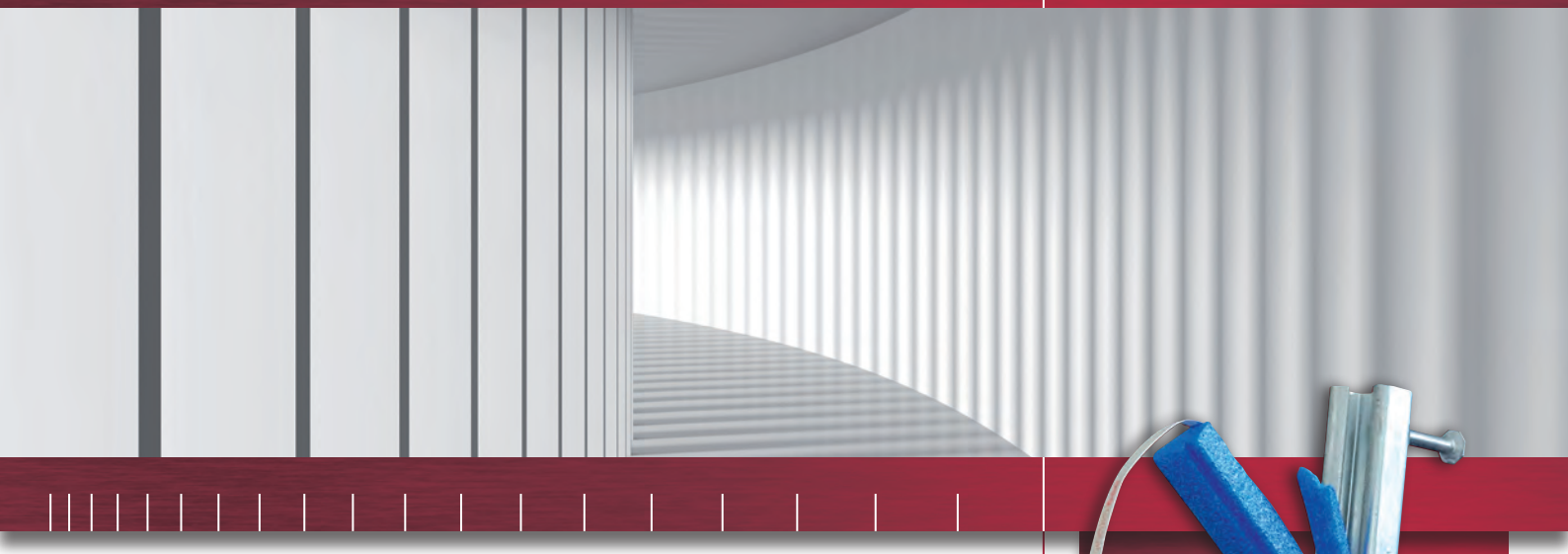
ANCHORING TECHNOLOGY



PEC-TA Cast-in channels

European Technical Approval
ETA-13/0245

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Deutsches Institut für Bautechnik
Zulassungsstelle für Bauprodukte und Bauarten
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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-13/0245

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		Ankerschiene PEC-TA *Anchor channel PEC-TA*
Zulassungsinhaber *Holder of approval*		PEC Vertriebs GmbH Gatzenstraße 107 47802 Krefeld DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Ankerschienen *Anchor channels*
Geltungsdauer: *Validity:*	vom *from* bis *to*	15 May 2013 15 May 2018
Herstellwerk *Manufacturing plant*		PEC Werk 1

Diese Zulassung umfasst *This Approval contains*	27 Seiten einschließlich 19 Anhänge *27 pages including 19 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 Anchor channel PEC-TA 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. PEC special screws (hammerhead or 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 if applicable additionally with the type of stainless steel, e.g. PEC-TA 40/25 A4 according to Annex 2.

Each special screw is marked with the identifying mark of the producer, if applicable with the strength grade and if applicable with the type of stainless steel 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 type, 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

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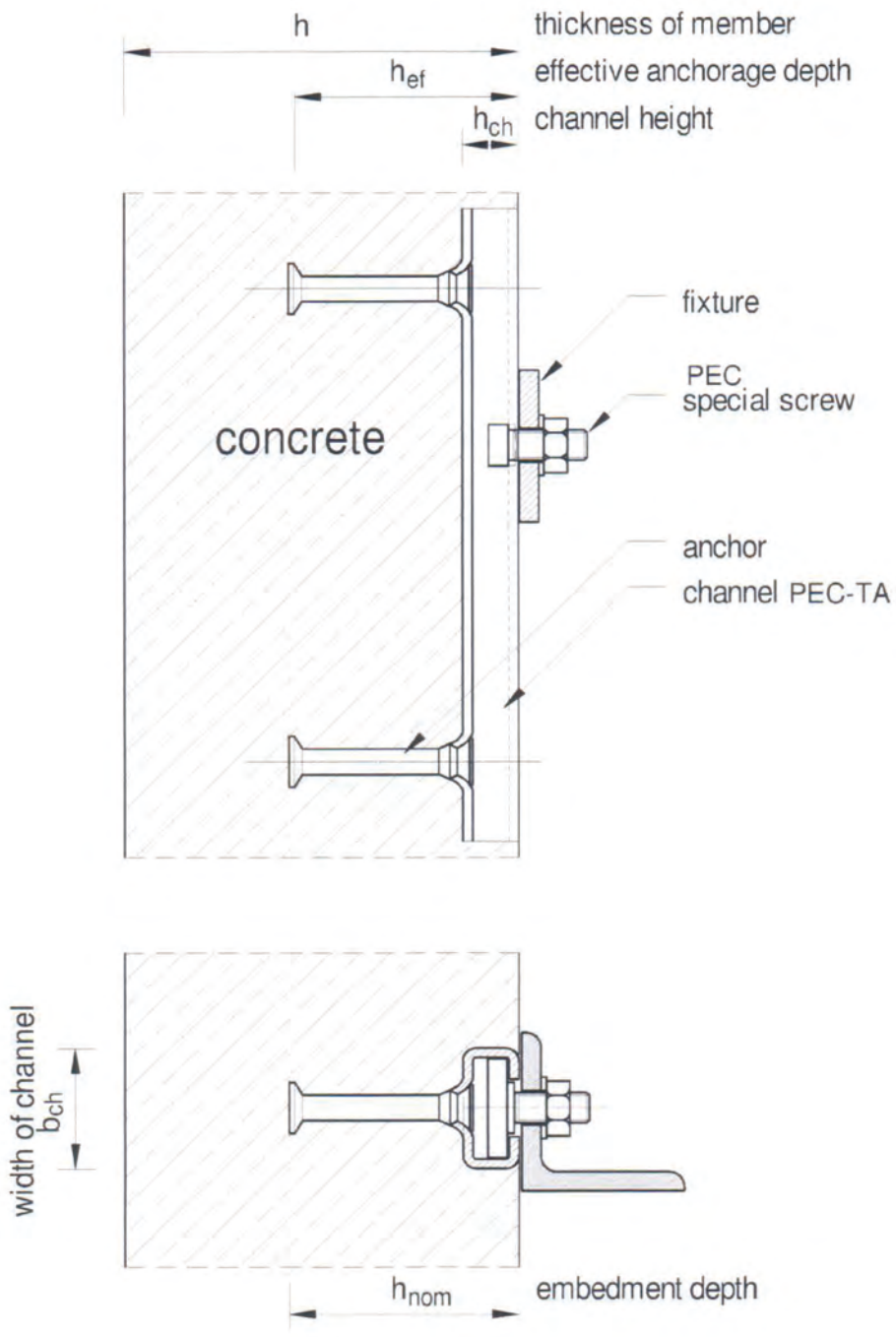


Anchor channel PEC-TA	Annex 1
Product and intended use	

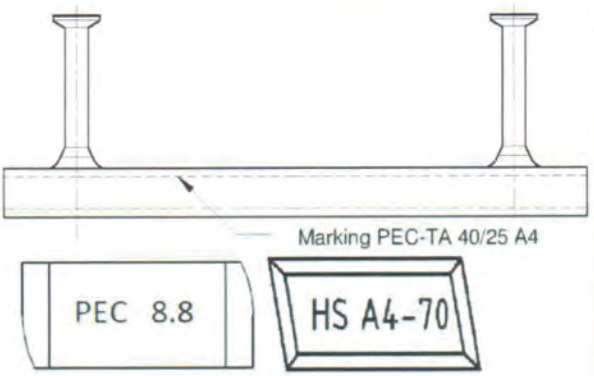
Deutsches Institut für Bautechnik DIBt

Marking of the PEC-TA anchor channel:
e.g. PEC-TA 40/25 A4

PEC-TA	= Identifying mark of the manufacturer
40/25	= Size
A4	= Material

Material channels
No marking for : 1.0038 / 1.0044 /1.0976 / 1.0979

A4= 1.4401 / 1.4404 / 1.4571 / 1.4362

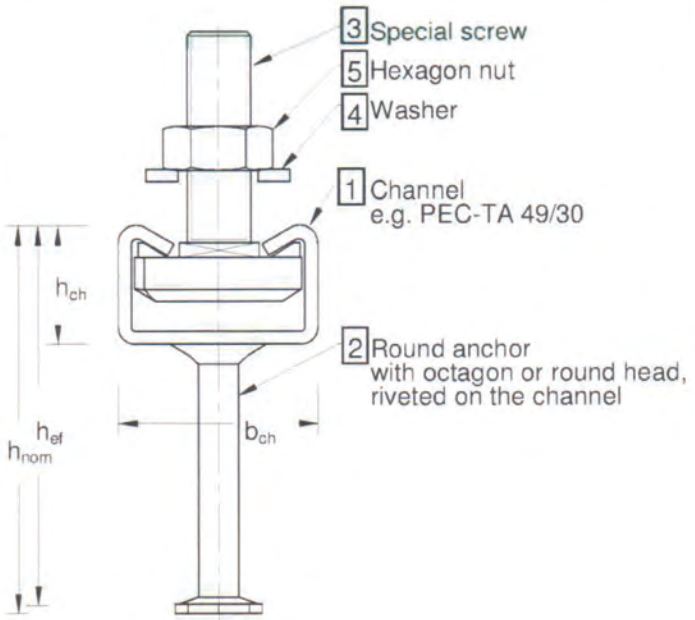


Marking of the special screw:

e.g. PEC A4-70
PEC or HS = Identifying mark of manufacturer
A4-70 = Material / strength grade

Material / strength grade special screws:

4.6	= Steel grade 4.6
8.8	= Steel grade 8.8
A4	= Stainless steel grade 50 1.4401 / 1.4404 / 1.4571
A4-70	= Stainless steel grad 70 1.4401 / 1.4404 / 1.4571



Legend

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

Anchor channel PEC-TA	Annex 2
Product and marking	

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Table 1: Material and intended use

Component	1 Dry internal conditions	2 Internal conditions with usage humidity	3 Medium corrosion exposure
	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 applications under water)	Anchor channels may also be used in structures subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanent damp internal conditions, if no particular aggressive conditions (e.g. permanent alternating immersion in seawater etc.) exist.
1 Channel profile	1.0038, 1.0044	Steel acc. to EN 10025, hot-dip galvanized [1])	1.4362 Stainless steel 1.4401 acc. to EN 10088 1.4404 1.4571
	1.0976, 1.0979	Steel acc. to EN 10149, hot-dip galvanized [1])	
2 Anchor	1.0038, 1.0213, 1.0214	Steel acc. to EN 10025, hot-dip galvanized [1])	
	1.5523, 1.5535	Steel acc. to EN 10263:2002-02, hot-dip galvanized [1])	
3 Special screws	Steel, strength class 4.6 or 8.8 acc. to EN ISO 898-1, electroplated [2])	Steel, strength class 4.6 or 8.8 acc. to EN ISO 898-1, hot-dip galvanized [1])	Strength class 50 or 70 Stainless steel acc. to EN ISO 3506-1
4 Washers	Steel acc. to EN 10025-2, electroplated [2])	Steel acc. to EN 10025-2 hot-dip galvanized [1])	1.4401 Stainless steel 1.4404 acc. to EN 10088 1.4571 1.4578
5 Nuts	Steel, strength class 5 and 8 acc. to EN ISO 20898-2, electroplated [2])	Steel, strength class 5 and 8 acc. to EN ISO 20898-2, hot-dip galvanized [1])	Strength class 50 or 70 Stainless steel acc. to EN ISO 3506-2

[1]) Hot-dip galvanized according to EN ISO 10684 ≥ 50µm
[2]) Electroplated according to EN ISO 4042

Anchor channel PEC-TA	Annex 3
Material and intended use	

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Table 2: Dimensions of channel profiles

Anchor channel	Figure	Dimensions						
		b_{ch} [mm]	h_{ch} [mm]	$t_{nom,b}$ [mm]	$t_{nom,l}$ [mm]	d [mm]	f [mm]	I_y [mm^4]
28/15	1	28	15	2,30	2,30	12	2,30	3 928
38/17	1	38	17	3	3	18	3	7 914
40/25	2	40	25	2,75	2,75	18	5,6	20 561
49/30	2	50	30	3,25	3,25	22	7,4	43 832
54/33	2	53,5	33	5	5	21,5	8,05	74 753

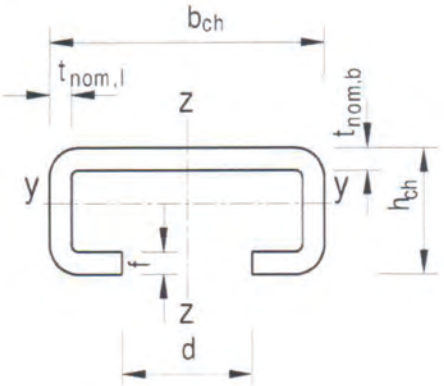

Fig. 1

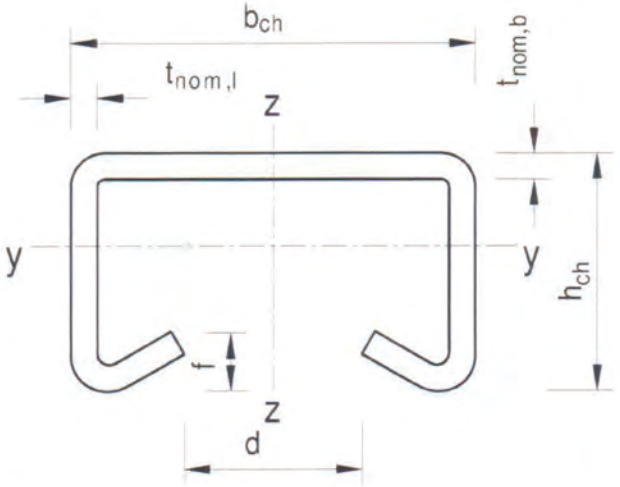

Fig. 2

Anchor channel PEC-TA	Annex 4
Geometrical channel profile properties	

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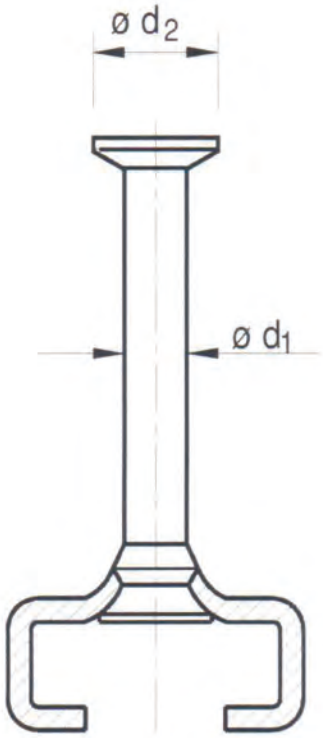
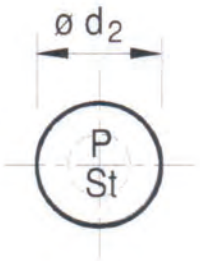
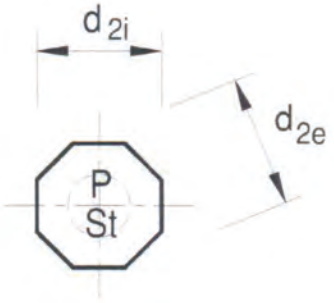
Table 3: Dimensions of anchors

Channel	Anchor	Shaft Ø d_1 [mm]	Round head Ø d_2 [mm]	Octagonal head d_{2i} [mm]	Octagonal head d_{2e} [mm]
28/15	6	6	12	13,1	14,2
38/17	8	8	16	17,5	18,9
40/25	8	8	16	17,5	18,9
49/30	10	10	20	21,8	23,6
54/33	11	11	24,3	27	29,2







Anchor channel PEC-TA	Annex 5
Types of anchors	

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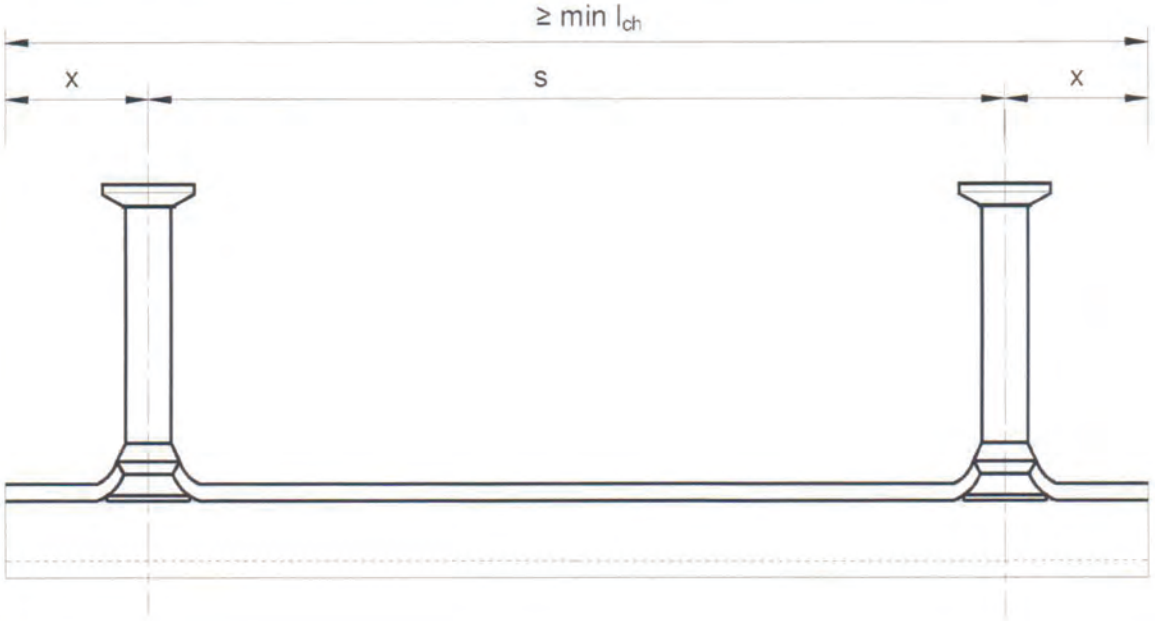
Table 4: Anchor spacing and position

Anchor channel	Anchor spacing s_{min} [mm]	Anchor spacing s_{max} [mm]	End spacing x [mm]	min. channel length min l_{ch} [mm]
28/15	50	200	25 [1])	100
38/17	100	200	25 [1])	150
40/25	100	250	25 [1])	150
49/30	100	250	25 [1])	150
54/33	100	250	35	170

[1]) The end spacing may be increased from 25mm to 35 mm.



Anchor channel PEC-TA	Annex 6
Anchor positioning	

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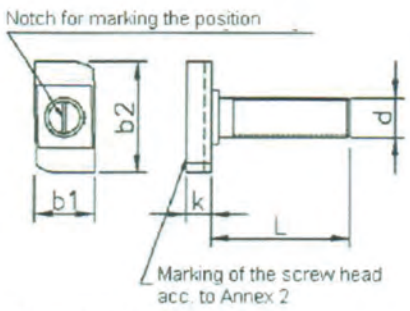
Table 5: Dimensions of the special screws

Special screw head shape	Thread d_{thread} [mm]	head width b_1 [mm]	head length b_2 [mm]	head thickness k [mm]	for profile size
28/15 hammer	M8	10,1	23	4	28/15
28/15 hammer	M10	10,1	23	5	
38/17 hammer	M10	13	31	6	38/17
38/17 hammer	M12	13	31	7	
38/17 hammer	M16	16	31	7	
40/22 hook	M10	14	35	7,5	40/25
	M12	14	35	7,5	
	M16	17	34	8,5	
50/30 hook	M12	13,0	43,3	10	49/30
	M16	17,0	42,7	11	54/33
	M20	21	42,2	12	

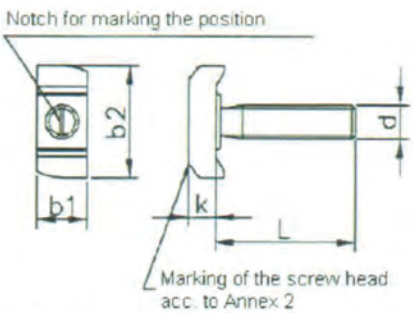
Table 6: Strength grade

Special screws	Steel [1])		Stainless steel [1])	
Strength grade	4.6	8.8	A4-50	A4-70
f_{uk} [N/mm²]	400	800	500	700
f_{yk} [N/mm²]	240	640	210	450
Finish	hot dip galv. or electroplated			

[1]) Materials acc. to Annex 3



Hammer head



Hook head

Anchor channel PEC-TA	Annex 7
Dimensions and strength grade of special screws	

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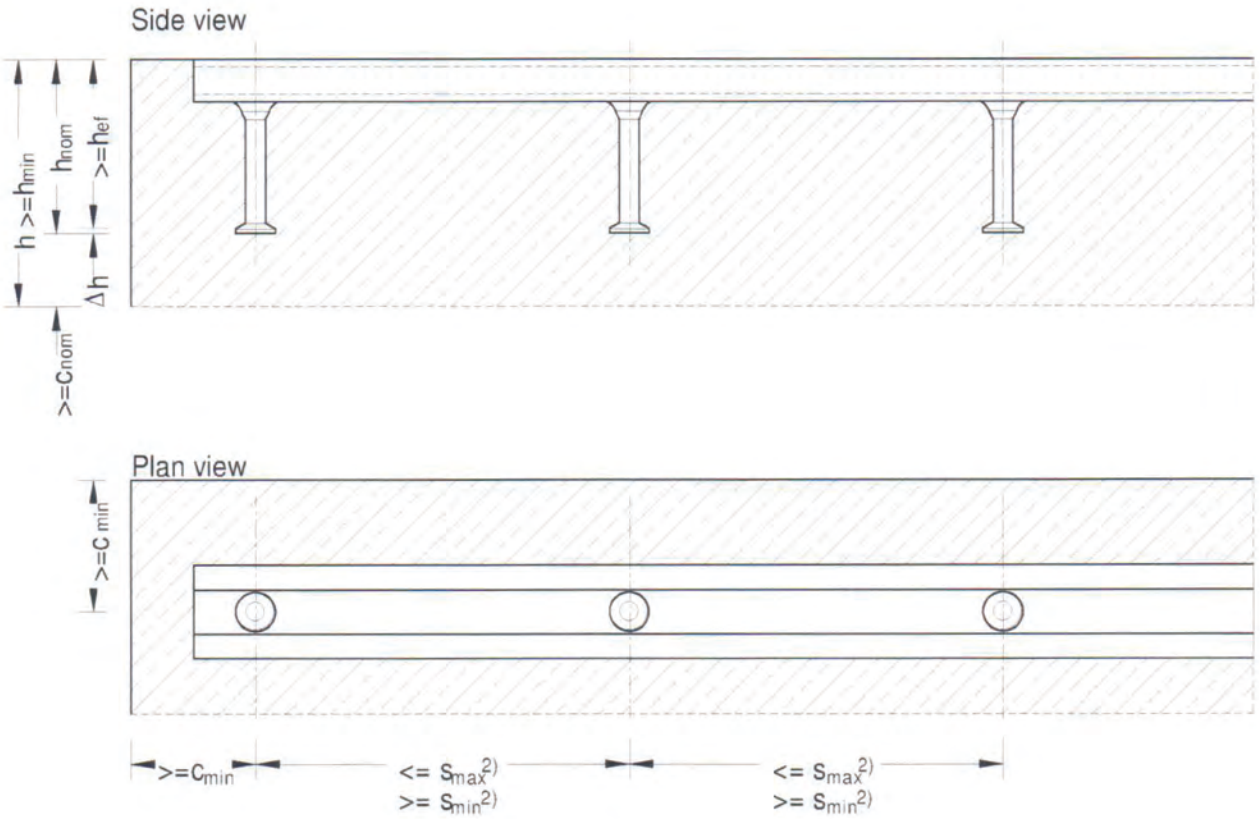
Table 7: Installation parameters for anchor channels

Anchor channel [2)]	min. anchorage depth $h_{ef,min}$ [mm]	min. edge distance c_{min} [mm]	min. member thickness h_{min} [mm]
28/15	45	40	$h_{ef} + \Delta h$ [3)] $+ c_{nom}$ [1)]
38/17	76	50	
40/25	79	50	
49/30	94	75	
54/33	155	100	

[1]) $c_{nom} \geq 20$ mm and acc. to EN 1992-1-1
[2]) s_{min}, s_{max} acc. to Annex 6
[3]) Δh= anchor head thickness



Anchor channel PEC-TA	Annex 8
Installation parameters for anchor channels	

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Table 8: Installation parameters of special screws

Anchor channel	Screw head size	Special screw Ø	Min. spacing $s_{min,s}$ [5]) of the special screw	Setting torque T_{inst} [4])				
				General [2])	Steel - steel contact [3])			
				4.6; 8.8; A4-50; A4-70 [1])	4.6 [1])	8.8 [1])	A4-50 [1])	A4-70 [1])
		[mm]		[Nm]	[Nm]	[Nm]	[Nm]	[Nm]
28/15	28/15	8	40	8			8	
		10	50	13				40
38/17	38/17	10	50	15	15			40
		12	60	25		70		70
		16	80	40		180		180
40/25	40/22	10	50	15	15			40
		12	60	25		70		70
		16	80	30		120		70
49/30	50/30	12	60	25		70		70
		16	80	60		120		180
		20	100	75		360		360
54/33	50/30	12	60	25		70		70
		16	80	60		120		180
		20	100	75		360		360

[1]) Materials according to Annex 3, Tab. 1

[2]) Acc. to Annex 10, Figure 1

[3]) Acc. to Annex 10, Figure 2

[4]) T_{inst} must not be exceeded

[5]) See Annex 11, Fig. 1

Anchor channel PEC-TA	Annex 9
Installation parameters of special screws	

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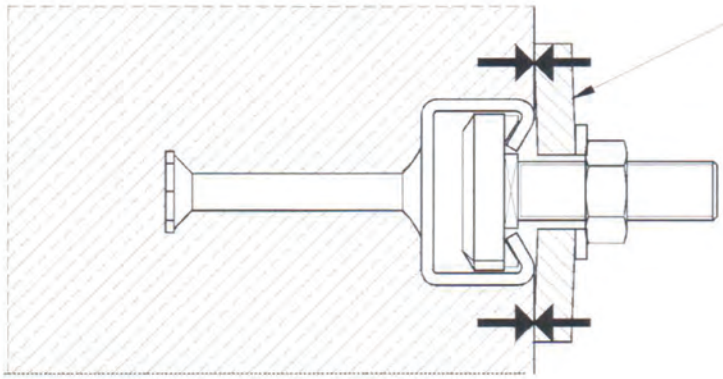

Fig. 1: General
The fixture is braced to the concrete or to the anchor channel respectively braced to concrete and anchor channel. The setting torques acc. to Annex 9, shall be applied and must not be exceeded.

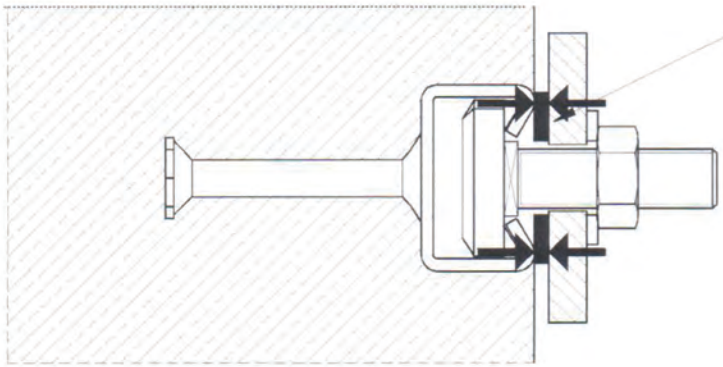

Fig. 2: Steel-steel contact
The fixture is braced to the anchor channel by suitable washer.
The setting torques acc. to Annex 9, shall be applied and must not be exceeded.

Anchor channel PEC-TA	Annex 10
Positions of fixture	

Table 9: Characteristic values for tension loads - steel failure of channel

Anchor channel		**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Steel failure of anchor:						
Characteristic resistance	$N_{Rk,s,a}$ [kN]	not relevant				
Partial safety factor	γ_{Ms} [-] [1])	1,8				
Steel failure, connection channel-anchor						
Characteristic resistance	$N_{Rk,s,c}$ [kN]	9	18	20	31	55
Partial safety factor	$\gamma_{Ms,ca}$ [-] [1])	1,8				
Steel failure, local flexure of channel lips for $s_s \geq s_{slb}$						
Spacing of the special screws for $N_{Rk,s,l}$.	s_{slb} [mm]	41	48	64	74	80
Characteristic resistance	$N_{Rk,s,l}$ [kN]	9	18	20	31	55
Partial safety factor	$\gamma_{Ms,l}$ [-] [1])	1,8				
Steel failure, local flexure of 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]) $s_{min,s}$ acc. to Annex 09

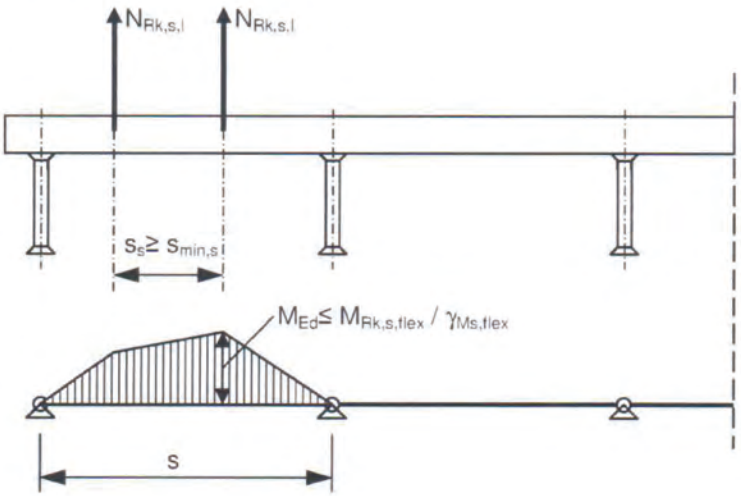

Table 10: Flexure resistance of channel

Anchor channel		**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Characteristic flexure resistance $M_{Rk,s,flex}$ [Nm]	steel	320	588	1103	1703	3003
	stainless steel	333	600	1083	1739	3000
Partial safety factor	γ_{Ms} [-] [1])	1,15				

[1]) In absence of other national regulations

Anchor channel PEC-TA	Annex 11
Characteristic values for tension load, Steel failure of channel	

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Table 11: Characteristic values for tension load, steel failure of special screws

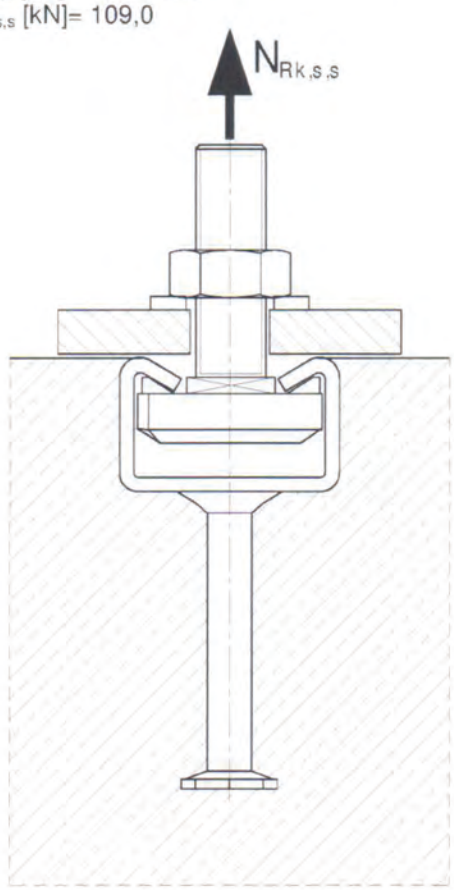
Special screws			M8	M10	M12	M16	M20
Characteristic resistance	$N_{Rk,s,s}$ [kN]	4.6		23,2			
		8.8			35,4	55,8	183,1
		A4-50 [2])	17,2				
		A4-70 [2])		20,5	47,2 [3])	53,0 [4])	129
Partial safety factor	γ_{Ms} [-] [1])	4.6		2,00			
		8.8		1,50			
		A4-50 [2])		2,86			
		A4-70 [2])		1,87			

[1]) In absence of other national regulations

[2]) Materials acc. to Annex 3

[3]) for HS 40/22 M12 A4-70 and HS 50/30 M12 A4-70: $N_{Rk,s,s}$ [kN]= 58,6

[4]) for HS 40/22 M16 A4-70: $N_{Rk,s,s}$ [kN]= 91,0 and
HS 50/30 M16 A4-70: $N_{Rk,s,s}$ [kN]= 109,0



Channel under tension load

Anchor channel PEC-TA

Characteristic values for tension load, Steel failure of special screws

Annex 12

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Table 12: Characteristic values for tension loads - concrete failure

Anchor channel			**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Pullout failure of anchor:							
Characteristic resistance in cracked concrete C12/15	octagonal and round head of anchor	$N_{Rk,p}$ [kN]	7,6	13,6	13,6	21,2	33,2
Increasing factors of $N_{Rk,p}$	C16/20	ψ_c [-]	1,33				
	C20/25		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				
Increasing factor		$\psi_{ucr,N}$ [-]	1,40				
Partial safety factor		$\gamma_{Mp}=\gamma_{Mc}$ [-] [1])	1,50				
Concrete cone failure $N^0_{Rk,c}$ see CEN/TS 1992-4-3: 2009, chapter 6.2.5.							
Profile factor		α_{ch} [-]	0,81	0,88	0,88	0,91	0,98
Effective anchorage depth		h_{ef} [mm]	45	76	79	94	155
Characteristic edge distance		$c_{cr,N}$ [mm]	111	171	176	199	260
Characteristic spacing		$s_{cr,N}$ [mm]	222	342	352	398	520
Increasing factor		$\psi_{ucr,N}$ [-]	1,40				
Partial safety factor		γ_{Mc} [-] [1])	1,50				
Splitting			Verification of splitting is not relevant				

[1]) In absence of other national regulations

Table 13: Displacements under tension loads

Anchor channel		**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Tension load	N_{Ek} [kN]	3,6	7,1	7,9	12,3	21,8
Short time displacement	δ_{N0} [mm]	1,0	1,0	2,0	2,5	2,5
Long time displacement	$\delta_{N\infty}$ [mm]	1,2	1,2	2,2	2,7	2,7

Anchor channel PEC-TA	Annex 13
Characteristic values for tension load, Concrete failure and displacements	

Table 14: Characteristic values for shear loads

Anchor channel			**28/15**	**38/17**	**40/25**	**49/30**	**54/33**
Steel failure, local flexure of the channel lips:							
Characteristic resistance		$V_{Rk,s,l}$ [kN]	9,0	18,0	20,0	31,0	55,0
Partial safety factor		$\gamma_{Ms,l}$ [-] [1])	1,80				
Pry-out failure							
Factor k in equation (31) of CEN/TS 1992-4-3		k_5 [-] [2])	2,0				
Partial safety factor		γ_{Mc} [-] [1])	1,5				
Concrete edge failure							
Cracked concrete without edge reinforcement or stirrups		$\alpha_p{}^*\psi_{re,V}$ [-]	2,5				
Cracked concrete with straight edge reinforcement ≥Ø12 mm		$\alpha_p{}^*\psi_{re,V}$ [-]	3,0				
Non-cracked concrete or cracked concrete with edge reinforcement and stirrups with a spacing a ≤ 100 mm and a ≤ 2^*c_1		$\alpha_p{}^*\psi_{re,V}$ [-]	3,5				
Effect of the thickness of the structural component		$\alpha_{h,V}$ [-]	$(h/h_{cr,V})^{0,5}$				
Characteristic height		$h_{cr,V}$ [mm]	$2^*(c_1+h_{ch})$				
Characteristic edge distance		$c_{cr,V}$ [mm]	$2^*c_1+b_{ch}$				
Characteristic spacing		$s_{cr,V}$ [mm]	$2^*c_{cr,V} = 4^*c_1 + 2^*b_{ch}$				
Partial safety factor		γ_{Mc} [-] [1])	1,5				

[1]) In absence of other national regulations

[2]) Without supplementary reinforcement. In case of supplementary reinforcement the factor k_5 should be multiplied with factor 0,75

[3]) Verification according to CEN/TS 1992-4-1:2009, section 5

Anchor channel PEC-TA	Annex 14
Characteristic values for shear loads	

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Table 15: Characteristic values for shear loads - steel failure of special screws

Special screws		Material	M8	M10	M12	M16	M20
Characteristic resistance	$V_{Rk,s,s}$ [kN] [2])	4.6		11,6			
		8.8			33,7	62,8	98,0
		A4-50 [3])	9,2				
		A4-70 [3])		20,3	29,5	55,0	85,8
Characteristic bending resistance	$M^0_{Rk,s}$ [Nm] [2])	4.6		29,9			
		8.8			104,8	266,4	519,3
		A4-50 [3])	18,7				
		A4-70 [3])		52,3	91,7	233,1	454,4
Partial safety factor	γ_{Ms} [-] [1])	4.6		1,67			
		8.8		1,25			
		A4-50 [3])		2,38			
		A4-70 [3])		1,56			

[1]) In absence of other national regulations

[2]) In conformity to EN ISO 898-1:1999

[3]) Materials acc. to Annex 3

Table 16: Displacements under shear loads

Anchor channel		28/15	38/17	40/25	49/30	54/33
Shear load	V_{Ek} [kN]	3,6	7,1	7,9	12,3	21,8
Short time displacement	δ_{V0} [mm]	0,6	0,6	0,6	0,6	1,2
Long time displacement	$\delta_{V\infty}$ [mm]	0,9	0,9	0,9	0,9	1,8

Anchor channel PEC-TA	Annex 15
Characteristic values for shear loads, Steel failure of special screws and displacements	

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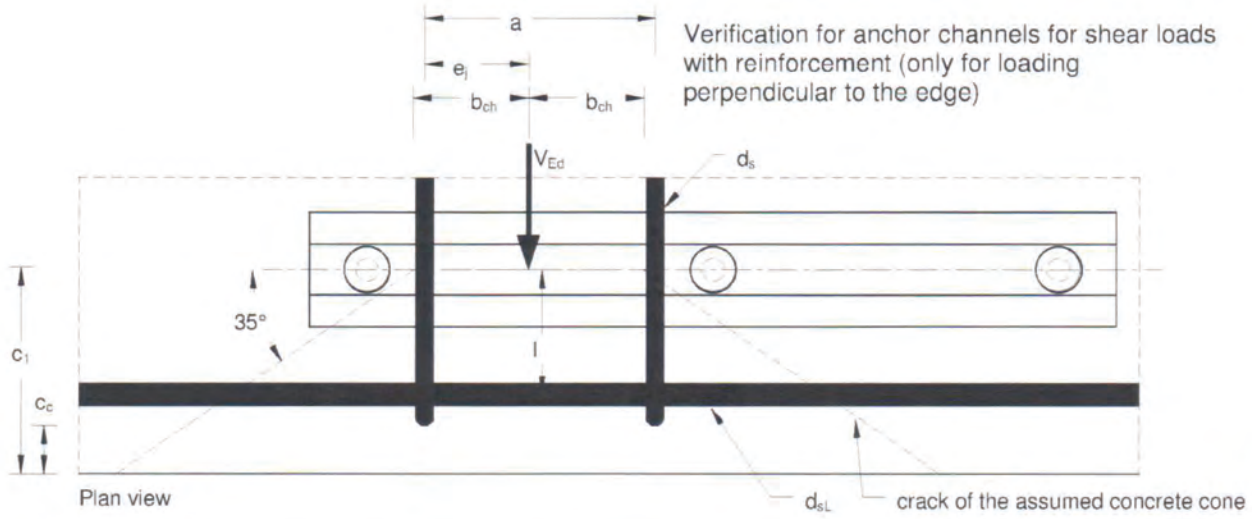


Verification for anchor channels for shear loads with reinforcement (only for loading perpendicular to the edge)

$$V_{Ed} \leq V_{Rd,re} = V_{Rk,re}/\gamma_{Mc} \qquad V_{Ed} = \max(V_{Ed}\ ;\ V_{Ed}^{a})$$

$$V_{Rk,re} = V_{Rd,c,re} / x$$

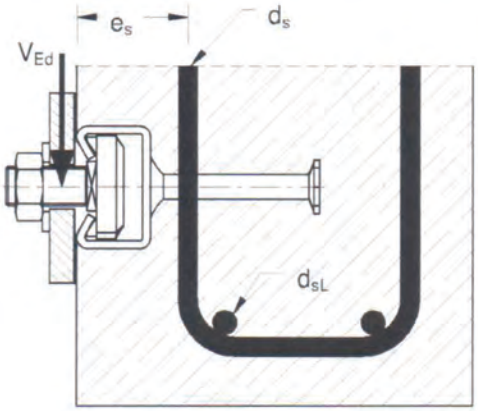
$$V_{Rk,c,re} = V_{Rk,c,hook} + V_{Rk,c,bond} \leq V_{Rk,c,re,max} \leq \sum_{m+n} A_s \cdot f_{y,k}$$

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

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

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

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



Reinforcement requirements

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

$$6\ \text{mm} \leq d_s \leq 20\ \text{mm}$$

Anchor channel PEC-TA	Annex 16
Verification of shear loads with reinforcement	

Deutsches Institut für Bautechnik DIBt

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 stirrups between 2 shear loads acting on an anchor channel (distance between the loads $p \le s_{cr,V}$ according to Table 14) [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	[mm]	=	diameter of stirrup
$d_{s,L}$	[mm]	=	diameter of edge bars
ψ_4	[-]	=	$(l_i / c_1)^{0,4} * (10 / d_s)^{0,25}$
l_i	[mm]	=	anchorage length of a stirrup leg in the concrete cone
		=	c_1-c_c-0,7*(e_j-b_{ch}) for stirrups crossed diagonally by the assumed crack
		=	c_1-c_c for stirrups directly under the load or for stirrups crossed orthogonally by the assumed crack
		≥	4*d_s
c_1	[mm]	=	edge distance
c_c	[mm]	=	concrete cover
e_j	[mm]	=	distance of the stirrup leg to the point of load action
b_{ch}	[mm]	=	width of the anchor channel (according to Table 2)
A_s	[mm²]	=	cross section of one leg of the stirrup
f_{yk}	[MPa]	=	characteristic yield strength of the reinforcement
f_{ck}	[MPa]	=	characteristic concrete strength measured on cubes with a side length of 150 mm
f_{bk}	[MPa]	=	characteristic bond strength
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	[mm]	=	spacing of stirrups
x	[-]	=	e_s/z+1 factor taking into account eccentricity between reinforcement force and load
e_s	[mm]	=	distance between reinforcement and shear force acting on the anchor channel
z	[mm]	≈	0,85*d internal lever arm of the concrete member
d	[mm]	=	min(2*h_{ef}; 2*c_1)
$V^0_{Rk,c}$	[kN]	=	according to CEN/TS 1992-4-3:2009, section 6.3.5.3
V^a_{Ed}	[kN]	=	according to CEN/TS 1992-4-1:2009, section 3.2.2

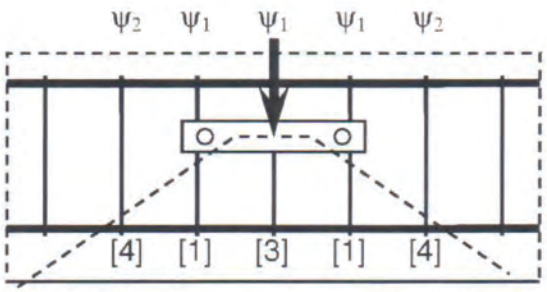


Fig 1: Effectiveness factor for one load

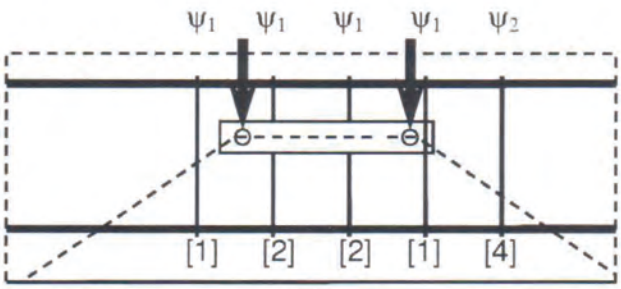


Fig 2: Effectiveness factor for two loads

Anchor channel PEC-TA	Annex 17
Verification of shear loads with reinforcement	

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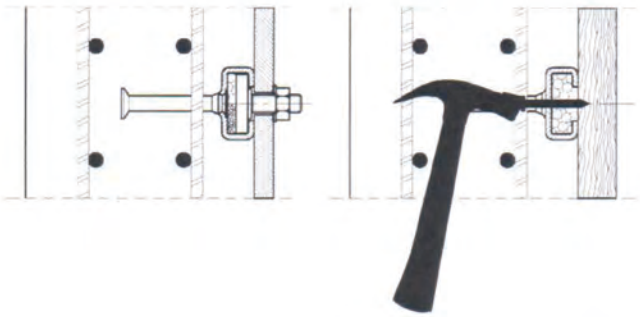
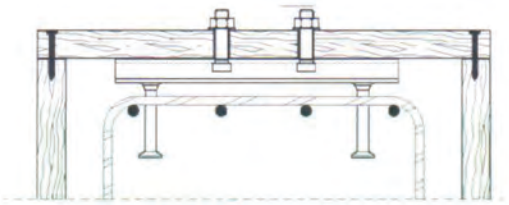


1. Fixing anchor channel

Install the channel surface-flush and fix the channel non-relocatable to the formwork or to the reinforcement

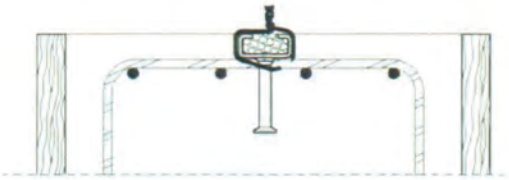
1.1) **Fixing to steel formwork:**
With special screws and nuts, with rivets, cramps or with magnetic fixings

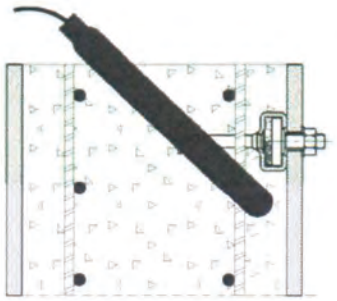
1.2) **Fixing to timber formwork:**
With nails or woodscrews through the pre-punched holes in the back of the channels and with staples



1.3) **Fixing to anchor channels at the top:**

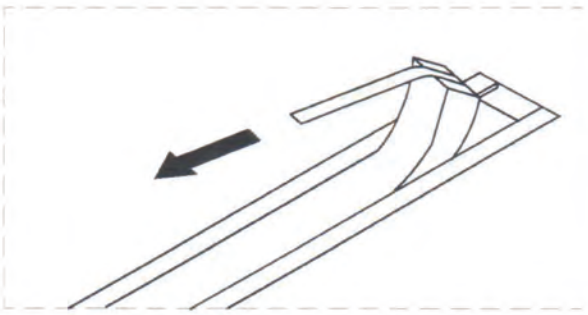
- To timber auxiliary construction on the side formwork (e.g. with special screws).
- Fixing from above directly to the reinforcement or to a mounting rebar, attach the channel by wire binding





2. Pouring concrete and regular compacting of concrete

Compact the concrete properly around the channel and the anchors



3. Removing of the channel filler

Clean the channel on the outside after removing the formwork. Remove the PE-foam infill by pulling the plastic stripe

Anchor channel PEC-TA	Annex 18
Manufacturer's specification for anchor channels	

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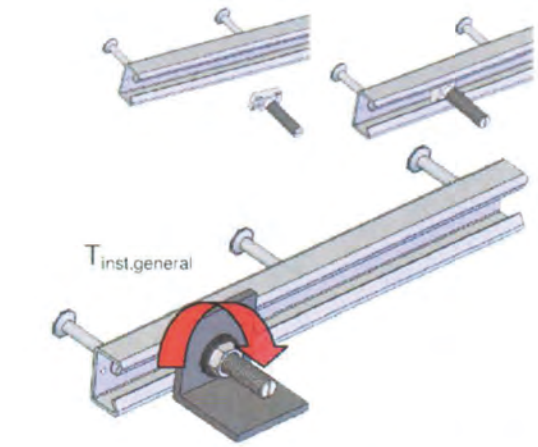

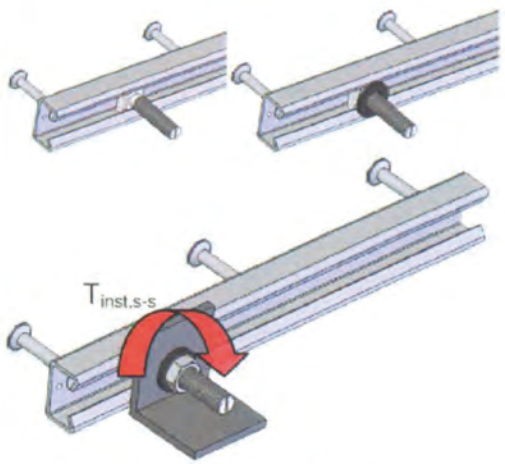

4. Fastening the special screw to the anchor channel

4.1) Setting torques (General)

1. Insert the special screw into the channel slot at any point along the channel length
2. Turn the special screw 90° clockwise and the head of the screw locks into position
3. Do not mount the special screw closer than 25 mm (resp. 35 mm if x = 35 mm acc. Annex 6) from the end of the channel
4. Use the washer under the nut
5. Check the correct fit of the special screw. The notch on the shank end of the special screw must be perpendicular to the channel longitudinal axis.
6. Tighten the nuts to the setting torque according to Table 17. The setting torque must not be exceeded

4.2) Setting torques (Steel-to-steel contact)

1. Use washers between the channel and the fixture to create a defined contact
2. Tighten the nuts to the setting torque according to Table 18. The setting torque must not be exceeded

Table 17: Setting torques (General)

Strength grade	Anchor channel	T_{inst} [Nm]				
		M8	M10	M12	M16	M20
4.6	28/15	8	13			
8.8	38/17		15	25	40	
A4-50	40/25		15	25	30	
A4-70	49/30		15	25	60	75
	54/33		15	25	60	75

Table 18: Setting torques T_{inst} (Steel-to-steel contact)

Strength grade	T_{inst} [Nm]				
	M8	M10	M12	M16	M20
4.6		15			
8.8			70	120 [1]	360
A4-50	8				
A4-70		40	70	180 [2]	360

[1] for screw 38/17 8.8 T_{inst}=180 Nm
[2] for screw 40/22 A4-70 T_{inst}=70 Nm

Anchor channel PEC-TA	Annex 19
Manufacturer's specification for special screws	

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