Deutsches Institut für Bautechnik
Zulassungsstelle für Bauprodukte und Bauarten
Bautechnisches Prüfamt
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-13/0537

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		Yuanda Ankerschiene *Yuanda anchor channel*
Zulassungsinhaber *Holder of approval*		Yuanda Europe Ltd. Uferstrasse 90 4057 BASEL SCHWEIZ
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Ankerschienen *Anchor channels*
Geltungsdauer: *Validity:*	vom *from* bis *to*	26 June 2013 26 June 2018
Herstellwerk *Manufacturing plant*		Yuanda Werk 1

Diese Zulassung umfasst *This Approval contains*	25 Seiten einschließlich 17 Anhänge *25 pages including 17 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The Yuanda Anchor channel is an anchor channel consisting of a C-shaped channel of cold-formed steel and at least two metal anchors non-detachably fixed on the profile back.

The anchor channel is imbedded surface-flush in the concrete. Yuanda special screws (hooked) with appropriate hexagon nuts and washers will be fixed in the channel.

An illustration of the product and intended use is given in Annex 1.

1.2 Intended use

The anchor channel is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences.

The anchor channel is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C12/15 at minimum to C90/105 at most according to EN 206-1:2000-12. The anchor channel may be anchored in cracked and non-cracked concrete.

The anchor channel may be used for transmission of tensile loads, shear loads, or a combination of tensile and shear loads perpendicular to the longitudinal axis of the channel.

The intended use of the anchor channel (channel profile, anchor, special screw, washer and nut) concerning corrosion is given in Annex 3, Table 1 depending on the chosen material.

The provisions made in this European technical approval are based on an assumed working life of the anchor channel of 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.

2 Characteristics of the product and methods of verification

2.1 Characteristics of the product

The anchor channel corresponds to the drawings and information given in Annex 2 to 7. The characteristic material values, dimensions and tolerances of the anchor channel not indicated in the Annexes shall correspond to respective values laid down in the technical documentation[7] of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor channel meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 2000/605/EC.

[7] The technical documentation of this European technical approval is deposited at Deutsches Institut für Bautechnik and, as far as it is relevant to the tasks of the approved body involved in the attestation of conformity procedure, is handed over to the approved bodies.

The characteristic values for the design of the anchorages are given in Annexes 8 to 17.

The anchor channel shall be marked with the identifying mark of the producer, the size and additionally with the type of channel, e.g. YD C1 according to Annex 2.

Each special screw is marked with the identifying mark of the producer, with the strength grade and with the type of coating according to Annex 2.

2.2 Method of verification

2.2.1 General

The assessment of the fitness of the anchor channel for the intended use with regard to the requirements of mechanical resistance and stability as well as safety in use in the sense of the Essential Requirements 1 and 4 was performed based on the following verifications:

Verifications for tension loads for

1.	Distribution of acting tension loads	
2.	Steel failure - anchor	$N_{Rk,s,a}$
3.	Steel failure - special screw	$N_{Rk,s,s}$
4.	Steel failure - connection channel/ anchor	$N_{Rk,s,c}$
5.	Steel failure - local flexure of channel lips	$N_{Rk,s,l}$
6.	Steel failure - flexure resistance of channel	$M_{Rk,s,flex}$
7.	Steel failure - transfer of setting torque into prestressing force	T_{inst}
8.	Concrete failure - pullout	$N_{Rk,p}$
9.	Concrete failure - concrete cone	$N_{Rk,c}$
10.	Concrete failure - splitting due to installation	c_{min}, s_{min}, h_{min}
11.	Concrete failure - splitting due to loading	$N_{Rk,sp}$
12.	Concrete failure - blow-out	$N_{Rk,cb}$
13.	Reinforcement	$N_{Rk,re}$, $N_{Rd,a}$
14.	Displacement under tension loads	δ_N

Verifications for shear loads for

1.	Distribution of acting shear loads	
2.	Steel failure without lever arm - special screw	$V_{Rk,s,s}$
3.	Steel failure without lever arm - flexure channel lips	$V_{Rk,sl}$
4.	Steel failure with lever arm	$M^0_{Rk,s}$
5.	Concrete failure - pry-out	$V_{Rk,cp}$
6.	Concrete failure - concrete edge	$V_{Rk,c}$
7.	Reinforcement	$V_{Rk,c,re}$
8.	Displacement under shear loads	δ_V

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE-marking

3.1 System of attestation of conformity

According to the Decision 2000/273/EC of the European Commission[8] system 2(i) (referred to as system 1) of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(a) Tasks for the manufacturer:
- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the approved body:
- (3) initial type-testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial/raw/constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.[9]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchor channels in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

[8] Official Journal of the European Communities L 86 of 07.04.2000

[9] The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

3.2.2 Tasks of the approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor channel. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- trade name of the anchor channels and special screws.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Design of anchorages

The fitness of the anchor channel for the intended use is given under the following condition:

The design of the anchorage is based on the CEN/TS 1992-4:2009 "Design of fastenings for use in concrete", part 1 and 3 under the responsibility of an engineer experienced in anchorages and concrete work.

The verification for shear load with supplementary reinforcement follows CEN/TS 1992-4-3:2009, section 6.3.6 and 6.3.7 or alternatively Annexes 16 and 17.

The reduction of the member cross section caused by the anchor channel is taken into account for the verification of the concrete member if necessary.

The member thickness is not less than h_{min} indicated in Annex 8, Table 7.

The edge distance of the anchors on the profile back of the channel is not less than c_{min} indicated in Annex 8, Table 7.

The spacing of the anchors is between the s_{min} and s_{max} given in Annex 6, Table 4.

The spacing of the special screws is not less than $s_{min,s}$ given in Annex 9, Table 8.

The effective anchorage depth is not less than min h_{ef} according to Annex 8, Table 7.

The characteristic resistances are calculated with the minimum effective anchorage depth.

Taking into account the loads to be anchored verifiable calculation notes and drawings are generated.

The position, the size, the length of the anchor channel, if applicable the spacing of the anchors, and if applicable the position as well as the size of the special screws are indicated on the design drawings. The material of the anchor channel and the special screw is given additionally on the drawings.

4.3 Installation of the anchor channel

The fitness for use of the anchor channel can only be assumed, if the following installation conditions are observed:

- Installation by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- Use of the anchor channel only as supplied by the manufacturer without exchanging the components.
- Installation in accordance with the manufacturer's specifications given in Annexes 18 and 19 and the design drawings.
- The anchor channels are fixed on the formwork such that no movement of the channels will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The concrete under the head of the anchors are properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Size and spacing of special screws corresponding to the design drawings.
- Orientating the special screw (notch according Annex 7) rectangular to the channel axis.
- Observation of the prescribed values (e.g. T_{inst} according Annex 9) of installation.
- The setting torques given in Annex 9 must not be exceeded.

5 Responsibility of the manufacturer

It is in the responsibility of the manufacturer to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to and 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

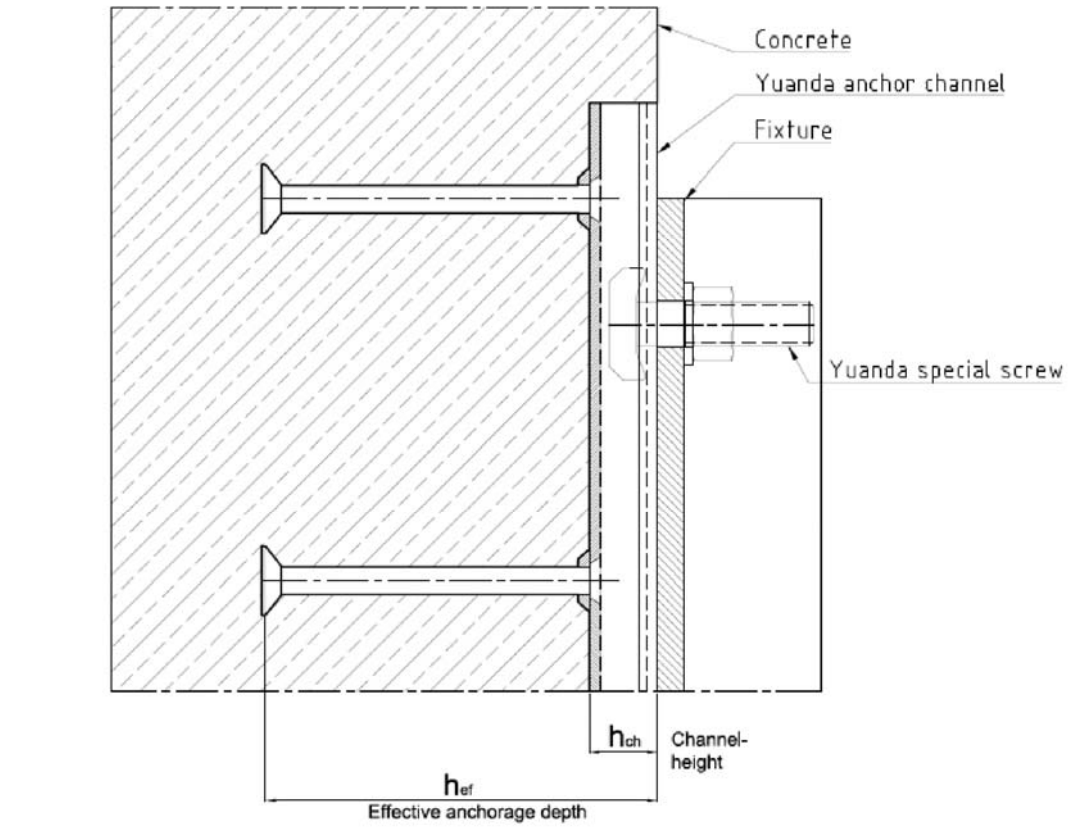
- dimensions of the anchor channel,
- mentioning of the matching screws,
- materials of the anchor channel (channel, anchor, screw , washer, nut)
- details on the installation procedure, preferably by using illustrations,
- maximum setting torque,
- identification of the manufacturing batch.

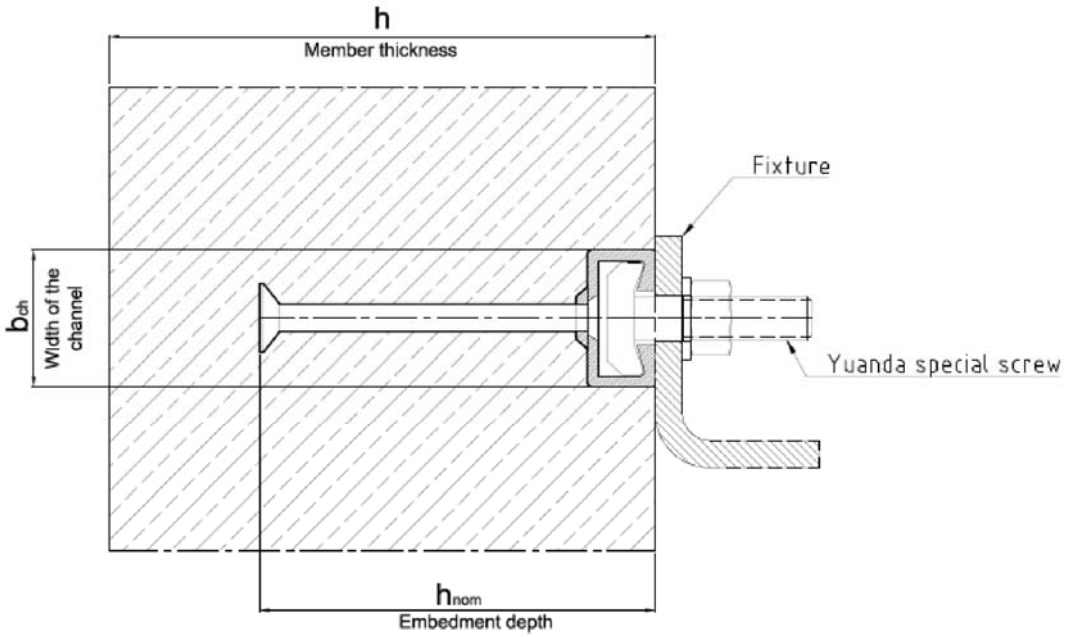
All data shall be presented in a clear and explicit form.

Uwe Bender
Head of Department

beglaubigt:
Müller

Deutsches Institut für Bautechnik DIBt





Yuanda Anchor channel	Annex 1
Product and intended use	

Deutsches Institut für Bautechnik DIBt

Anchor channel hot rolled profile

Fig. 1: Standard version

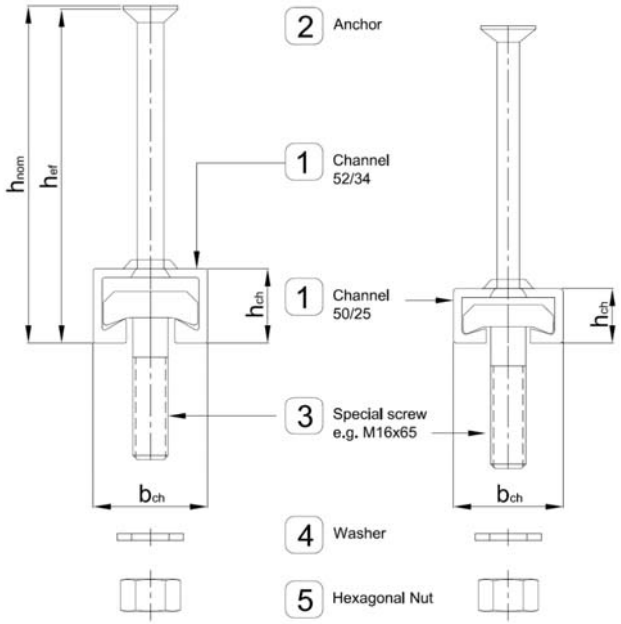
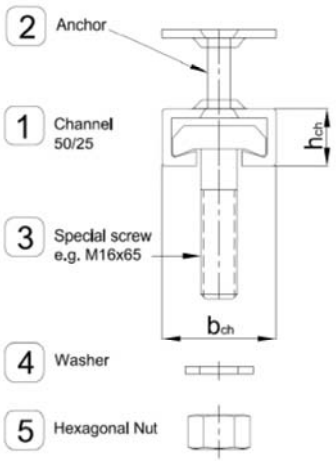


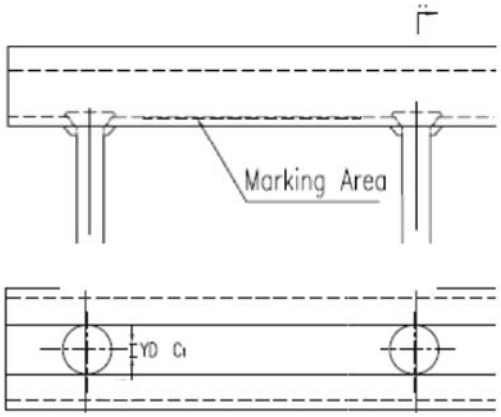
Fig. 2: Ski assembled version



Legend:

h_{ch}:	Channel height
b_{ch}:	Width of the channel
h_{nom}:	Embedment depth
h_{ef}:	Effective anchorage depth

Marking of the YUANDA anchor channel, e.g. YD C1



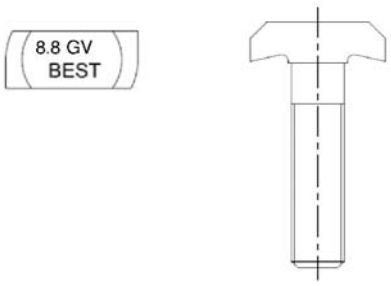
YD:	Identifying mark of the producer
C1:	Size and type of channel

Size and type of channels:

C1:	YDCH-50/25/350-S
C2:	YDCH-52/34/350-S
C3:	YDCH-50/25/350-SK

S = standard version
SK = ski assembled version

Marking of the YUANDA- special screw, e.g. BEST 8.8 GV



8.8	strength grade
BEST	Identifying mark of the producer
GV	type of coating

Type of coating:

GV	electroplated ≥5µm
HV	hot-dip-galvanized ≥ 50µm

Yuanda Anchor channel	Annex 2
Product and marking	

Deutsches Institut für Bautechnik DIBt

Item no.	Specification	Intended use	
		1	2
		Dry internal conditions	Internal conditions with usual humidity
		Anchor channels may only be used in structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity acc. column 2)	Anchor channels may also be used in structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundry in residential buildings, exceptional permanent damp conditions and application under water)
		Materials	
1	Channel profile	Steel Q235[1)] On the basis of EN 10025 hot-dip galv. ≥100µm	Steel Q235[1)] On the basis of EN 10025 hot-dip galv. ≥100µm
2	Anchor	Steel Q235[1)] On the basis of EN 10025 hot-dip galv. ≥100µm	Steel Q235[1)] On the basis of EN 10025 hot-dip galv. ≥100µm
3	Special screws with shaft and thread according to EN ISO 4018	strength grade 8.8 On the basis of EN ISO 898-1 electroplated ≥5µm	strength grade 8.8 On the basis of EN ISO 898-1 hot-dip galv. ≥50µm
4	Washer according DIN 125	Referring to EN 10025 electroplated ≥5µm	Referring to EN 10025 hot-dip galv. ≥50µm
5	Hexagonal nuts according DIN 934	strength grade 8.8 EN ISO 20898-2 electroplated≥ 5µm	strength grade 8.8 EN ISO 20898-2 hot-dip galv. ≥50µm

1) for profile 50/25: f_{yk}=240 N/mm², f_{uk}=360 N/mm²; for profile 52/34: f_{yk}=380 N/mm², f_{uk}=550 N/mm²

Yuanda Anchor channel	Annex 3
Materials and intended use	

Deutsches Institut für Bautechnik DIBt

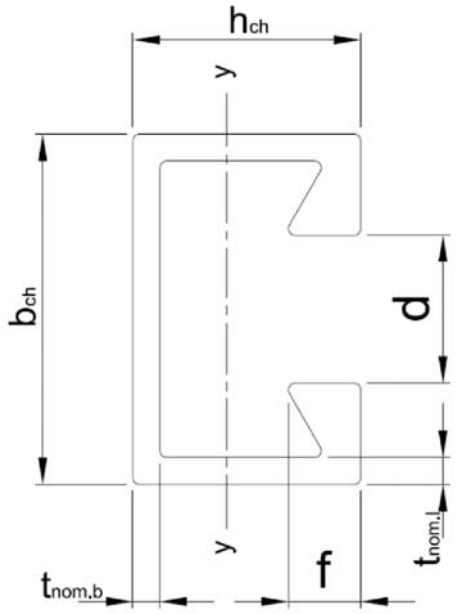


Table 1: Geometrical profile properties

Anchor channel	Dimensions						Material	I_y
	b_{ch}	h_{ch}	$t_{nom,b}$	$t_{nom,l}$	d	f		
	[mm]							[mm^4]
50/25	50	25	4.0	4.0	20.0	6.6	Steel	38772
52/34	52	34	4.0	4.0	22.5	10.8		95264

Yuanda Anchor channel	Annex 4
Geometrical profile properties	

Deutsches Institut für Bautechnik DIBt

Fig. 3: Anchor for Standard version

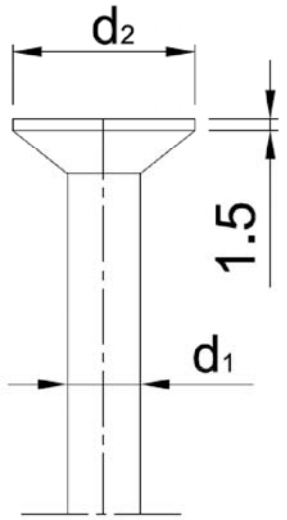


Fig. 4: Anchor for Ski assembled version (cross-section)

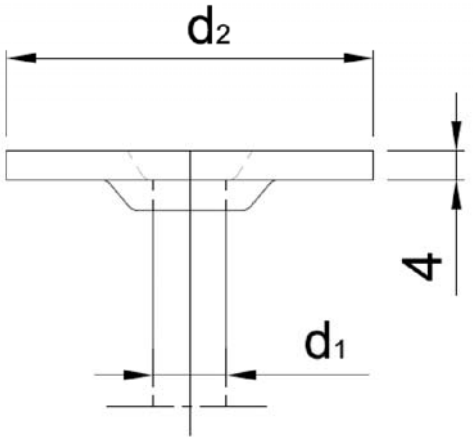


Fig. 5: Anchor for Ski assembled version (top view)

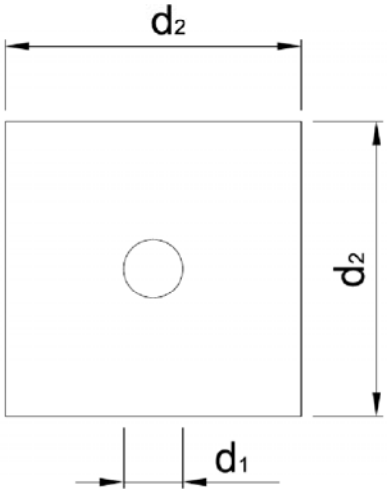


Table 2: Dimensions of the anchor

Anchor channel	Figure	Shaft Ø d_1	Head Ø d_2/ □ d_2
50/25	3	10	25 (Ø)
52/34		12	25 (Ø)
50/25	4	10	50 (□)

Yuanda Anchor channel	Annex 5
Types of anchor	

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Fig. 6: Standard version

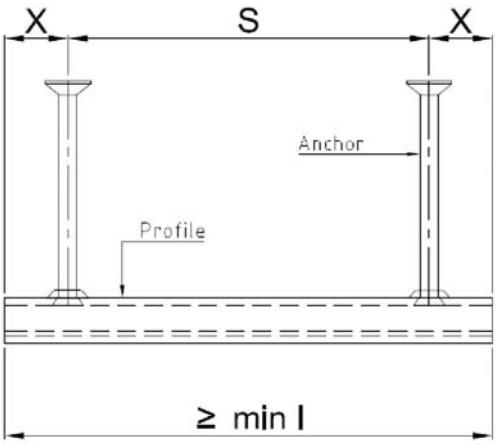


Fig. 7: Ski assembled version

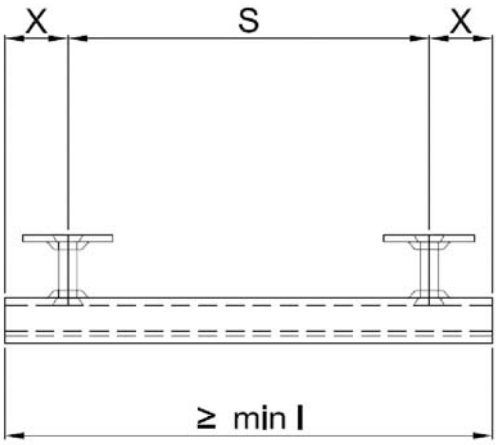


Table 3: Minimum and maximum spacing, end distance and minimum channel length

Anchor channel		Figure	Anchor spacing		End distance	minimum channel length
			s_{min}	s_{max}	x	min l
			[mm]			
50/25	standard version	6	140	140	35	210
52/34			140	140	35	210
50/25	ski-assembled version	7	93	93	35	163

Yuanda Anchor channel	Annex 6
Anchor positioning	

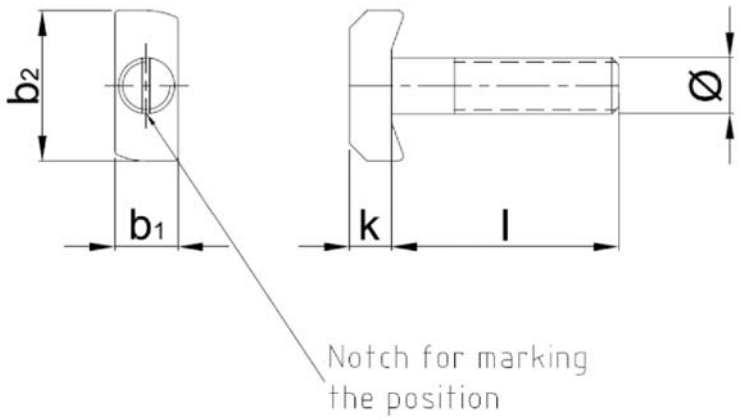


Table 4: Dimensions of the special screw

Anchor channel		Annex 2, Figure	Thread diameter	Width b_1	Length b_2	Thickness of head k	Length of shaft l
			[mm]				
50/25	standard version	1	16	18,0	41,0	14,0	61,0
52/34			16	18,0	43,0	16,0	61,0
50/25	ski-assembled version	2	16	18,0	41,0	14,0	61,0

Table 5: Material properties of special screw

	Steel grade 8.8
f_{uk} [N/mm²]	800
f_{yk} [N/mm²]	640

Marking of the special screw according to Annex 2.

Yuanda Anchor channel	Annex 7
Special screws, Dimensions and material properties	

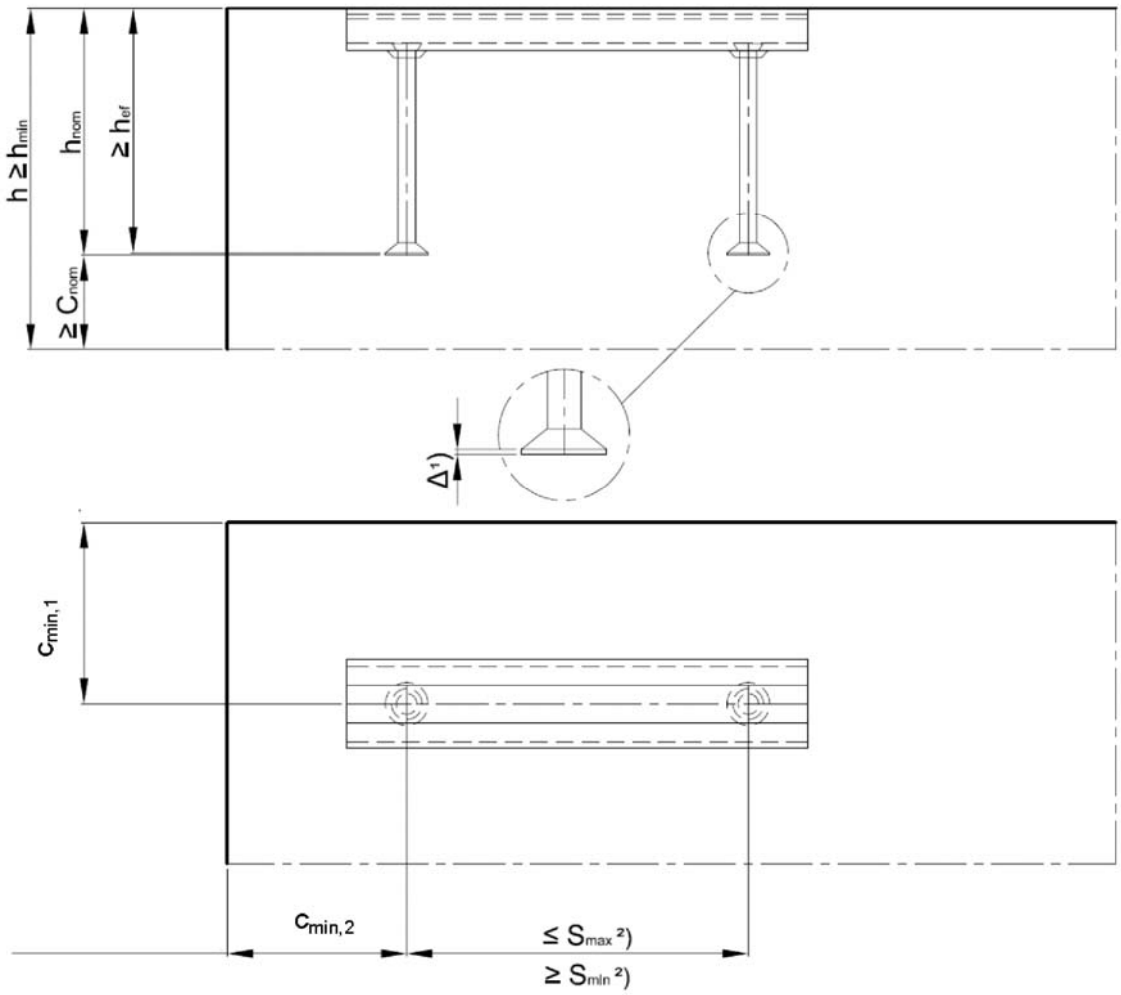


Table 6: Minimum effective anchorage depth, edge distances and member thicknesses

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Annex 2, Fig.			1		2
min. effective anchorage depth	$h_{ef,min}$	[mm]	138	147	56
min. edge distance	$c_{min,1}$		110	110	110
min. edge distance	$c_{min,2}$		60	60	60
min. member thickness	h_{min}		$h_{ef}+\Delta^{1)}+c_{nom}{}^{3)}$		

1) Δ = Thickness of anchor head
2) s_{min}, s_{max} according to Annex 6, Table 3
3) c_{nom} according to EN 1992-1-1 and $c_{nom} \geq 30$ mm

Yuanda Anchor channel

Installation parameters of the anchor channels

Annex 8

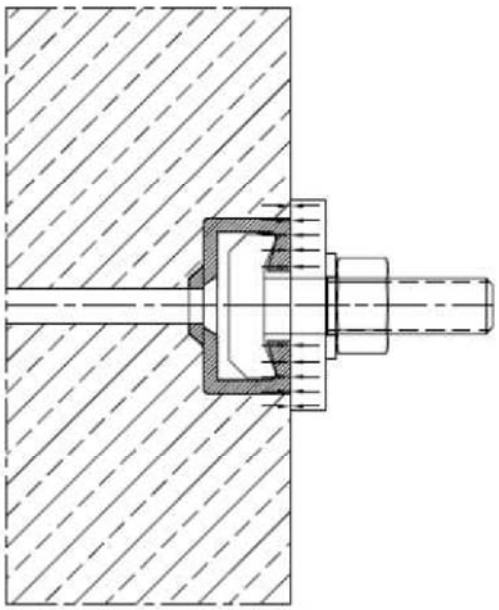
Deutsches Institut für Bautechnik DIBt

Table 7: Minimum spacing and setting torque of the special screws

Anchor channel		Special Screw Ø	Min. spacing $s_{min,s}$ [3] of the special screw	Setting torque T_{inst} [4]	
				General application [1]	Steel-steel contact [2]
		[mm]	[mm]	[Nm]	
50/25	standard version	16	80	60	200
52/34		16	80	60	200
50/25	ski-assembled version	16	80	60	200

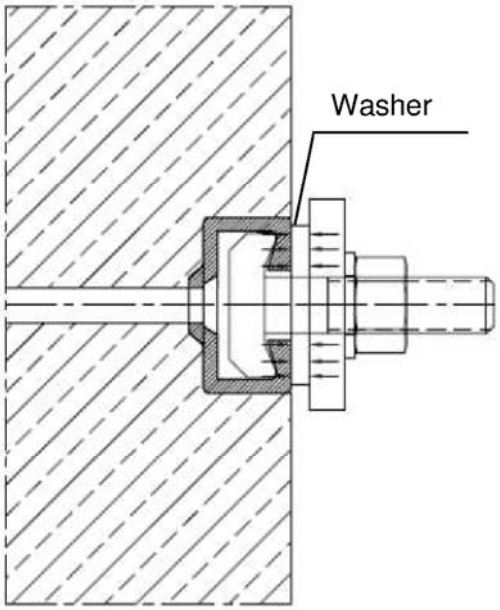
1) according to Fig. 8
2) according to Fig. 9
3) see Annex 10, Fig. 10
4) T_{inst} must not exceeded

Fig. 8: General application



The fixture is braced to the concrete **or** to the anchor channel respectively braced to the concrete **and** to the anchor channel. The setting torque T_{inst} according to Table 7, shall be applied and must not be exceeded.

Fig. 9: Steel-steel contact



The fixture is braced to the anchor channel by a suitable washer. The setting torque T_{inst} according to Table 7, shall be applied and must not be exceeded.

Yuanda Anchor channel	Annex 9
Installation parameters of special screw and Positions of the fixture	

Table 8: Characteristic values for tension loads – steel failure anchor channel

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Steel failure, anchor					
Characteristic resistance	$N_{Rk,s,a}$	[kN]	not relevant		
Partial safety factor	γ_{Ms} [1)]		1,8		
Steel failure, connection anchor/channel					
Characteristic resistance	$N_{Rk,s,c}$	[kN]	24,5	32,5	24,5
Partial safety factor	$\gamma_{Ms,ca}$ [1)]		1,8		
Steel failure, channel lips for $s_s \geq s_{slb}$					
Spacing of the special screw for $N_{Rk,s,l}$	s_{slb}	[mm]	66	84	66
Characteristic resistance	$N_{Rk,s,l}$	[kN]	39,0	60,0	39,0
Partial safety factor	$\gamma_{Ms,l}$ [1)]		1,8		
Steel failure, channel lips for $s_{slb} \geq s_s \geq s_{min,s}$ [2)]					
Characteristic resistance	$N_{Rk,s,l}$	[kN]	$0,5(1+s_s/s_{slb})N_{Rk,s,l} \leq N_{Rk,s,c}$		
Partial safety factor	$\gamma_{Ms,l}$ [1)]		1,8		

1) in absence of other national regulations
2) see Annex 9, Table 7

Fig. 10: Min. spacing $s_{min,s}$ of specials screws

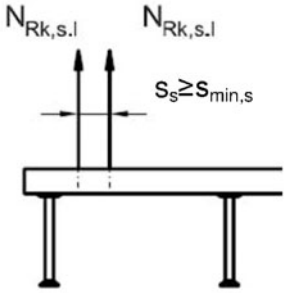


Fig. 11: Static system

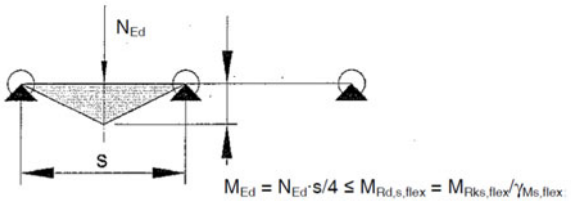


Table 9: Characteristic bending moment of channels

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Characteristic bending moments of the channel	$M_{Rk,s,flex}$	[Nm]	947	2774	947
Partial safety factor	$\gamma_{Ms,flex}$ [1)]		1,15		

1) in absence of other national regulations

Yuanda Anchor channel	Annex 10
Characteristic values for tension loads – steel failure anchor channel	

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Table 10: Characteristic values for tension loads – steel failure of special screw

Special screw, 8.8			M16
Steel failure			
Characteristic resistance	$N_{Rk,s,s}$	[kN]	125,6
Partial safety factor	$\gamma_{Ms,s}$ [1)]	1,50	

1) in absence of other national regulations

Table 11: Characteristic values for tension loads – concrete failure

Anchor channel				50/25 standard version	52/34 standard version	50/25 ski-assembled version
Pullout						
Characteristic resistance in cracked concrete C12/15		$N_{Rk,p}$	[kN]	37,1	34,0	169,3
Increasing factor of $N_{Rk,p}$	C20/25	ψ_c	[-]	1,67		
	C25/30			2,00		
	C30/37			2,47		
	C35/45			3,00		
	C40/50			3,33		
	C45/55			3,67		
	≥ C50/60			4,00		
		$\psi_{ucr,N}$	[-]	1,4		
Partial safety factor		$\gamma_{Mp}=\gamma_{Mc}$ [1)]	[-]	1,5		
Concrete cone failure $N^0_{Rk,c}$ according to CEN/TS 1992-4-3, Section 6.2.5						
		α_{ch}	[-]	0,96	0,97	0,84
effective anchorage depth		h_{ef}	[mm]	138	147	56
characteristic edge distance		$c_{cr,N}$	[mm]	248	255	134
characteristic anchor spacing		$s_{cr,N}$	[mm]	496	510	268
		$\psi_{ucr,N}$		1,4		
Partial safety factor		γ_{Mc} [1)]		1,5		
Splitting						
				Verification of splitting failure is not relevant		

1) in absence of other national regulations

Table 12: Displacements under tension loads

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Tension load	N_{Ek}	[kN]	9,7	12,9	9,7
Short term displacement	δ_{N0}	[mm]	0,4	0,5	0,4
Long term displacement	$\delta_{N\infty}$	[mm]	1,2	1,2	1,2

Yuanda Anchor channel	Annex 11
Characteristic values for tension loads– steel failure of special screws, concrete failure and displacements	

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Table 13: Characteristic values for shear loads

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Steel failure, bending of channel lips					
Characteristic resistance		$V_{Rk,s,l}$ [kN]	32,0	42,0	32,0
Partial safety factor		$\gamma_{Ms,l}$ [1)]	1,8		
Concrete pry-out					
Factor k in Equation (31) in CEN/TS 1992-4-3		k_5 [3)]	2,0	2,0	1,5
Partial safety factor		γ_{Mc} [1)]	1,5		
Concrete edge failure					
Factor $\psi_{re,V}$	cracked concrete without edge reinforcement or stirrups	$\psi_{re,V}$	3,0	3,5	3,0
	cracked concrete with straight edge reinforcement ($d_s \geq$ Ø12mm)	$\psi_{re,V}$	3,6	4,2	3,6
	non-cracked concrete[2)] or cracked concrete with edge reinforcement and stirrups with a spacing $a \leq 100$mm and $a \leq 2c_1$	$\psi_{re,V}$	4,2	4,9	4,2
Influence of member thickness		$\alpha_{h,V}$	$(h/h_{cr,V})^{0,5}$		
Characteristic member height		$h_{cr,V}$	$2c_1+2h_{ch}$		
Characteristic anchor spacing		$s_{cr,V}$	$4c_1+2b_{ch}$		
Partial safety factor		γ_{Mc} [1)]	1,5		

1) in absence of other national regulations
2) Verification according to CEN/TS 1992-4-1:2009, Section 5
3) Without supplementary reinforcement. In case of supplementary reinforcement, the factor k_5 shall be multiplied with 0,75

Yuanda Anchor channel	Annex 12
Characteristic values for shear loads	

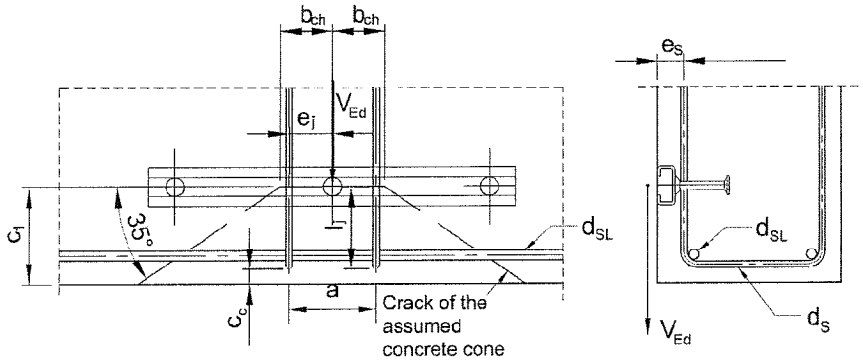
Table 14: Characteristic values for shear loads – Steel failure of special screw

Special Screw, 8.8			M16
Steel failure			
Characteristic resistance	$V_{Rk,s,s}$	[kN]	62,8
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	256,6
Partial safety factor	$\gamma_{Ms,s}$ [1)]		1,25

1) in absence of other national regulations

Table 15: Displacements under shear loads

Anchor channel			50/25 standard version	52/34 standard version	50/25 ski-assembled version
Shear load	V_{Ek}	[kN]	12,7	16,7	12,7
Short term displacement	δ_{V0}	[mm]	1,8	1,8	1,8
Long term displacement	$\delta_{V\infty}$	[mm]	2,7	2,7	2,7



$$V_{Ed} \le V_{Rd,re} = V_{Rk,re} / \gamma_{Mc} \qquad V_{Ed} = \max[V_{Ed}; V_{Ed}^{a}] \tag{1}$$

$$V_{Rk,re} = V_{Rk,c,re} / x \tag{2}$$

$$V_{Rk,c,re} = V_{Rk,c,hook} + V_{Rk,c,bond} \le V_{Rk,c,re,max} \le \sum_{m+n} A_s \cdot f_{yk} \tag{3}$$

$$V_{Rk,c,hook} = \sum_{j=1}^{m}\left(\psi_1 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{yk} \cdot \left(\frac{f_{ck}}{30}\right)^{0,1}\right) + \sum_{j=1}^{n}\left(\psi_2 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{yk} \cdot \left(\frac{f_{ck}}{30}\right)^{0,1}\right) \tag{4}$$

$$V_{Rk,c,bond} = \sum_{j=1}^{m+n}\left(\pi \cdot d_s \cdot l_j \cdot f_{bk}\right) \tag{5}$$

$$V_{Rk,c,re,max} = 4{,}2 \cdot c_1^{-0,12} \cdot V_{Rk,c} \tag{6}$$

$$V_{Rk,c} = V_{Rk,c}^{0} \cdot \alpha_{s,V} \cdot \alpha_{c,V} \cdot \alpha_{h,V} \tag{7}$$

$$50\,\text{mm} \le a \le \begin{pmatrix} s \\ 150\,\text{mm} \\ (c_1 - c_c + 0{,}7 \cdot b_{ch} - 4 \cdot d_s)/0{,}35 \\ c_1 - c_c \end{pmatrix} \tag{7}$$

$$6\,\text{mm} \le d_s \le 20\,\text{mm} \tag{8}$$

Yuanda Anchor channel	Annex 14
Verification for shear loads with anchor reinforcement	

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Ψ_1 = effectiveness factor
= 0.67 ·for stirrups directly besides a shear load ①
·for a stirrup at the location of a shear load ③
·for a stirrup between 2 shear loads acting on an anchor channel (distance between the loads $p \leq s_{cr,V}$ according to Table 13 ②

Ψ_2 = effectiveness factor
= 0.11 for other stirrups in the concrete cone ④

Ψ_3 = $(d_{s,L}/d_s)^{2/3}$
d_s = diameter of stirrup [mm]
$d_{s,L}$ = diameter of edge bars [mm]
Ψ_4 = $(l_j/c_1)^{0,4} \cdot (10/d_s)^{0,25}$
l_j = anchorage length of a stirrup leg in the concrete cone [mm]
= c_1-c_c-0,7·(e_j-b_{ch}) [mm] for stirrups crossed diagonally by the assumed crack
= c_1-c_c [mm] for stirrups directly under the load or for stirrups crossed orthogonally by the assumed crack
≥ 4·d_s
c_1 = edge distance [mm]
c_c = concrete cover [mm]
e_j = distance of the stirrup leg to the point of load action
b_{ch} = width of the anchor channel [mm] (according to Table 1)
A_s = cross section of one leg of the stirrup [mm²]
f_{yk} = characteristic yield strength of the reinforcement [N/mm²]
f_{ck} = characteristic concrete strength measured on cubes with a side length of 150 mm [N/mm²]
f_{bk} = characteristic bond strength [N/mm²]
m = number of stirrups in the assumed concrete cone with Ψ_1
n = number of stirrups in the assumed concrete cone with Ψ_2
a = spacing of stirrups
x = $e_s/z+1$
e_s = distance between reinforcement and shear force acting on the anchor channel according to CEN/TS 1992-4-3, Section 5.3.4
z = internal lever arm
≈ 0,85·d [mm];
d = $\min(2 \cdot h_{ef}; 2 \cdot c_1)$
$V^0_{Rk,c}$ = according to CEN/TS 1992-4-3:2009, Section 6.3.5.3
V^a_{Ed} = according to CEN/TS 1992-4-1:2009, Section 3.2.2

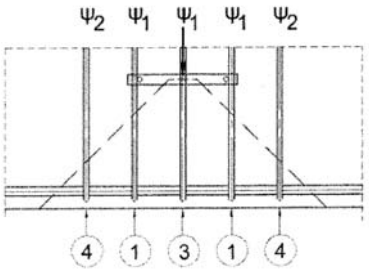

Fig. 11: Effectiveness factor for one load

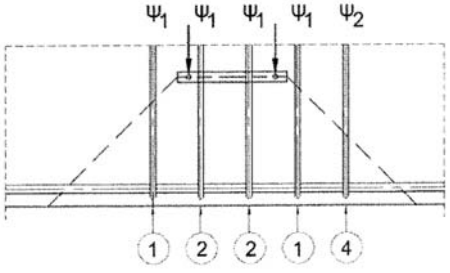

Fig. 12: Effectiveness factor for two loads

Yuanda Anchor channel	Annex 15
Verification for shear loads with anchor reinforcement	

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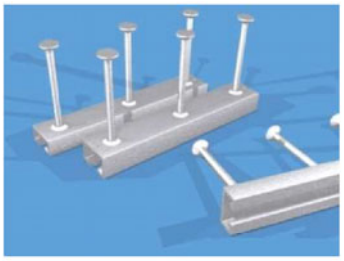
1)



Selection of anchor channel according to planning documents.

2a)

Fixing of the anchor channel to timber formwork with nails through the prefabricated holes in the back of the anchor channel

or

2b)

Fixing of the anchor channel from above directly to the reinforcement, attach the channel by wire binding

3)

During casting the concrete has to be compacted properly around the channel and the anchors

4)

Removing the foam filler with a hammer or a hook

Yuanda Anchor channel	Annex 16
Manufacturers' specification Anchor channel	

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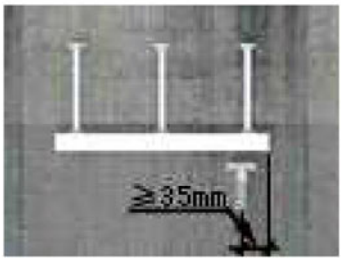
5)

Selection of the special screw

6)

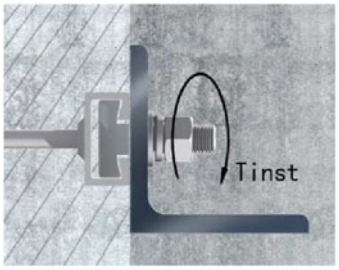
Insert the special screw into the slot of the channel. After a 90° turn clockwise, the head of special screw locks into the channel.

7)



Positioning of the special screw: at the channel ends a minimum clearance must be maintained (≥ 35mm)

8)

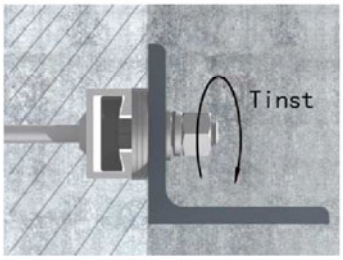


Tighten the hexagonal nut to the setting torque T_{inst}.

1. General application according Annex 9, Fig. 8: T_{inst} = 60Nm
2. Steel to steel contact according Annex 9, Fig. 9: T_{inst} = 200Nm

The setting torque must not be exceeded.

9)



If the anchor channel is embedded below the concrete surface, use washers. (T_{inst} = 200Nm)

The setting torque must not be exceeded.

Yuanda Anchor channel	Annex 17
Manufacturers' specification Special screw	