



S-KA



S-KAK



S-KAH A4



S-KAH HCR



S-KAR A2



HHA A2

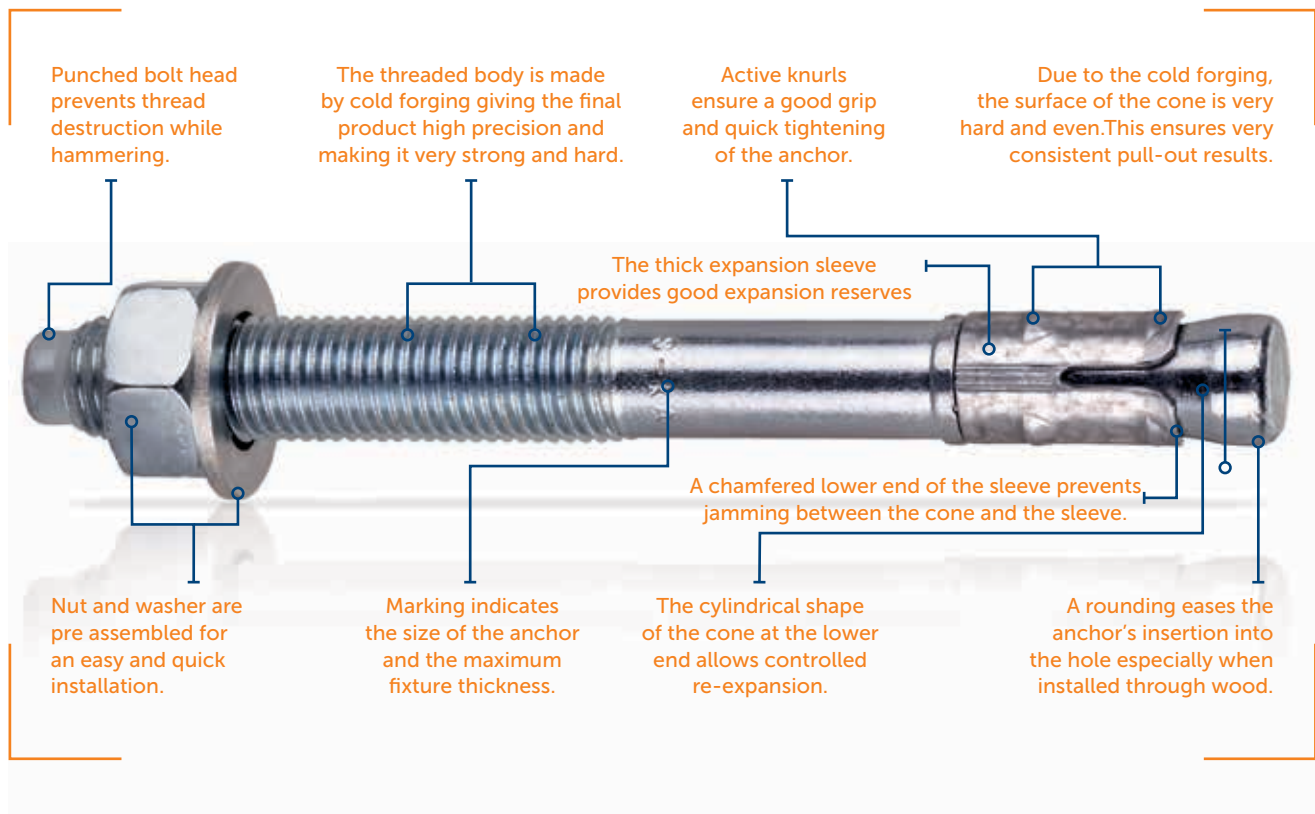
PRODUCT DATA SHEET

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 as 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 as 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, $t \geq 5 \mu\text{m}$



Dry indoor conditions, indoor with temporary condensation

S-KAK carbon steel

Hot dip galvanized acc. EN ISO 10684, $t \geq 40 \mu\text{m}$



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 / CERTIFICATIONS / APPLICATIONS

Description of document	Authority/ Laboratory	ID	Additional info
European Technical Assessment	 Eurofins Experts Services Oy	ETA-08/0173	EAD 330232-00-0601
European Technical Assessment	 ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-18/0971	EAD 330747-00-0601
Fire resistance	 Eurofins Experts Services Oy	ETA-08/0173	EOTA TR 020 / EN 1992-4:2018
Fire resistance	 ZAG -National Building and Civil Engineering Institute, Slovenia	ETA-18/0971	EOTA TR 020 / EN 1992-4:2018
Seismic resistance	 Eurofins Experts Services Oy	ETA-08/0173	EOTA TR 045:C1
Russian Technical Approval	 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_NbntmQrf37gw9T98k	Sormat S-KA through bolt installation video

Additional information concerning all given data in the product data sheet

- 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.
- If spacings or edge distances become smaller than the characteristic figures ($S_{cr,N} / C_{cr,N}$) a calculation as per EOTA TR 055 or EN 1992-4 needs to be carried out. For more details, see ETA-approval ETA-08/0173 and ETA-18/0971.
- 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/mm² 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).
- 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 EOTA TR 055 or EN 1992-4.

STATIC AND QUASI-STATIC LOADS

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$.
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).
- ETA-18/0971, EAD 330747-00-0601: Torque controlled expansion anchor of size M6 and M8 for multiple use for non-structural applications in concrete
- ETA-08/0173, EAD 330232-00-0601: Torque controlled expansion anchors of sizes M8, M10, M12 and M16 for use in concrete

Characteristic resistances

Anchor size			M6		M8		M10		M12		M16		M20
ETA			●	●	●	■	-	■	-	■	-	■	-
Effective anchorage depth h_{ef} [mm]			25	35	35	45	30	60	55	70	60	85	110
Non-cracked concrete													
Tensile N_{Rk}	S-KA/S-KAK [kN]		2,0	3,5	7,0	9,0	7,4	16,0	13,7	20,0	20,8	35,0	41,6
	S-KAH/S-KAH HCR [kN]		3,0	5,0	7,0	9,0	7,4	16,0	13,7	20,0	20,8	35,0	41,6
Shear V_{Rk}	S-KA/S-KAK [kN]		4,3	4,3*	7,1	10,0*	8,1	18,0*	20,1	23,0*	45,7	44,0*	58,2*
	S-KAH/S-KAH HCR [kN]		4,3	7,1	7,1	11,0*	8,1	17,0	20,1	25,0	45,7	47,0*	58,2*
Cracked concrete													
Tensile N_{Rk}	S-KA/S-KAK [kN]		2,0	3,5	7,0	5,0	-	9,0	-	12,0	-	20,0	-
	S-KAH/S-KAH HCR [kN]		3,0	5,0	7,0	5,0	-	9,0	-	12,0	-	20,0	-
Shear V_{Rk}	S-KA/S-KAK [kN]		4,3	4,3*	7,1	10,4	-	18,0*	-	23,0*	-	44,0*	-
	S-KAH/S-KAH HCR [kN]		4,3	7,1	7,1	10,4	-	17,0*	-	25,0*	-	54,0	-

■ ETA-08/0173 ● ETA-18/0971 * Failure mode = steel

Design resistances

Anchor size			M6		M8		M10		M12		M16		M20
ETA			●	●	●	■	-	■	-	■	-	■	-
Effective anchorage depth h_{ef} [mm]			25	35	35	45	30	60	55	70	60	85	110
Non-cracked concrete													
Tensile N_{Rd}	S-KA/S-KAK [kN]		1,3	2,3	4,7	5,0	4,9	8,9	9,1	11,1	13,9	23,3	27,7
	S-KAH/S-KAH HCR [kN]		2,0	3,3	4,7	5,0	4,9	8,9	9,1	11,1	13,9	23,3	27,7
Shear V_{Rd}	S-KA/S-KAK [kN]		2,9	3,4*	4,7	8,0*	5,4	14,4*	13,4	18,4*	30,5	35,2*	38,8*
	S-KAH/S-KAH HCR [kN]		2,9	4,7	4,7	8,8*	5,4	13,6*	13,4	20,0*	30,5	37,6*	38,8*
Cracked concrete													
Tensile N_{Rd}	S-KA/S-KAK [kN]		1,3	2,3	4,7	2,8	-	5,0	-	6,7	-	13,3	-
	S-KAH/S-KAH HCR [kN]		2,0	3,3	4,7	2,8	-	5,0	-	6,7	-	13,3	-
Shear V_{Rd}	S-KA/S-KAK [kN]		2,9	3,4*	4,7	6,9	-	14,4*	-	18,4*	-	35,2*	-
	S-KAH/S-KAH HCR [kN]		2,9	4,7	4,7	6,9	-	13,6*	-	20,0*	-	36,0	-

■ ETA-08/0173 ● ETA-18/0971 * Failure mode = steel

STATIC AND QUASI-STATIC LOADS

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$.
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).
- ETA-18/0971, EAD 330747-00-0601: Torque controlled expansion anchor of size M6 and M8 for multiple use for non-structural applications in concrete.
- ETA-08/0173, EAD 330232-00-0601: Torque controlled expansion anchors of sizes M8, M10, M12 and M16 for use in concrete.

Recommended loads

Anchor size		M6		M8		M10		M12		M16		M20
ETA		●	●	●	■	-	■	-	■	-	■	-
Effective anchorage depth h_{ef} [mm]		25	35	35	45	30	60	55	70	60	85	110
Non-cracked concrete												
<i>Tensile</i> N_{Rec}	S-KA/S-KAK [kN]	1,0	1,7	3,3	3,6	3,5	6,3	6,5	7,9	9,9	16,7	19,8
	S-KAH/S-KAH HCR [kN]	1,4	2,4	3,3	3,6	3,5	6,3	6,5	7,9	9,9	16,7	19,8
<i>Shear</i> V_{Rec}	S-KA/S-KAK [kN]	2,0	2,5*	3,4	5,7*	3,8	10,3*	9,6	13,1*	21,8	25,1*	27,7*
	S-KAH/S-KAH HCR [kN]	2,0	3,4	3,4	6,3*	3,8	9,7*	9,6	14,3*	21,8	26,9*	27,7*
Cracked concrete												
<i>Tensile</i> N_{Rec}	S-KA/S-KAK [kN]	1,0	1,7	3,3	2,0	-	3,6	-	4,8	-	9,5	-
	S-KAH/S-KAH HCR [kN]	1,4	2,4	3,3	2,0	-	3,6	-	4,8	-	9,5	-
<i>Shear</i> V_{Rec}	S-KA/S-KAK [kN]	2,0	2,5*	3,4	5,0	-	10,3*	-	13,1*	-	25,1*	-
	S-KAH/S-KAH HCR [kN]	2,0	3,4	3,4	5,0	-	9,7*	-	14,3*	-	25,7	-
■ ETA-08/0173 ● ETA-18/0971 * Failure mode = steel												

SEISMIC RESISTANCE

Design acc. EOTA TR 045: Performance category C1

The data of these tables is based on:

- Concrete C20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$.
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).
- ETA-08/0173, EAD 330232-00-0601: Torque controlled expansion anchors of sizes M8, M10, M12 and M16 for use in concrete.



Characteristic resistances

Anchor size		M8	M10	M12	M16
Effective anchorage depth h_{ef}	[mm]	45	60	70	85
Cracked concrete					
<i>Tensile</i> N_{Rk}	S-KA/S-KAK	5,0	9,0	12,0	20,0
	S-KAH/S-KAH HCR	5,0	9,0	12,0	20,0
<i>Shear</i> V_{Rk}	S-KA/S-KAK	5,6	11,9	15,4	31,2
	S-KAH/S-KAH HCR	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					
<i>Tensile</i> N_{Rd}	S-KA/S-KAK	2,8	5,0	6,7	13,3
	S-KAH/S-KAH HCR	2,8	5,0	6,7	13,3
<i>Shear</i> V_{Rd}	S-KA/S-KAK	4,5	9,5	12,3	25,0
	S-KAH/S-KAH HCR	7,0	9,0	14,6	25,2

FIRE RESISTANCE

Design acc. EOTA TR 020



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, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Installation has been done correctly (see page 10).
- No influence of edge distances and spacings.
- Respect of minimum base material thickness (see page 11).
- ETA-18/0971, EAD 330747-00-0601: Torque controlled expansion anchor of size M6 and M8 for multiple use for non-structural applications in concrete.
- ETA-08/0173, EAD 330232-00-0601: Torque controlled expansion anchors of sizes M8, M10, M12 and M16 for use in concrete.

Characteristic resistances

Anchor size			M6		M8		M10	M12	M16
ETA			●	●	●	■	■	■	■
Effective anchorage depth h_{ef} [mm]			25	35	35	45	60	70	85
Fire Exposure R30									
Tensile N_{Rk}	S-KA/S-KAK	[kN]	-	0,16	0,26	1,3	2,3	3,0	5,0
	S-KAH/S-KAH HCR	[kN]	-	0,16	0,53	1,3	2,3	3,0	5,0
Shear V_{Rk}	S-KA/S-KAK	[kN]	-	0,16	0,26	1,3	2,3	3,6	5,3
	S-KAH/S-KAH HCR	[kN]	-	0,16	0,53	2,4	9,1	13,2	24,0
Fire Exposure R120									
Tensile N_{Rk}	S-KA/S-KAK	[kN]	-	0,08	0,13	0,3	0,5	0,9	1,3
	S-KAH/S-KAH HCR	[kN]	-	0,08	0,26	1,0	1,8	2,4	4,0
Shear V_{Rk}	S-KA/S-KAK	[kN]	-	0,08	0,13	0,3	0,5	0,9	1,3
	S-KAH/S-KAH HCR	[kN]	-	0,08	0,26	1,1	1,8	2,6	4,8

■ ETA-08/0173 ● ETA-18/0971

Recommended resistances

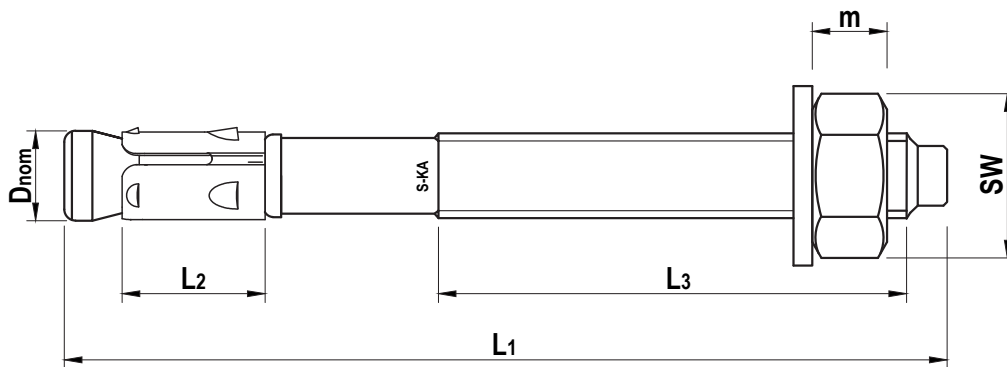
Anchor size			M6		M8		M10	M12	M16
ETA			●	●	●	■	■	■	■
Effective anchorage depth h_{ef} [mm]			25	35	35	45	60	70	85
Fire Exposure R30									
Tensile N_{Rec}	S-KA/S-KAK	[kN]	-	0,16	0,26	1,3	2,3	3,0	5,0
	S-KAH/S-KAH HCR	[kN]	-	0,16	0,53	1,3	2,3	3,0	5,0
Shear V_{Rec}	S-KA/S-KAK	[kN]	-	0,16	0,26	1,3	2,3	3,6	5,3
	S-KAH/S-KAH HCR	[kN]	-	0,16	0,53	2,4	9,1	13,2	24,0
Fire Exposure R120									
Tensile N_{Rec}	S-KA/S-KAK	[kN]	-	0,08	0,13	0,3	0,5	0,9	1,3
	S-KAH/S-KAH HCR	[kN]	-	0,08	0,26	1,0	1,8	2,4	4,0
Shear V_{Rec}	S-KA/S-KAK	[kN]	-	0,08	0,13	0,3	0,5	0,9	1,3
	S-KAH/S-KAH HCR	[kN]	-	0,08	0,26	1,1	1,8	2,6	4,8

■ ETA-08/0173 ● ETA-18/0971

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]	14,5	15,9	17,9	19,1	26,3	32,4
Thread length	L3 [mm]	18...60	23...107	26...115	45...115	43...115	55
Bolt body	d _{nom} [mm]	6	8	10	12	16	20
Hexagonal nut	SW [mm]	10	13	17	19	24	30
	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/mm ²]	500	545	620	600	560	475
	S-KAH	[N/mm ²]	620	600	600	600	600	475
	S-KAH HCR	[N/mm ²]	-	600	600	600	600	-
Char. bending resistance M ⁰ _{Rk,s}	S-KA / S-KAK	[Nm]	7	21	48	72	186	308
	S-KAH	[Nm]	9	22	45	79	200	308
	S-KAH HCR	[Nm]	-	22	45	79	200	-
Design bending resistance M _{Rd,s}	S-KA / S-KAK	[Nm]	5,6	16,8	38,4	57,6	148,8	205,3
	S-KAH	[Nm]	7,2	17,6	36,0	63,2	160	205,3
	S-KAH HCR	[Nm]	-	17,6	36,0	63,2	160	-
Recommended bending moment M _{Rec}	S-KA / S-KAK	[Nm]	4,0	12,0	27,4	41,1	106,3	146,7
	S-KAH	[Nm]	5,1	12,6	25,7	45,1	114,3	146,7
	S-KAH HCR	[Nm]	-	12,6	25,7	45,1	114,3	-

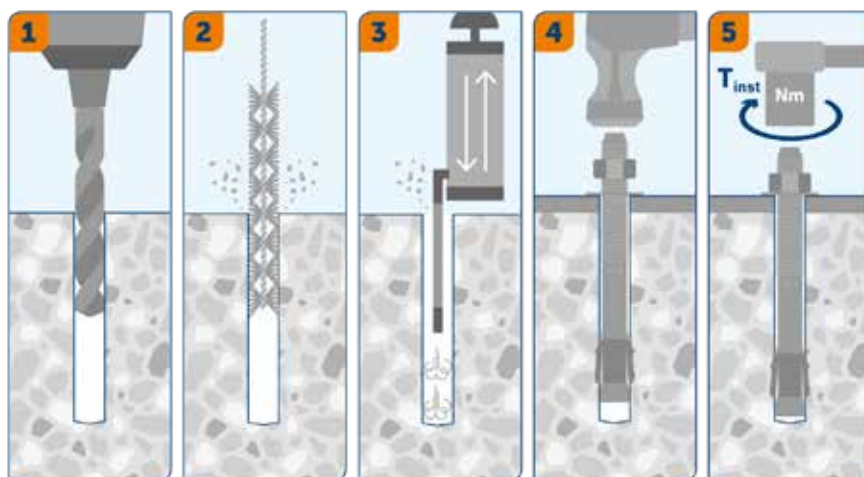
Material quality

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, EN ISO 1461, min. 40 µm (M6 = min. 20 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	45	45	60	50	75	75	90	80	110	135
Effective anchorage depth	h_{ef}	[mm]	25	35	35	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	17	19	24	30					
Required torque	S-KA / S-KAK	T_{inst}	4	7	15 / 11 ¹⁾	15 / 20 ²⁾	35	50	120	240			
	S-KAH / S-KAH HCR		5	8	15	20	35	70	120	240			

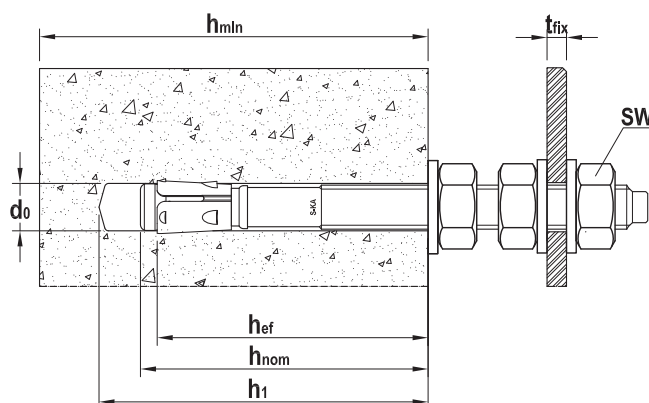
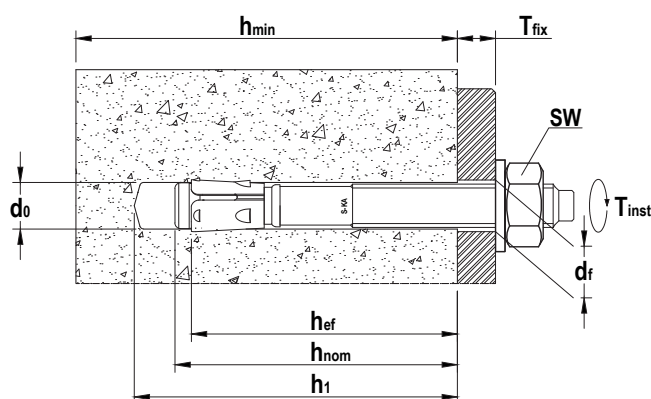
1) T_{inst} for S-KA is 11 Nm and for S-KAK 15 Nm

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

Installation methods

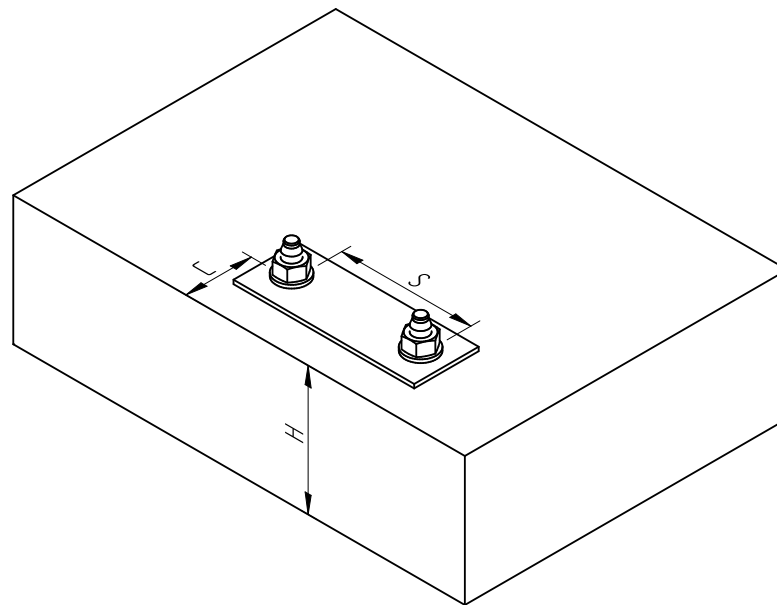
Push-through installation

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	35	45	30	60	55	70	60	85	110
Minimum thickness of base material	h_{min} [mm]	80	80	80	100	65	120	100	140	110	170	180
Minimum spacing	s_{min} [mm]	50	40	60	50	200	55	240	60	320	70	400
	$c \geq$ [mm]	50	40	60	50	150	80	180	90	240	120	300
Minimum edge distance	c_{min} [mm]	50	40	60	50	150	50	180	55	240	85	300
	$s \geq$ [mm]	50	40	60	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]	140	120	120	180	-	240	-	280	-	340	-
	$s_{cr,N}$ [mm]	75	105	105	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]	70	60	60	90	-	120	-	140	-	170	-
	$c_{cr,N}$ [mm]	37,5	52,5	52,5	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	Material					
				Zinc	Hot dip	Stainless A4	HCR	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					○	
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			○			
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-08/0173
- ETA-18/0971 (multiple use in non-structural applications)
- No ETA

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