

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-15/0815
of 16 April 2018

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

Concrete screw

Manufacturer

SHEH KAI PRECISION CO., LTD
No. 1, Ben Gong 1st Rd., Ben Chou Industrial Park,
KAOHSIUNG 82059
TAIWAN R.O.C

Manufacturing plant

SHEH KAI PRECISION CO., LTD
No. 1, Ben Gong 1st Rd., Ben Chou Industrial Park,
KAOHSIUNG 82059
TAIWAN R.O.C

This European Technical Assessment
contains

18 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 330232-00-0601

This version replaces

ETA-15/0815 issued on 1 February 2016

European Technical Assessment

ETA-15/0815

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Specific Part

1 Technical description of the product

The Sheh Kai concrete screw of sizes SK 8, SK 10 and SK 12 is an anchor made of galvanized 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)

Wesentliches Merkmal	Leistung
Characteristic resistance under static and quasi-static loading, displacements	See Annex C1 to C5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C6 and C7

3.3 Safety in use (BWR 4)

For Basic Works Requirement Safety in use the same criteria are valid as for Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, and European Assessment Document EAD 330011-00-0601 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

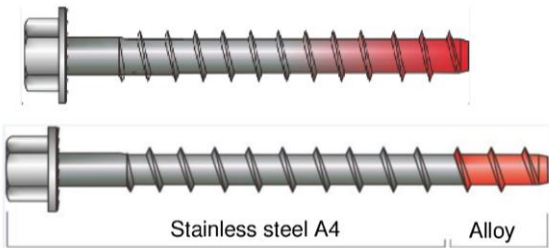
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin 16 April 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

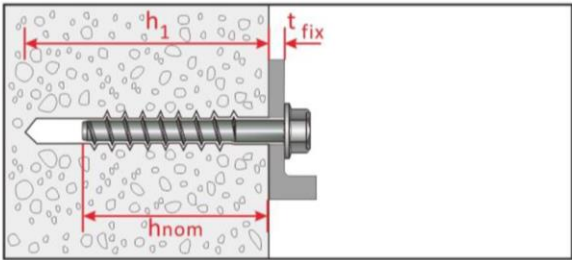
beglaubigt:
Lange

Product in the installed condition

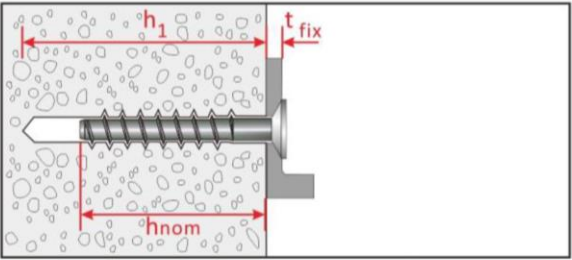


Steel 10B21

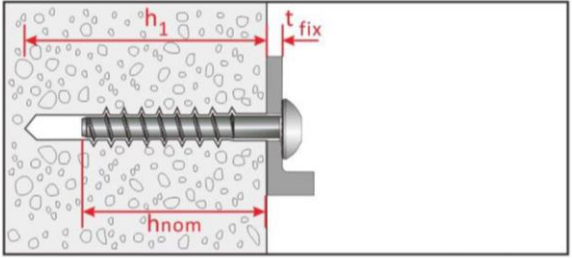
Stainless steel A4



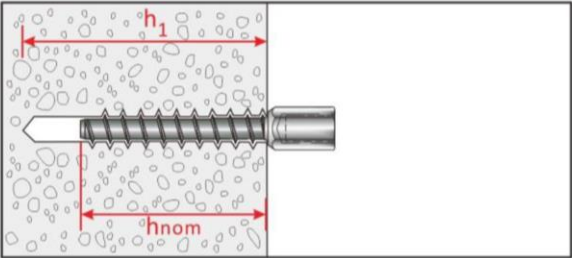
Hexagon Head : SK-H, SK-HF
10B21 (SK8, SK10, SK12)
A4 (SK8, SK10, SK12)



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

Product description
Installed condition

Annex A1

Table A1: Materials and screw types

Name	Material									
Screw fastener	Head marking	material								
	SK	Steel 10B21 acc. to SAE-J403 zinc coating: electroplated ($> 5 \mu\text{m}$) or mechanical plated ($> 30 \mu\text{m}$) (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
Characteristic yield strength	f_{yk}	N/mm ²	780	640	432	750	640	432	750	640
Characteristic tensile strength	f_{uk}	N/mm ²	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)



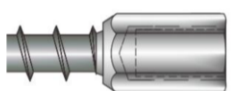
Countersunk head

- 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

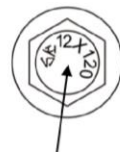
Product description
Materials and screw types

Annex A2

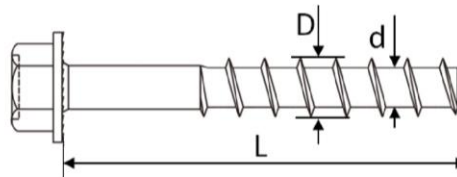
Table A2: Dimensions and markings

Fastener 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 fastener	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	
Shaft diameter	d	[mm]	7,4				9,4				11,3	
Thread pitch	p	[mm]	5,8				7,7				8,1	

**Steel
10B21**

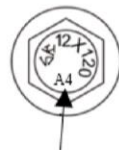


Head marking:
Identifying mark of producer: SK
Nominal size: e.g. 12 mm
Length L: e.g. 120 mm

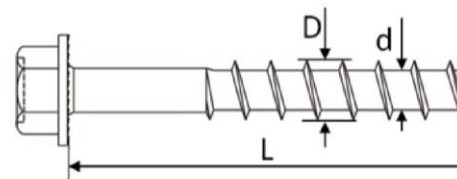


Reverse Locking
Serrations

**Stainless Steel
A4**



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



Reverse Locking
Serrations

Sheh Kai Concrete Screw SK

Product description
Dimensions and markings

Annex A3

Intended use

Anchorage subject to:

- Static and quasi-static loads:
All sizes.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000,
- Strength classes C20/25 to C50/60 according to EN 206-1:2000,
- Uncracked or cracked concrete: all sizes.

Use conditions (Environmental conditions)

- Anchorages subject to dry internal conditions.
- Anchorages subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist. Screw types made of stainless steel with marking A4.

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:
 - FprEN 1992-4:2016 in addition with TR 055, Edition December 2016

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

Intended Use Specifications

Annex B1

Table B1: Installation parameters (Steel 10B21)

Fastener 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 ≥	[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} ≤	[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)

Fastener 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 ≥	[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} ≤	[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

Intended Use
Installation parameters

Annex B2

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

Fastener 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

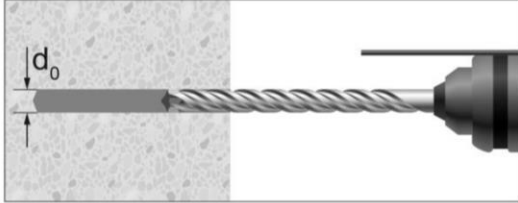
Sheh Kai Concrete Screw SK

Intended Use

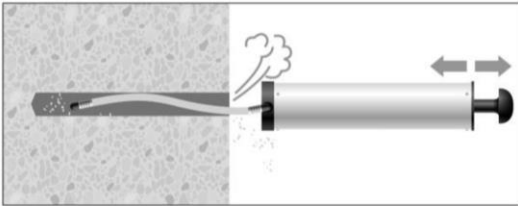
Minimum member thickness, minimum edge distance and anchor spacing

Annex B3

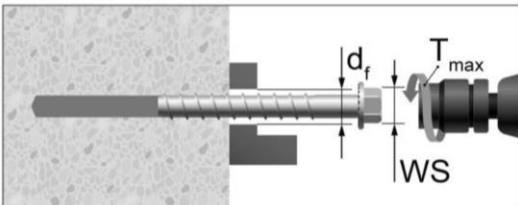
Installation instruction



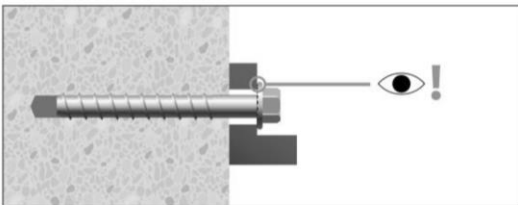
Drill the hole to the bore hole depth h_1 .



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

Intended Use
Installation Instruction

Annex B4

Table C1:

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

Fastener size			SK 8			SK 10			SK 12
Head type			H HF	CS	PH	H HF	CS	PH	H HF
Material			Steel 10B21						
Steel failure									
Characteristic resistance	N _{Rk,s}	[kN]	35,9			57,0			83,0
Partial factor	γ _{Ms} ²⁾	[-]	1,4			1,4			1,4
Pull-out failure									
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	4,5			10,0			12,0
Characteristic resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	9,0	9,0	6,5	16,0	16,0	11	25,0
Increasing factors for N _{Rk,p} in cracked or uncracked concrete	ψ _c	C30/37	1,22						
		C40/50	1,41						
		C50/60	1,58						
Robustness to installation	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 ¹⁾						
Factor for uncracked concrete	k _{ucr}	[-]	11,0 ¹⁾						
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) Based on concrete strength measured on cylinders.

2) In absence of other national regulations.

Sheh Kai Concrete Screw SK

Performance
Characteristic values under tension loading

Annex C1

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

Fastener size			SK 8			SK 10				SK 12
Head type			H HF	CS	PH	H HF	HB	CS	PH	H HF
Material			Stainless steel A4							
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 factor	γ _{Ms} ²⁾	[-]	1,5			1,5			1,5	
Pull-out failure										
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	4,5	4,5	4,0	7,0	7,0	7,0	7,0	12,0
Characteristic resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	9,0	5,5	4,0	16,0	16,0	10	7,0	25,0
Increasing factors for N _{Rk,p} in cracked or uncracked concrete	ψ/c	C30/37	1,22							
		C40/50	1,41							
		C50/60	1,58							
Robustness to installation	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 ¹⁾							
Factor for uncracked concrete	k _{ucr}	[-]	11,0 ¹⁾							
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) Based on concrete strength measured on cylinders.

2) In absence of other national regulations.

Sheh Kai Concrete Screw SK

Performance
Characteristic values under tension loading

Annex C2

Table C3: Displacements under tension loads for non-cracked and cracked concrete

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

Sheh Kai Concrete Screw SK

Performance
Displacements under tension loading

Annex C3

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

Fastener 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
Setting 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	$V^0_{Rk,s}$	[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 factor	$\gamma_{Ms}^{1)}$	[-]	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 factor	$\gamma_{Ms}^{1)}$	[-]	1,5	1,25		1,5	1,25		1,5	1,25
Concrete pryout failure										
k-factor	k_8	[-]	1,0						2,0	
Partial factor	$\gamma_{Mcp}^{1)}$	[-]	1,5							
Concrete edge failure										
Effective length of anchor	ℓ_f	[mm]	50,6	51,9		58,1	58,7		75,4	75,6
Outside diameter of fastener	d_{nom}	[mm]	7,25			9,24			11,15	
Partial factor	$\gamma_{Mc}^{1)}$	[-]	1,5							

1) In absence of other national regulations.

Sheh Kai Concrete Screw SK

Performance
Characteristic values under shear loading

Annex C4

Table C5: Displacements under shear loads for non-cracked and cracked concrete

Fastener size	Material	Head type	Concrete	Shear load V	Displacement	
					δ_{V0}	$\delta_{V\infty}$
[-]	[-]	[-]	[-]	[kN]	[mm]	[mm]
SK 8	Steel 10B21	H/HF	Cracked and uncracked C20/25	1,5	1,8	2,7
		CS				
		PH				
SK 10		H/HF		12,8		
		CS				
		PH				
SK 12	H/HF	18,6				
SK 8	Stainless steel A4	H/HF	Cracked and uncracked C20/25	9,4	1,8	2,7
		CS		6,4		
		PH		15,3		
SK 10		H/HF/HB		10,3		
		CS				
		PH				
SK 12	H/HF	22,3				

Sheh Kai Concrete Screw SK

Performance
Displacements under shear loading

Annex C5

Table C6: Characteristic tension resistance values for resistance to fire

Fastener 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
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						

1) In absence of other national regulations.

Sheh Kai Concrete Screw SK

Performance

Characteristic values for resistance to fire (tension)

Annex C6

Table C7: Characteristic shear resistance values for resistance to fire

Fastener size				SK 8		SK 10		SK 12	
Head type				all	all	all	all	all	all
Material				10B21	A4	10B21	A4	10B21	A4
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]	$V^0_{Rk,c,fi} = 0.25 \cdot V^0_{Rk,c}^{(2)}$					
	R120	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.20 \cdot V^0_{Rk,c}^{(2)}$					

1) In absence of other national regulations.

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

Sheh Kai Concrete Screw SK

Performance

Characteristic values for resistance to fire (shear)

Annex C7