Deutsches Institut für Bautechnik

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

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European Technical Assessment

ETA-15/0815 of 3 September 2024

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Sheh Kai Concrete Screw SK
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	SHEH KAI PRECISION CORPORATE LTD. No. 1 Ben Gong 1st Rd. Kangshan District 820110 Koahsiung TAIWAN R.O.C
Manufacturing plant	SHEH KAI PRECISION CORPORATE LTD. No. 1, Ben Gong 1st Rd. Kangshan District, 820110 KAOHSIUNG TAIWAN R.O.C
This European Technical Assessment contains	20 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330232-01-0601, Edition 05/2021
This version replaces	ETA-15/0815 issued on 16 April 2018

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Specific Part

1 Technical description of the product

The Sheh Kai Concrete Screw SK of sizes SK 8, SK 10 and SK 12 is an anchor made of galvanized and stainless steel. The anchor is screwed into a predrilled cylindrical drill 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.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B3, C1 and C2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C4
Displacements (static and quasi-static loading)	See Annex C3 and C5
Characteristic resistance for seismic performance categorie C1	See Annex C6 and C7
Characteristic resistance and displacements for seismic performance categorie C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C8 and C9

3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

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

In accordance with European Assessment Document EAD No. 330232-01-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

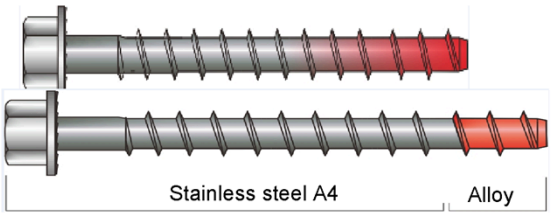
Issued in Berlin 3 September 2024 by Deutsches Institut für Bautechnik

Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

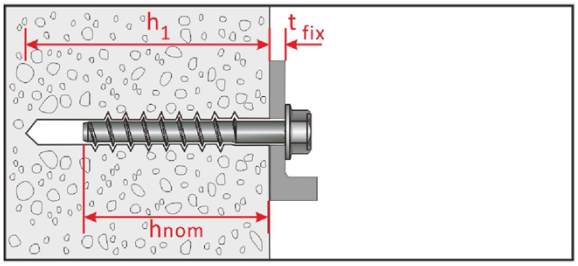
Deutsches Institut für Bautechnik DIBt

Product in the installed condition

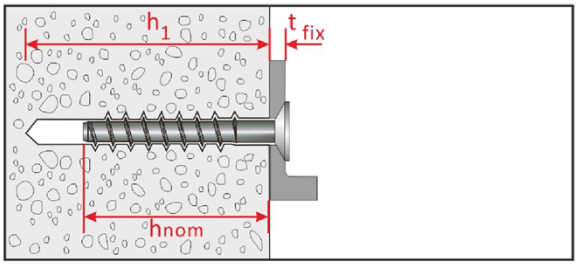


Steel 10B21

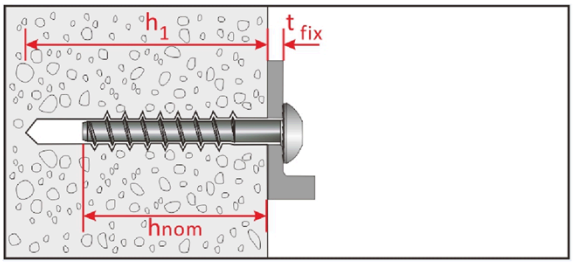
Stainless steel A4



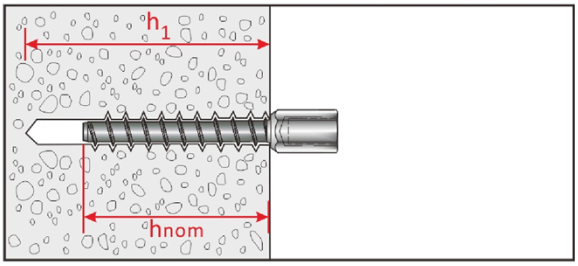
Hexagon Head : SK-H, SK-HF
10B21 (SK8, SK10, SK12)
A4 (SK8, SK10, SK12)



Countersunk Head : SK-CS
10B21 (SK8, SK10)
A4 (SK8, SK10)



Pan Head : SK-PH
10B21 (SK8, SK10)
A4 (SK8, SK10)



Hanger Bolt : SK-HB
A4 (SK10-M12)

Sheh Kai Concrete Screw SK	**Annex A1**
Product description Installed condition	

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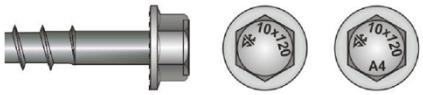
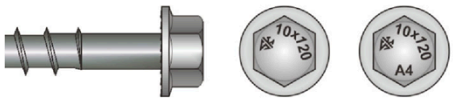
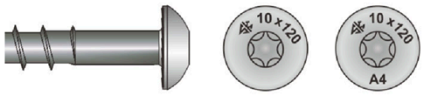
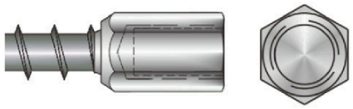
Table A1: Materials and screw types

Name	Material
Screw anchor	

Head marking	material
SK	Steel 10B21 acc. to SAE-J403 zinc coating: electro plated (> 5 µm) or mechanical plated (> 30 µm) (only head type –H and –HF)
SK A4	Stainless steel 1.4401, 1.4404 (both A4)

Anchor size / head types			SK 8			SK 10			SK 12	
			-H -HF -CS -PH	-H -HF	-CS -PH	-H -HF -CS -PH	-H -HF -HB	-CS -PH	-H -HF	
Material			10B21	A4		10B21	A4		10B21	A4
Nominal value of the characteristic yield strength	f_{yk}	N/mm²	780	640	432	750	640	432	750	640
Nominal value of the characteristic tensile strength	f_{uk}	N/mm²	870	800	540	850	800	540	850	800
Elongation at rupture	As	[%]	≤ 8							

	Hexagon washer head 1) SK-H size 8,10,12 (10B21 steel) 2) SK-H A4 size 8,10,12 (stainless A4)
	Hexagon washer head 3) SK-HF size 8,10,12 (10B21 steel) 4) SK-HF A4 size 8,10,12 (stainless A4)
	Countersunk head 5) SK-CS size 8,10 (10B21 steel) 6) SK-CS A4 size 8,10 (stainless A4)
	Pan head 7) SK-PH size 8,10 (10B21 steel) 8) SK-PH A4 size 8,10 (stainless A4)
	Hanger Bolt head 9) SK-HB A4 size 10 with M12 internal thread (stainless A4)

Sheh Kai Concrete Screw SK

Product description
Materials and screw types

Annex A2

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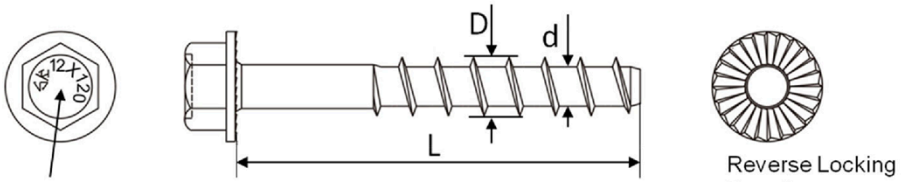
Table A2: Dimensions and markings

Anchor size			**SK 8**				**SK 10**				**SK 12**	
Head type			**H, HF, PH**		**CS**		**H, HF, PH, HB**		**CS**		**H, HF**	
Material			**10B21**	**A4**	**10B21**	**A4**	**10B21**	**A4**	**10B21**	**A4**	**10B21**	**A4**
Embedment depth	h_{nom}	[mm]	65	85	65	85	75	100	75	100	95	120
Length of anchor	min L	[mm]	70	90	75	95	80	105	85	110	100	125
	max L	[mm]	150				150				150	
Thread diameter	D	[mm]	9,9				12,5				14,3	
Core diameter	d	[mm]	7,4				9,4				11,3	
Thread pitch	p	[mm]	5,8				7,7				8,1	

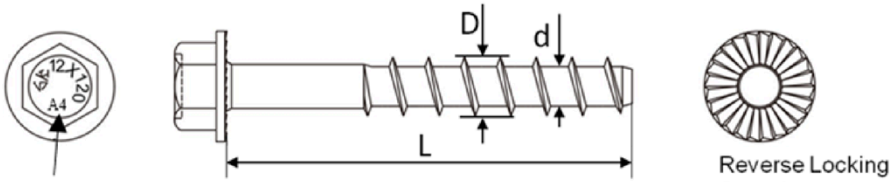
Steel
10B21



Reverse Locking Serrations

Head marking:
Identifying mark of producer: SK
Nominal size: e.g. 12 mm
Length L: e.g. 120 mm

Stainless Steel
A4



Reverse Locking Serrations

Head marking:
Identifying mark of producer: SK
Nominal size: e.g. 12mm
Length L: 120mm
Material: A4

Sheh Kai Concrete Screw SK	**Annex A3**
Product description Dimensions and markings	

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Intended use

Anchorages subject to:

- Static and quasi-static loads
- Seismic action for performance category C1
- Fire exposure

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206:2013+A2:2021
- Strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021
- Uncracked or cracked concrete

Use conditions (Environmental conditions)

- Anchorages subject to dry internal conditions: all screw types
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 + A1:2015:
  - Screw types made of stainless steel with marking A4: CRC III

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads 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.).
- Anchorages are designed for design method A in accordance with:
  - EN 1992-4: 2018 in addition with Technical Report TR 055, Edition February 2018

Installation:

- Hammer drilling only: all sizes and all embedment depths.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor shall not be possible.
- The head of the anchor must be fully engaged on the fixture and show no signs of damage.

Sheh Kai Concrete Screw SK	Annex B1
Intended Use Specifications	

Table B1: Installation parameters (Steel 10B21)

Anchor size			**SK 8**			**SK 10**			**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**CS**	**PH**	**H HF**
Material			**Steel 10B21**						
Diameter of drill bit	d_0	[mm]	8			10			12
Embedment depth	h_{nom}	[mm]	65			75			95
Min. hole depth in concrete	$h_1 \geq$	[mm]	75			85			105
Effective anchorage depth	h_{ef}	[mm]	50,6			58,1			75,4
Clearance hole in the fixture	d_f	[mm]	11			13			15
Thickness of fixture	t_{fix}	[mm]	5-85	10-85	5-85	5-75	10-75	5-75	5-55
Installation torque	T_{inst}	[Nm]	40	-[1)]	-[1)]	60	-[1)]	-[1)]	80
Wrench size (types: H, HF, HI)	WS	[mm]	13	-	-	17	-	-	19
Torx size (types: CS, PH)	TX	-	-	45		-	50		-
Max. power output, machine setting	$T_{max} \leq$	[Nm]	185	120	120	350	120	120	350

1) For the installation of the CS and PH head types only impact screw driver can be used.

Table B2: Installation parameters (Stainless Steel A4)

Anchor size			**SK8**			**SK 10**				**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**HB**	**CS**	**PH**	**H HF**
Material			**Stainless A4**							
Diameter of drill bit	d_0	[mm]	8			10				12
Embedment depth	h_{nom}	[mm]	85			100				120
Min. hole depth in concrete	$h_1 \geq$	[mm]	95			110				130
Effective anchorage depth	h_{ef}	[mm]	51,9			58,7				75,6
Clearance hole	d_f	[mm]	11			13				15
Thickness of fixture	t_{fix}	[mm]	5-65	10-65	5-65	5-50	5-50	10-50	5-50	5-30
Installation torque	T_{inst}	[Nm]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]
Wrench size (types: H, HF, HI)	WS	[mm]	13	-	-	17	19	-	-	19
Torx size (types: CS, PH)	TX	-	-	45		-	-	50		-
Max. torque moment, machine setting	$T_{max} \leq$	[Nm]	120	120	120	185	185	185	185	185

1) For the installation of the CS and PH head types only impact screw driver can be used.

Sheh Kai Concrete Screw SK	**Annex B2**
Intended Use Installation parameters	

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Table B3: Minimum thickness of member, Minimum spacing and edge distance

Anchor size			**SK 8**		**SK 10**		**SK 12**	
Head type			**H, HF, CS, PH**		**H, HF, CS, PH, HB**		**H,HF**	
Material			**10B21**	**A4**	**10B21**	**A4**	**10B21**	**A4**
Minimum member thickness	h_{min}	[mm]	110	125	130	140	160	170
Minimum edge distance	c_{min}	[mm]	50	50	60	60	70	70
Minimum spacing	s_{min}	[mm]	50	50	60	60	70	70

Sheh Kai Concrete Screw SK	**Annex B3**
Intended Use Minimum member thickness, minimum edge distance and anchor spacing	

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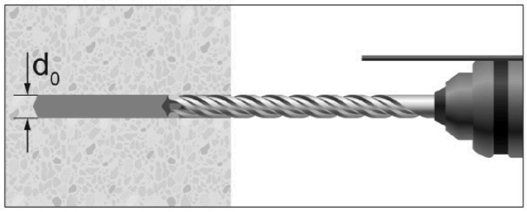
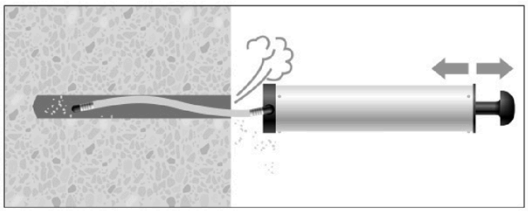
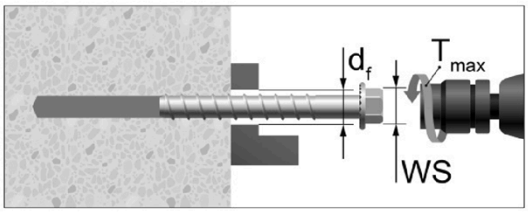
Installation instruction



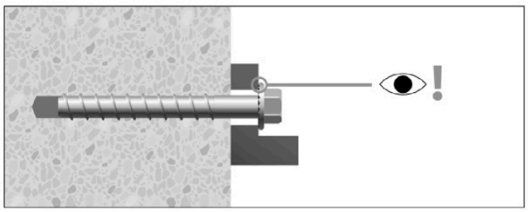
Drill the hole to the bore hole depth $\mathbf{h_1}$.



Clean the hole.



Screw in the anchor by using a torque wrench or an impact screw driver.
In case of using torque wrench: T_{inst} acc. to Table B1 and B2.
In case of using impact screw driver: T_{max} acc. to Table B1 and B2
WS= Wrench Size



Control of complete setting, full contact of screw head with fixture part.

Sheh Kai Concrete Screw SK	Annex B4
Intended Use Installation Instruction	

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Table C1: Characteristic resistance under tension loading, Design method A (Steel 10B21)

Anchor size			**SK 8**			**SK 10**			**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**CS**	**PH**	**H HF**
Material			**Steel 10B21**						
Embedment depth	h_{nom}	[mm]	65			75			95
Steel failure									
Characteristic resistance	$N_{Rk,s}$	[kN]	35,9			57,0			83,0
Partial safety factor	γ_{Ms} 1)	[-]	1,4			1,4			1,4
Pull-out failure									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,0			10,0			16,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9,0	9,0	6,5	16,0	16,0	11,0	25,0
Increasing factors for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$ in cracked or uncracked concrete	ψ_c	C30/37	1,22						
		C40/50	1,41						
		C50/60	1,58						
Installation factor	γ_{inst}	[-]	1,4			1,0			1,2
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	50,6			58,1			75,4
Characteristic edge distance	$c_{cr,N}$	[mm]	$1,5h_{ef}$						
Characteristic spacing	$s_{cr,N}$	[mm]	$3h_{ef}$						
Factor for cracked concrete	k_{cr}	[-]	7,7						
Factor for uncracked concrete	k_{ucr}	[-]	11,0						
Splitting failure									
Characteristic edge distance for splitting	$c_{cr,sp}$	[mm]	$1,5h_{ef}$						
Characteristic anchor spacing for splitting	$s_{cr,sp}$	[mm]	$3h_{ef}$						

1) In absence of other national regulations.

Sheh Kai Concrete Screw SK	**Annex C1**
Performance (10B21 steel) Characteristic values under tension loading	

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Table C2: Characteristic resistance under tension loading, Design method A (Stainless Steel A4)

Anchor size			**SK 8**			**SK 10**				**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**HB**	**CS**	**PH**	**H HF**
Material			**Stainless A4**							
Embedment depth	h_{nom}	[mm]	85			100				120
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	33,0	22,3	22,3	53,7	53,7	36,2	36,2	78,1
Partial safety factor	γ_{Ms} 1)	[-]	1,5			1,5				1,5
Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	7,0	4,5	4,0	7,0	7,0	7,0	7,0	16,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9,0	5,5	4,0	16,0	16,0	10,0	7,0	25,0
Increasing factors for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$ in cracked or uncracked concrete	ψ_c	C30/37	1,22							
		C40/50	1,41							
		C50/60	1,58							
Installation factor	γ_{inst}	[-]	1,4			1,0				1,2
Concrete cone failure										
Effective anchorage depth	h_{ef}	[mm]	51,9			58,7				75,6
Characteristic edge distance	$c_{cr,N}$	[mm]	$1,5h_{ef}$							
Characteristic spacing	$s_{cr,N}$	[mm]	$3h_{ef}$							
Factor for cracked concrete	k_{cr}	[-]	7,7							
Factor for uncracked concrete	k_{ucr}	[-]	11,0							
Splitting failure										
Characteristic edge distance for splitting	$c_{cr,sp}$	[mm]	$1,5h_{ef}$							
Characteristic anchor spacing for splitting	$s_{cr,sp}$	[mm]	$3h_{ef}$							

1) In absence of other national regulations.

Sheh Kai Concrete Screw SK	**Annex C2**
Performance (Stainless A4) Characteristic values under tension loading	

Deutsches Institut für Bautechnik DIBt

Table C3: Displacements under tension loads for uncracked and cracked concrete

Anchor size	Embedment depth	Material	Head type	Concrete	Tension load N	Displacement	
						δ_{N0}	$\delta_{N\infty}$
[-]	[mm]	[-]	[-]	[-]	[kN]	[mm]	[mm]
SK 8	65	Steel 10B21	H/HF	cracked C20/25	1,5	0,1	0,8
			CS				
			PH				
SK 10	75		H/HF		4,8	0,2	1,0
			CS				
			PH				
SK 12	95		H/HF		4,8	0,3	1,2
SK 8	85	Stainless A4	H/HF	cracked C20/25	1,5	0,1	0,8
			CS		1,5		
			PH		1,4		
SK 10	100		H/HF/HB		3,3	0,2	1,0
			CS				
			PH				
SK 12	120		H/HF		4,8	0,3	1,2
SK 8	65	Steel 10B21	H/HF	uncracked C20/25	3,1	0,1	0,8
			CS				
			PH		2,2		
SK 10	75		H/HF		7,6	0,1	1,0
			CS				
			PH		5,2		
SK 12	95		H/HF		9,9	0,3	1,2
SK 8	85	Stainless A4	H/HF	uncracked C20/25	3,1	0,1	0,8
			CS		1,8		
			PH		1,4		
SK 10	100		H/HF/HB		7,6	0,1	1,0
			CS		4,8		
			PH		3,3		
SK 12	120		H/HF		9,9	0,3	1,2

Sheh Kai Concrete Screw SK

Performance
Displacements under tension loads

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic resistance under shear loading, Design method A

Anchor size			**SK 8**			**SK 10**			**SK 12**	
Head type			**H HF CS PH**	**H HF**	**CS PH**	**H HF CS PH**	**H HF HB**	**CS PH**	**H HF**	**H HF**
Material			**10B21**	**A4**		**10B21**	**A4**		**10B21**	**A4**
Embedment depth	h_{nom}	[mm]	65	85		75	100		95	120
Effective embedment depth	h_{ef}	[mm]	50,6	51,9		58,1	58,7		75,4	75,6
Steel failure without lever arm										
Characteristic resistance	$V_{Rk,s}$	[kN]	16,9	16,5	11,2	26,8	26,8	18,1	39,0	39,0
Factor for groups	k_7	[-]	0,8							
Partial safety factor	γ_{Ms} 1)	[-]	1,5	1,25		1,5	1,25		1,5	1,25
Steel failure with lever arm										
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	39,1	35,9	24,2	79,0	74,4	50,2	138,8	130.6
Partial safety factor	γ_{Ms} 1)	[-]	1,5	1,25		1,5	1,25		1,5	1,25
Concrete pryout failure										
k-factor	k_8	[-]	1,0						2,0	
Installation factor	γ_{inst}	[-]	1,0							
Concrete edge failure										
Effective length of anchor	$l_f = h_{ef}$	[mm]	50,6	51,9		58,1	58,7		75,4	75,6
Effective diameter of anchor	d_{nom}	[mm]	7,25			9,24			11,15	
Installation factor	γ_{inst}	[-]	1,0							

1) In absence of other national regulations.

Sheh Kai Concrete Screw SK	**Annex C4**
Performance Characteristic values under shear loading	

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Table C5: Displacements under shear loads for uncracked and cracked concrete

Anchor size	Embedment depth	Material	Head type	Concrete	Shear load V	Displacement	
						δ_{V0}	$\delta_{V\infty}$
[-]	[mm]	[-]	[-]	[-]	[kN]	[mm]	[mm]
SK 8	65	Steel 10B21	H/HF	Cracked and uncracked C20/25	8,0	1,8	2,7
			CS				
			PH				
SK 10	75		H/HF		12,8		
			CS				
			PH				
SK 12	95		H/HF		18,6		
SK 8	85	Stainless steel A4	H/HF	Cracked and uncracked C20/25	9,4	1,8	2,7
			CS		6,4		
			PH				
SK 10	100		H/HF/HB		15,3		
			CS		10,3		
			PH				
SK 12	120		H/HF		22,3		

Sheh Kai Concrete Screw SK	**Annex C5**
Performance Displacements under shear loads	

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Table C6: Characteristic values for seismic actions C1 (Steel 10B21)

Anchor size			**SK 8**			**SK 10**			**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**CS**	**PH**	**H HF**
Material			**Steel 10B21**						
Embedment depth	h_{nom}	[mm]	65			75			95
Steel failure for tension and shear load									
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	35,9			57,0			83,0
Partial safety factor	$\gamma_{Ms,N}$	[-]	1,4						
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	11,5			18,5			26,5
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,5						
Pull-out failure									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p,C1}$	[kN]	6,0			10,0			16,0
Concrete cone failure									
Effective embedment depth	h_{ef}	[mm]	50,6			58,1			75,4
Edge distance	$c_{cr,N}$	[mm]	$1{,}5h_{ef}$						
Spacing	$s_{cr,N}$	[mm]	$3h_{ef}$						
Robustness	γ_{inst}	[-]	1.4			1.0			1.2
Concrete pryout failure									
Pry-out factor	k_8	[-]	1.0						2.0
Concrete edge failure									
Effective length of fastener	$l_f = h_{ef}$	[mm]	50,6			58,1			75,4
Outside diameter of fastener	d_{nom}	[mm]	8			10			12

Sheh Kai Concrete Screw SK	**Annex C6**
Performance (10B21 steel) Characteristic values for seismic actions C1	

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Table C7: Characteristic values for seismic actions C1 (Stainless Steel A4)

Anchor size			**SK 8**			**SK 10**			**SK 12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**CS**	**PH**	**H HF**
Material			**Stainless A4**						
Embedment depth	h_{nom}	[mm]	85			100			120
Steel failure for tension and shear load									
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	33,0	22,3	22,3	53,7	36,2	36,2	78,1
Partial safety factor	$\gamma_{Ms,N}$	[-]	1,4						
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	11,5	11,5	11,2	18,5	18,5	18,1	26,5
Partial safety factor	$\gamma_{Ms,V}$	[-]	1,5						
Pull-out failure									
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p,C1}$	[kN]	6,0	4,5	4,0	7,0			16,0
Concrete cone failure									
Effective embedment depth	h_{ef}	[mm]	51,9			58,7			75,6
Edge distance	$c_{cr,N}$	[mm]	$1{,}5h_{ef}$						
Spacing	$s_{cr,N}$	[mm]	$3h_{ef}$						
Robustness	γ_{inst}	[-]	1.4			1.0			1.2
Concrete pryout failure									
Pry-out factor	k_8	[-]	1.0						2.0
Concrete edge failure									
Effective length of fastener	$l_f = h_{ef}$	[mm]	51,9			58,7			75,6
Outside diameter of fastener	d_{nom}	[mm]	8			10			12

Sheh Kai Concrete Screw SK

Performance (Stainless A4)
Characteristic values for seismic actions C1

Annex C7

Deutsches Institut für Bautechnik DIBt

Table C8: Characteristic tension resistance values for resistance to fire

Anchor size				**SK 8**			**SK 10**		**SK 12**	
Head type				**H HF CS PH**	**H HF CS**	**PH**	**H HF CS PH**	**H HF HB CS PH**	**H HF**	**H/HF**
Material				**10B21**	**A4**		**10B21**	**A4**	**10B21**	**A4**
Embedment depth [mm]				65	85		75	100	95	120
Steel failure										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,41	0,8		1,0	1,7	2,0	2,9
	R60	$N_{Rk,s,fi}$	[kN]	0,37	0,7		0,9	1,3	1,5	2,4
	R90	$N_{Rk,s,fi}$	[kN]	0,29	0,5		0,7	1,0	1,3	2,0
	R120	$N_{Rk,s,fi}$	[kN]	0,21	0,4		0,5	0,9	1,0	1,6
Pull-out failure										
Characteristic resistance in concrete ≥ C20/25	R30	$N_{Rk,p,fi}$	[kN]	1,1	1,1	1,0	2,5	1,8	3,0	3,0
	R60									
	R90									
	R120	$N_{Rk,p,fi}$	[kN]	0,9	0,9	0,8	2,0	1,4	2,4	2,4
Concrete cone failure										
Characteristic resistance in concrete ≥ C20/25	R30	$N^0_{Rk,c,fi}$	[kN]	3,1	3,3		4,4	4,5	8,5	8,6
	R60									
	R90									
	R120	$N^0_{Rk,c,fi}$	[kN]	2,5	2,7		3,5	3,6	6,8	6,8
Effective embedment depth		h_{ef}	[mm]	50,6	51,9		58,1	58,7	75,4	75,6
Minimum member thickness		h_{min}	[mm]	110	125		130	140	160	170
Spacing		$s_{cr,N,fi}$	[mm]	$4h_{ef}$						
		s_{min}	[mm]	50			60		70	
Edge distance		$c_{cr,N,fi}$	[mm]	$2h_{ef}$						
Fire exposure from one side only		c_{min}	[mm]	50			60		70	
Fire exposure from more than one side				≥ 300 mm						

Sheh Kai Concrete Screw SK

Performance
Characteristic values for resistance to fire (tension)

Annex C8

Deutsches Institut für Bautechnik DIBt

Table C9: Characteristic shear resistance values for resistance to fire

Anchor size				**SK 8**		**SK 10**		**SK 12**	
Head type				**all**	**all**	**all**	**all**	**all**	**all**
Material				**10B21**	**A4**	**10B21**	**A4**	**10B21**	**A4**
Embedment depth [mm]				65	85	75	100	95	120
Steel failure without level arm									
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,41	0,8	1,0	1,7	2,0	2,9
	R60	$V_{Rk,s,fi}$	[kN]	0,37	0,7	0,9	1,3	1,5	2,4
	R90	$V_{Rk,s,fi}$	[kN]	0,29	0,5	0,7	1,0	1,3	2,0
	R120	$V_{Rk,s,fi}$	[kN]	0,21	0,4	0,5	0,9	1,0	1,6
Steel failure with level arm									
Characteristic resistance	R30	$M^0_{Rk,p,fi}$	[Nm]	0,45	0,9	1,4	2,3	3,4	4,9
	R60	$M^0_{Rk,p,fi}$	[Nm]	0,40	0,7	1,2	1,9	2,5	4,0
	R90	$M^0_{Rk,p,fi}$	[Nm]	0,31	0,5	0,9	1,5	2,1	3,3
	R120	$M^0_{Rk,p,fi}$	[Nm]	0,22	0,45	0,7	1,3	1,6	2,6
Pry-out failure									
k_8			[-]	1		1		2	
Characteristic resistance	R30	$V_{Rk,cp,fi}$	[kN]	3,1	3,3	4,4	4,5	17,0	17,1
	R60								
	R90								
	R120	$V_{Rk,cp,fi}$	[kN]	2,5	2,7	3,5	3,6	13,6	13,7
Concrete edge failure									
Characteristic resistance	≤ R90	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.25 * V^0_{Rk,c}$ [1)]					
	R120	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.20 * V^0_{Rk,c}$ [1)]					

1) $V^0_{Rk,c}$ = characteristic resistance for concrete edge failure in cracked concrete C20/C25 under normal temperature calculated according to EN 1992-4.

Sheh Kai Concrete Screw SK	**Annex C9**
Performance Characteristic values for resistance to fire (shear)	