tensile N_{Rk}					
S-KA/S-KAK	[kN]	**5,0**	**9,0**	**12,0**	**20,0**
S-KAH/S-KAH HCR	[kN]	**5,0**	**9,0**	**12,0**	**20,0**
Shear V_{Rk}					
S-KA/S-KAK	[kN]	**5,6**	**11,9**	**15,4**	**31,2**
S-KAH/S-KAH HCR	[kN]	**8,7**	**11,2**	**18,3**	**31,5**

Design resistances

Anchor size		M8	M10	M12	M16
Effective anchorage depth h_{ef}	[mm]	**45**	**60**	**70**	**85**
Cracked concrete					
Tensile N_{Rd}					
S-KA/S-KAK	[kN]	**2,8**	**5,0**	**6,7**	**13,3**
S-KAH/S-KAH HCR	[kN]	**2,8**	**5,0**	**6,7**	**13,3**
Shear V_{Rd}					
S-KA/S-KAK	[kN]	**4,5**	**9,5**	**12,3**	**25,0**
S-KAH/S-KAH HCR	[kN]	**7,0**	**9,0**	**14,6**	**25,2**

FIRE RESISTANCE

The data of these tables is based on:

- In the absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M'fi}$ = 1,0 is recommended
- Concrete C20/25, $f_{ck,cube}$ = 25 N/mm^2
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).

Characteristic resistances

Anchor size		M8	M10	M12	M16
Effective anchorage depth h_{ef}	[mm]	**45**	**60**	**70**	**85**
Fire Exposure R30					
Tensile N_{Rk}					
S-KA/S-KAK	[kN]	**1,3**	**2,3**	**3,0**	**5,0**
S-KAH/S-KAH HCR	[kN]	**1,3**	**2,3**	**3,0**	**5,0**
Shear V_{Rk}					
S-KA/S-KAK	[kN]	**1,3**	**2,3**	**3,6**	**5,3**
S-KAH/S-KAH HCR	[kN]	**2,4**	**9,1**	**13,2**	**24,0**
Fire Exposure R120					
Tensile N_{Rk}					
S-KA/S-KAK	[kN]	**0,3**	**0,5**	**0,9**	**1,3**
S-KAH/S-KAH HCR	[kN]	**1,0**	**1,8**	**2,6**	**4,8**
Shear V_{Rk}					
S-KA/S-KAK	[kN]	**0,3**	**0,5**	**0,9**	**1,3**
S-KAH/S-KAH HCR	[kN]	**1,1**	**1,8**	**2,6**	**4,8**

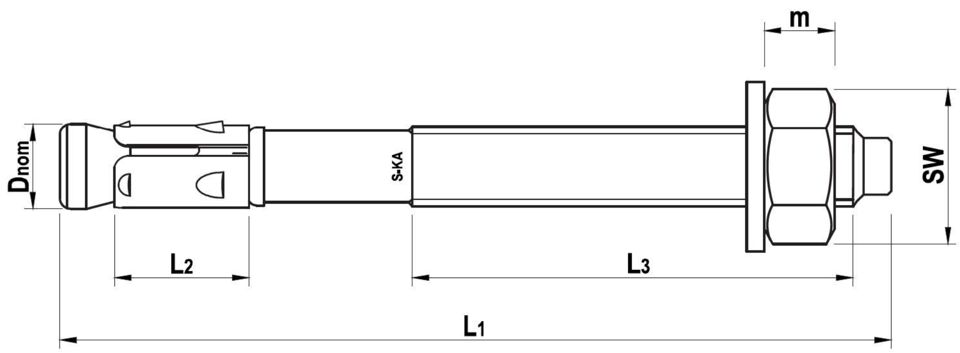
Recommended loads

Anchor size		M8	M10	M12	M16
Effective anchorage depth h_{ef}	[mm]	**45**	**60**	**70**	**85**
Fire Exposure R30					
Tensile N_{Rec}					
S-KA/S-KAK	[kN]	**1,3**	**2,3**	**3,0**	**5,0**
S-KAH/S-KAH HCR	[kN]	**1,3**	**2,3**	**3,0**	**5,0**
Shear V_{Rec}					
S-KA/S-KAK	[kN]	**1,3**	**2,3**	**3,6**	**5,3**
S-KAH/S-KAH HCR	[kN]	**2,4**	**9,1**	**13,2**	**24,0**
Fire Exposure R120					
Tensile N_{Rec}					
S-KA/S-KAK	[kN]	**0,3**	**0,5**	**0,9**	**1,3**
S-KAH/S-KAH HCR	[kN]	**1,0**	**1,8**	**2,6**	**4,8**
Shear V_{Rec}					
S-KA/S-KAK	[kN]	**0,3**	**0,5**	**0,9**	**1,3**
S-KAH/S-KAH HCR	[kN]	**1,1**	**1,8**	**2,6**	**4,8**

MATERIALS AND DIMENSIONS

Anchor dimensions

Anchor size		M6	M8	M10	M12	M16	M20
Length	L1 [mm]	**40...100**	**50...147**	**60...162**	**85...253**	**90...213**	**170...280**
Sleeve length	L2 [mm]	**14,3**	**15,9**	**17,9**	**19,1**	**26,3**	**32,4**
Thread length	L3 [mm]	**18...60**	**23...107**	**26...115**	**45...115**	**43...55**	**55**
Bolt body	d_{nom} [mm]	**6**	**8**	**10**	**12**	**16**	**20**
Hexagonal nut	SW [mm]	**10**	**13**	**≥ 16**	**≥ 18**	**24**	**≥ 29**
	m	**≥ 4,9**	**≥ 6,5**	**≥ 8,0**	**≥ 10,0**	**≥ 13,0**	**≥ 15,0**



Mechanical properties

Specification	Anchor/size		M6	M8	M10	M12	M16	M20
Nominal tensile strength $F_{uk,thread}$	S-KA / S-KAK	[N/mm²]	**475**	**545**	**620**	**600**	**560**	**475**
	S-KAH	[N/mm²]	**475**	**600**	**600**	**600**	**600**	**475**
	S-KAH HCR	[N/mm²]	**475**	**600**	**600**	**600**	**600**	**475**
Char. bending resistance $M^0_{Rk,s}$	S-KA / S-KAK	[Nm]	**7,2**	**21**	**48**	**72**	**186**	**308**
	S-KAH	[Nm]	**7,2**	**22**	**45**	**79**	**200**	**308**
	S-KAH HCR	[Nm]	**7,2**	**22**	**45**	**79**	**200**	**308**
Design bending resistance $M_{Rd,s}$	S-KA / S-KAK	[Nm]	**3,8**	**16,8**	**38,4**	**57,6**	**148,8**	**192,7**
	S-KAH	[Nm]	**3,8**	**17,6**	**36,0**	**63,2**	**160**	**192,7**
	S-KAH HCR	[Nm]	**3,8**	**17,6**	**36,0**	**63,2**	**160**	**192,7**
Recommended bending moment M_{Rec}	S-KA / S-KAK	[Nm]	**2,7**	**12,0**	**27,4**	**41,1**	**106,3**	**137,6**
	S-KAH	[Nm]	**2,7**	**12,6**	**25,7**	**45,1**	**114,3**	**137,6**
	S-KAH HCR	[Nm]	**2,7**	**12,6**	**25,7**	**45,1**	**114,3**	**137,6**

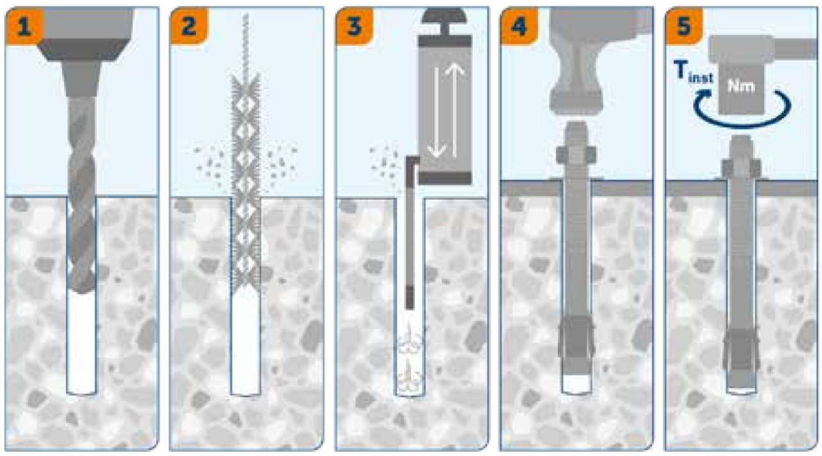
Material quality

Part of anchor		Material
Bolt	S-KA	Carbon steel, zinc electroplated EN ISO 4042, min. 5 µm
	S-KAK	Carbon steel, hot dip galvanized EN ISO 10684, min. 40 µm (M6 = min. 25 µm)
	S-KAH	Stainless steel A4
	S-KAH HCR	Stainless steel HCR 1.4529 / 1.4565

SETTING INSTRUCTIONS

Installation equipment

Specification	M6	M8	M10	M12	M16	M20
Rotary hammer (recommendation)	750...1200 r.p.m / 1.8...3.3 J					
					360...550 r.p.m / 4.9...11.5 J	
Setting tool (optional)	S-KA 6-10 SDS+			S-KA 12-20 SDS+		
Drill bit	SDS+ 2-CUT/4-CUT 6mm...20 mm					
Additional tools	brush, air pump/compressor, hammer, torque wrench					



INSTALLATION

1. Drill a hole according to the product data.
2.-3. Clean the hole using a metal brush and a blow-out pump.
4. Install anchor with a hammer or a setting tool.
5. Tighten the anchor to the specified installation torque.

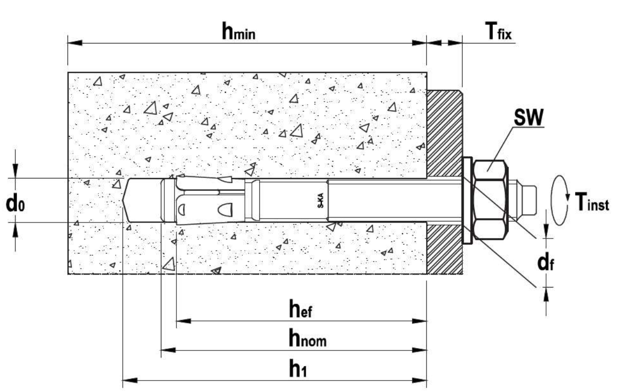
Installation data

Parameters and anchor sizes			M6		M8		M10		M12		M16		M20
Drill hole diameter	d_0	[mm]	6		8		10		12		16		20
Diameter of the drill bit at the upper tolerance limit	$d_{cut,max} \leq$	[mm]	6,40		8,45		10,45		12,50		16,50		20,55
Depth of drilled hole to deepest point	$h_1 \geq$	[mm]	35	50	45	60	50	75	75	90	80	110	130
Effective anchorage depth	h_{ef}	[mm]	25	35	30	45	30	60	55	70	60	85	110
Nominal anchorage depth	h_{nom}	[mm]	30	40	40	50	40	68	65	81	70	96	125
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7		9		12		14		18		22
Width across flats	SW	[mm]	10		13		16		18		24		30
Required torque S-KA / S-KAK	T_{inst}	[Nm]	7		20 / 15[1)]		35		50		120		240
S-KAH / S-KAH HCR			7		20		35		70		120		240

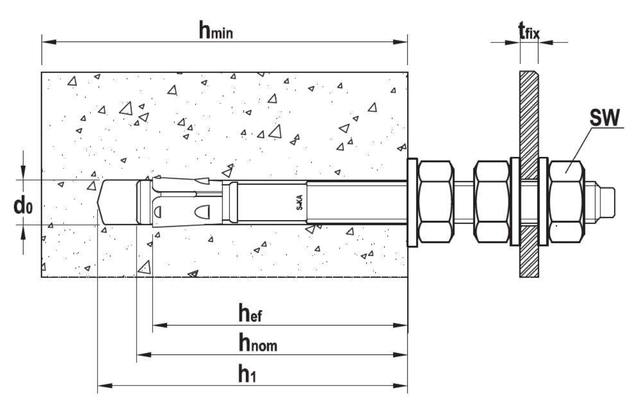
1) T_{inst} for S-KA is 20 Nm and for S-KAK 15 Nm

Installation methods

Push-through installation

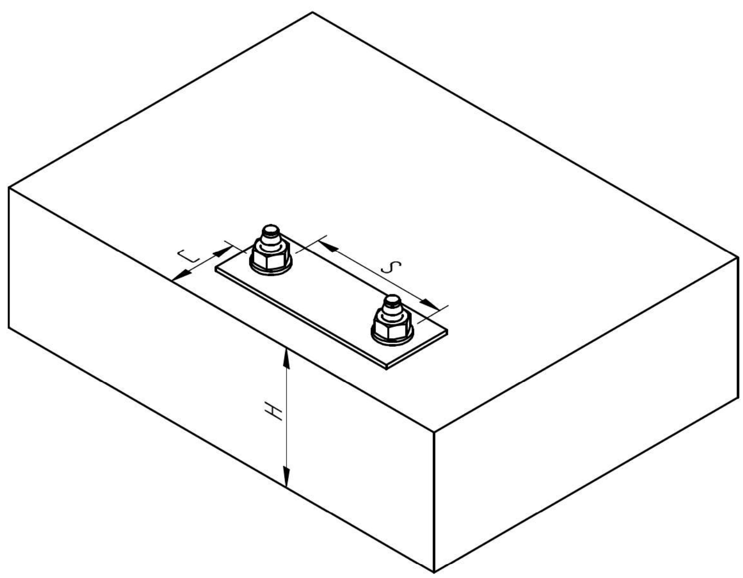


Distance installation



Minimum thickness of concrete member, spacing and edge distance

Cracked and non-cracked concrete			M6		M8		M10		M12		M16		M20
Effective anchorage depth	h_{ef}	[mm]	**25**	**35**	**30**	**45**	**30**	**60**	**55**	**70**	**60**	**85**	**110**
Minimum thickness of base material	h_{min}	[mm]	**50**	**60**	**60**	**100**	**65**	**120**	**100**	**140**	**110**	**170**	**180**
Minimum spacing	s_{min}	[mm]	**120**	**120**	**160**	**50**	**200**	**55**	**240**	**60**	**320**	**70**	**400**
	$c \geq$	[mm]	**90**	**90**	**120**	**50**	**150**	**80**	**180**	**90**	**240**	**120**	**300**
Minimum edge distance	c_{min}	[mm]	**90**	**90**	**120**	**50**	**150**	**50**	**180**	**55**	**240**	**85**	**300**
	$s \geq$	[mm]	**120**	**120**	**160**	**50**	**200**	**100**	**240**	**145**	**320**	**150**	**400**
Critical spacing for splitting failure and concrete cone failure (in case characteristic loading affects)	$s_{cr,sp}$	[mm]	-	-	-	**180**	-	**240**	-	**280**	-	**340**	-
	$s_{cr,N}$	[mm]	120	120	**160**	**135**	**200**	**180**	**240**	**210**	**320**	**255**	**400**
Critical edge distance for splitting failure and concrete cone failure (in case characteristic loading affects)	$c_{cr,sp}$	[mm]	-	-	-	**90**	-	**120**	-	**140**	-	**170**	-
	$c_{cr,N}$	[mm]	**90**	**90**	**120**	**68**	**150**	**90**	**180**	**105**	**240**	**128**	**300**



Setting tool S-KA TOOL SDS+

Hammering tool to make through bolt installation quicker and smoother

- Original Sormat through bolts setting tool with designed head that does not damage the head of the anchor and keep the head from slipping.
- Besides ensuring most efficient and safe through bolt installation in general, the setting tool also significantly saves time and energy in serial installation.
- Compatible with all rotary hammer machines with SDS+ chuck.

DELIVERY PROGRAM

Thread size	Type	T_{fix}	Length	S-KA Zinc	S-KAK Hot dip	S-KAH A4 Stainless A4	S-KAH HCR HCR	S-KAR A2 A2	HHA A2 A2
M6	6/15x65	15 mm	65 mm	○	○	○			
	6/50x100	50 mm	100 mm	○	○				
	6x40	2 mm	40 mm	○	○	○			
M8	8/10x72	10 mm	72 mm	●	●	●	●		
	8/30x92	30 mm	92 mm	●	●	●			
	8/50x112	50 mm	112 mm	●	●	●			
	8/85x147	85 mm	147 mm	●	●				
	8x50	2 mm	52 mm	○	○	○			
	8x105x144		144 mm						○
	8x205x244		244 mm						○
	8x200	130 mm	200 mm					○	
	8x240	170 mm	240 mm					○	
	8x300	230 mm	300 mm					○	
M10	10/10x92	10 mm	92 mm	●	●	●	●		
	10/20x102	20 mm	102 mm	●	●	●			
	10/30x112	30 mm	112 mm	●	●	●	●		
	10/50x132	50 mm	132 mm	●	●	●			
	10/80x162	80 mm	162 mm	●	●				
	10x60	3 mm	62 mm	○	○	○			
M12	12/5x103	5 mm	103 mm	●	●	●			
	12/20x118	20 mm	118 mm	●	●	●			
	12/30x128	30 mm	128 mm	●	●	●			
	12/50x148	50 mm	148 mm	●	●	●			
	12/65x163	65 mm	163 mm	●	●	●			
	12/80x178	80 mm	178 mm	●	●				
	12/155x253	155 mm	253 mm	○	○				
	12x75		75 mm			○			
	12x85	3 mm	85 mm	○					
M16	16/5x123	5 mm	123 mm	●	●	●			
	16/20x138	20 mm	138 mm	●	●	●			
	16/50x168	50 mm	168 mm	●	●	●			
	16/60x178	60 mm	178 mm	●	●	●			
	16/95x213	95 mm	213 mm	○	○				
	16x90	3 mm	90 mm	○					
M20	20/20x170	20 mm	170 mm	○	○	○			
	20/70x220	70 mm	220 mm	○	○	○			
	20/130x280	130 mm	280 mm	○	○				

● ETA approved
○ No ETA