

Deutsches Institut für Bautechnik

Anstalt des öffentlichen Rechts

Kolonnenstr. 30 L
10829 Berlin
Germany

Tel.: +49(0)30 787 30 0
Fax: +49(0)30 787 30 320
E-mail: dibt@dibt.de
Internet: www.dibt.de



DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-09/0339

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung
Trade name

Halfen Ankerschiene HTA
Halfen anchor channel HTA

Zulassungsinhaber
Holder of approval

Halfen GmbH
Abt. Forschung und Entwicklung
Liebigstraße 14
40764 Langenfeld
DEUTSCHLAND

Zulassungsgegenstand
und Verwendungszweck
*Generic type and use
of construction product*

Einbetonierte Ankerschienen
Cast-in anchor channels

Geltungsdauer: vom
Validity: from
bis
to

15 February 2010
15 February 2015

Herstellwerk
Manufacturing plant

Werk Langenfeld
Liebigstraße 14
40764 Langenfeld

Diese Zulassung umfasst
This Approval contains

27 Seiten einschließlich 19 Anhänge
27 pages including 19 annexes



Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

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 products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - 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 1998⁴, as amended by law of 31 October 2006⁵;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁶.
- 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 2006*, p. 2407, 2416

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 the product and intended use

1.1 Definition of the product

The Halfen anchor channel HTA is an anchor channel consisting of a C-shaped channel of hot-rolled or 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. Halfen-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 documentation⁷ 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.

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

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 anchor channel shall be marked with the identifying mark of the producer, the type, the size and if applicable additionally with the type of stainless steel, e.g. HTA 40/22 A4 according to Annex 2. The position of the anchor is marked for anchor channels with weld-on anchors by nail holes in the channel profile.

Each special screw is marked with the identifying mark of the producer and 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 | $M_{RK,s}^0$ |
| 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 Commission⁸ 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 verifications for shear load with supplementary reinforcement follows CEN/TS 1992-4-3:2009, section 6.3.6 and 6.3.7 or alternatively Annex 16 and 17.

The calculation of $\alpha_{h,v}$ (effect of the thickness of the structural component) for the verification of concrete edge failure is done according Annex 14, Table 17 exceptional to CEN/TS 1992-4-3:2009, section 6.3.5.6, formula (38).

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 9 and 10.

The edge distance of the anchors on the profile back of the channel is not less than c_{min} indicated in Annex 8, Table 9 and 10 and $c_{min,s}$ indicated in Annex 9, Table 11.

The spacing of the anchors shall be between s_{min} and s_{max} given in Annex 6, Table 5.

The spacing of the special screws is not less than $s_{min,s}$ given in Annex 9, Table 11.

The effective anchorage depth is not less than $\min h_{ef}$ according to Annex 8, Table 9 and 10.

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 shall be 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 Annex 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 to be 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 Indications to the manufacturer

5.1 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).

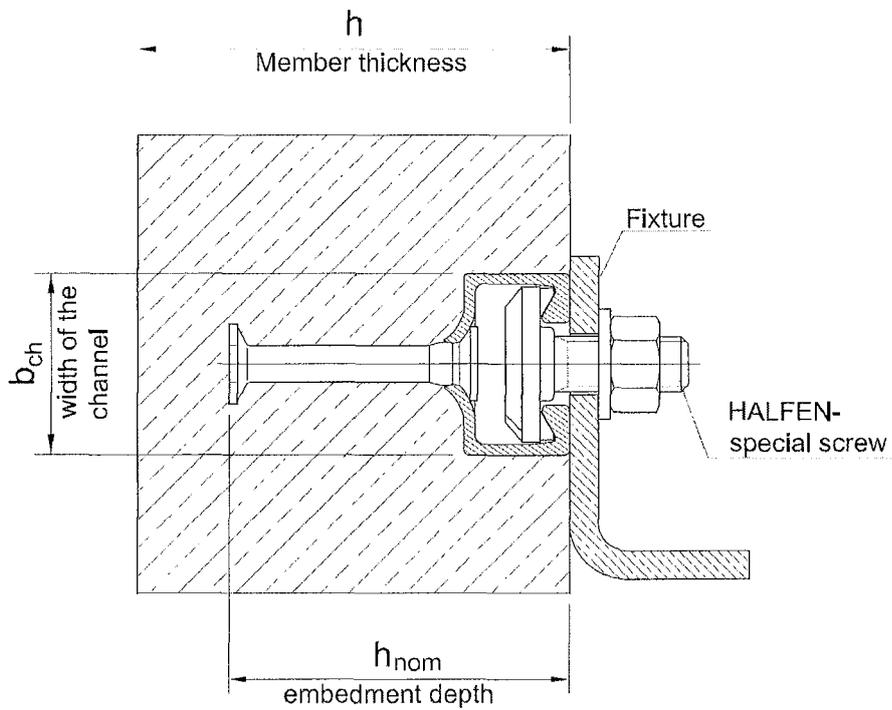
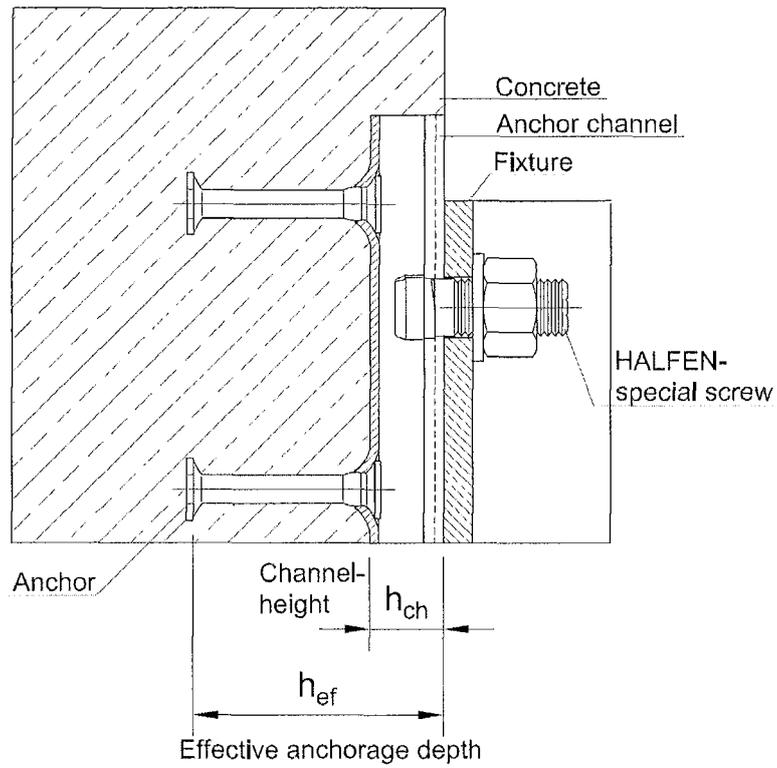
The minimum data required are:

- 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.

Dipl.-Ing. Georg Feistel
Head of Division Construction Engineering
of Deutsches Institut für Bautechnik
Berlin, 15 February 2010

beglaubigt
Müller



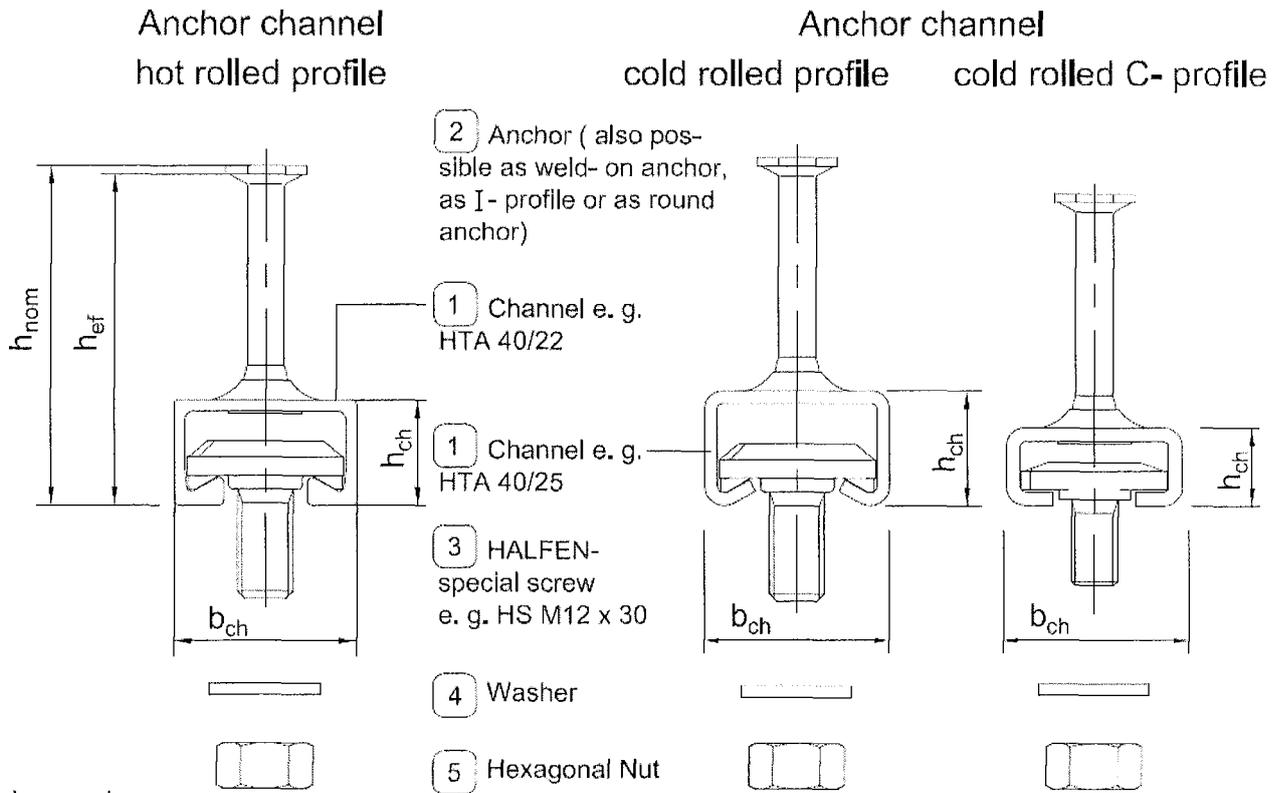
HALFEN Anchor Channel HTA

Product and intended use

Annex 1

of European
technical approval

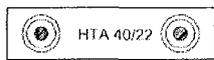
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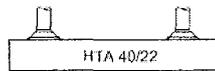
Legend

- h_{ch} Channel height
- b_{ch} Width of the channel
- h_{ef} effective anchorage depth
- h_{nom} embedment depth

Marking of the HALFEN anchor channel, e. g.: HTA 40/22 A4



a) Stamped on back of channel



b) Printed on channel web

H or HALFEN:

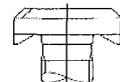
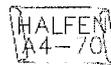
- Identifying mark of the producer
- TA Type of anchor channel
- 40/22 size
- A4 material

Close to the anchor a nail hole is positioned

Material channels:

- No marking for 1.0038/1.0044
- A4 1.4401/1.4404/1.4571
- L4 1.4362
- F4 1.4462
- HC/HCR 1.4529/1.4547

Marking of the HALFEN- special screw, e. g.: HALFEN A4-70



H or HALFEN:

- Identifying mark of the producer
- A4 material
- 70 strength grade

Material of the special screws:

- 4.6 Steel grade 4.6
- 8.8 Steel grade 8.8
- A4 Stainless steel (1.4401/1.4404/1.4571), grade -50
- A4-70 Stainless steel (1.4401/1.4404/1.4571), grade -70
- L4-70 Stainless steel (1.4362), grade -70
- F4-70 Stainless steel (1.4462), grade -70
- HC-50 Stainless steel (1.44529/1.4547), grade -50
- HC-70 Stainless steel (1.44529/1.4547), grade -70

HALFEN Anchor Channel HTA

Product and marking

Annex 2

of European technical approval

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Table 1: Materials and intended use

Item no.	Specification	Intended use			
		1	2	3	4
		Dry internal conditions	Internal conditions with usual humidity	Medium corrosion exposure	High 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 application under water)	Anchor channels may also be used in structures subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions, if no particular aggressive conditions (e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in de-sulphurization plants or road tunnels where de-icing materials are used).	
Materials					
①	Channel profile	Steel 1.0038; 1.0044 EN 10025 hot-dip galv. $\geq 50 \mu\text{m}^6$	Steel 1.0038; 1.0044 EN 10025 hot-dip galv. $\geq 50 \mu\text{m}^6$	Stainless steel 1.4401/ 1.4404/ 1.4571 1.4362 EN 10088	Stainless steel 1.4462 ²⁾ , 1.4529/ 1.4547 EN 10088
②	Anchor	Steel 1.0038; 1.0214, 1.0401, 1.1132, 1.5525 EN 10263, EN 10269 hot-dip galv. $\geq 50 \mu\text{m}^6$	Steel 1.0038; 1.0214, 1.0401, 1.1132, 1.5525 EN 10263, EN 10269 hot-dip galv. $\geq 50 \mu\text{m}^6$	Stainless steel 1.4401/ 1.4404/ 1.4571 1.4362, 1.4578 EN 10088, 1.0038 ³⁾	
③	HALFEN special screws shaft and thread according EN ISO 4018	Steel, strength grade 4.6 / 8.8 EN ISO 898-1 electroplated $\geq 5 \mu\text{m}^4$	Steel, strength grade 4.6 / 8.8 EN ISO 898-1 hot-dip galv. $\geq 40 \mu\text{m}^1$ 5)	Stainless steel 1.4401/ 1.4404/ 1.4571 1.4362 EN ISO 3506-1	Stainless steel 1.4462 ²⁾ , 1.4529/ 1.4547 EN ISO 3506-1
④	Washer, EN ISO 7089 and EN ISO 7093-1 production class A, 200 HV	Steel EN 10025 electroplated $\geq 5 \mu\text{m}^4$	Steel EN 10025 hot-dip galv. $\geq 40 \mu\text{m}^1$ 5)	Stainless steel 1.4401/ 1.4404/ 1.4571 EN 10088	Stainless steel 1.4462 ²⁾ , 1.4529/ 1.4547 EN 10088
⑤	Hexagonal nuts EN ISO 4032	Steel strength grade 5/8 EN 20898-2 electroplated $\geq 5 \mu\text{m}^4$	Steel strength grade 5/8 EN 20898-2 hot-dip galv. $\geq 40 \mu\text{m}^1$ 5)	Stainless steel 1.4401/ 1.4404/ 1.4571 EN ISO 3506-2	Stainless steel 1.4462 ²⁾ , 1.4529/ 1.4547 EN ISO 3506-2

¹⁾ or electroplated special coating $\geq 12 \mu\text{m}$

²⁾ 1.4462 not applicable for indoor swimming pools

³⁾ Steel acc. EN 10025, 1.0038 not for anchor channels 28/15 and 38/17

⁴⁾ electroplated acc. EN ISO 4042

⁵⁾ hot-dip galv. acc. to EN ISO 10684

⁶⁾ hot-dip galv. on the basis of EN ISO 1461, but thickness $\geq 50 \mu\text{m}$

HALFEN Anchor Channel HTA

Materials and intended use

Annex 3

of European technical approval

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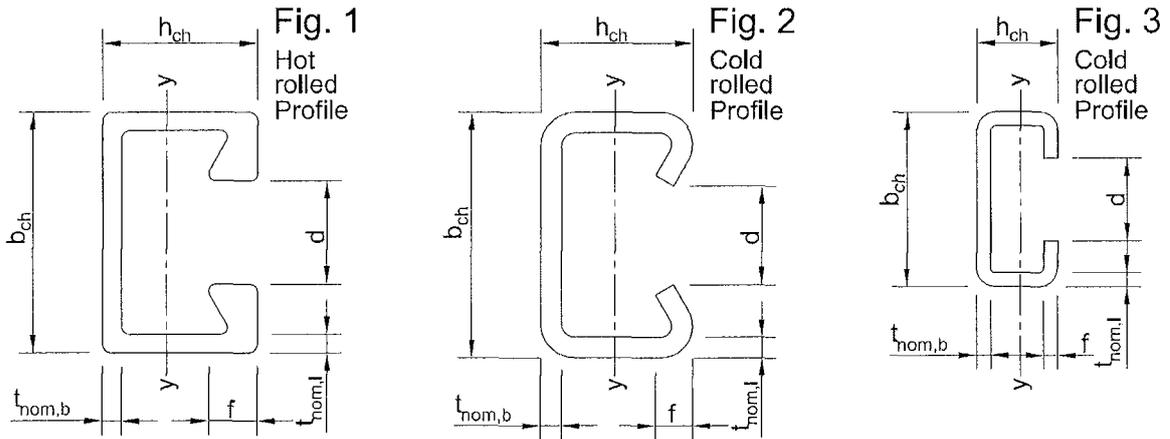


Table 2: Geometrical profile properties

Anchor channel	Figure	Dimensions						Material	I_y [mm ⁴]
		b_{ch}	h_{ch}	$t_{nom,b}$	$t_{nom,l}$	d	f		
		[mm]							
28/15	3	28.00	15.25	2.25	2.25	12.00	2.25	Steel	4060
38/17	3	38.00	17.50	3.00	3.00	18.00	3.00		8547
40/25	2	40.00	25.00	2.75	2.75	18.00	5.60		20570
49/30	2	50.00	30.00	3.00	3.00	22.00	7.39		41827
54/33	2	53.50	33.00	4.50	4.50	22.00	7.90		72079
72/49	2	72.00	49.00	6.00	6.00	33.00	9.90		293579
40/22	1	39.50	23.00	2.40	2.40	18.00	6.00		19703
50/30	1	49.00	30.00	3.00	2.75	22.50	7.85		51904
52/34	1	52.50	33.50	4.10	4.00	22.50	10.50		93262
55/42	1	54.50	42.00	5.00	5.00	26.00	12.90		187464
72/48	1	72.00	48.50	4.50	5.00	33.00	15.50		349721
28/15	3	28.00	15.25	2.25	2.25	12.00	2.25		Stainless steel
38/17	3	38.00	17.50	3.00	3.00	18.00	3.00	8547	
40/25	2	39.50	25.00	2.50	2.50	18.00	5.40	19097	
49/30	2	50.00	30.00	3.00	3.00	22.00	7.39	41827	
54/33	2	53.50	33.00	4.50	4.50	22.00	7.90	72079	
72/49	2	72.00	49.00	6.00	6.00	33.00	9.90	293579	
40/22	1	39.50	23.00	2.40	2.40	18.00	6.00	19759	
50/30	1	49.00	30.00	3.00	2.75	22.50	7.85	51904	
52/34	1	52.50	33.50	4.10	4.00	22.50	10.50	93262	
72/48	1	72.00	48.50	4.50	5.00	33.00	15.50	349721	

HALFEN Anchor Channel HTA

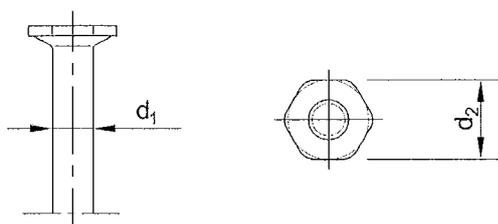
Geometrical profile properties

Annex 4

of European
technical approval

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Table 3: Types of round anchors



Type	Shaft Ø d_1	Head Ø d_2
	[mm]	
B6	6	12
	8	16
	10	20
	12	25
	14	28
	16	32

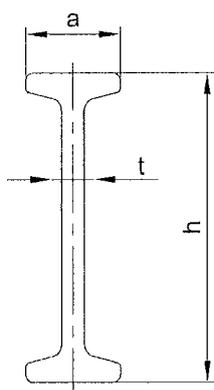


Table 4: Types of I-anchors

Type	Height h	Head width a	Web thickness t
	[mm]		
I 62	62	18	5
I 69	69	18	5
I 128	128	17	6
I 140	140	20	7.1

HALFEN Anchor Channel HTA

Types of anchor

Annex 5

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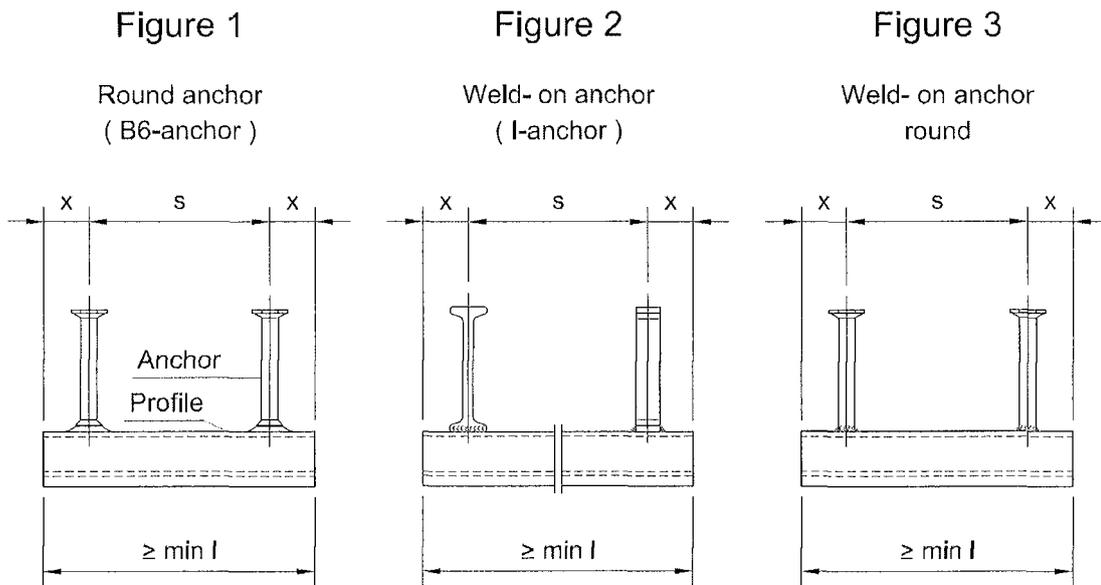


Table 5: Anchor positioning

Anchor channel	Anchor spacing		End spacing x ¹⁾		min Channel length min l	
	S _{min}	S _{max}	Round anchor Fig. 1	Welded anchor Fig. 2 and 3	Round anchor Fig. 1	Welded anchor Fig. 2 and 3
	[mm]					
28/15 38/17	50	200	25	25	100	100
40/22 40/25 49/30 50/30	100 (50)	250	25	25	100	150
52/34 54/33	100 (80)	250	35	25	150	150
55/42	100 (80)	300	35	25 (35)	150	150
72/48 72/49	100 (80)	400	35	25 (35)	150	150

() valid for round anchor acc. Fig. 1 and welded anchors with 35 mm end spacing

¹⁾ For channels with l=6070 mm, the end spacing is always 35 mm

HALFEN Anchor Channel HTA

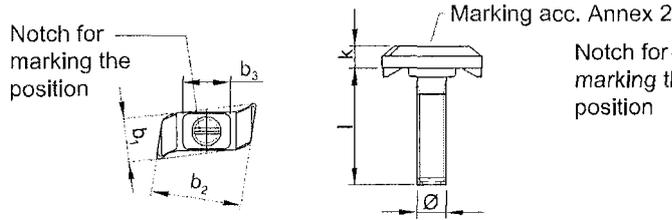
Anchor positioning, channel length

Annex 6

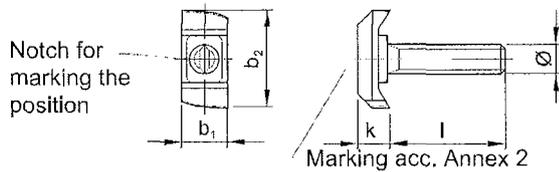
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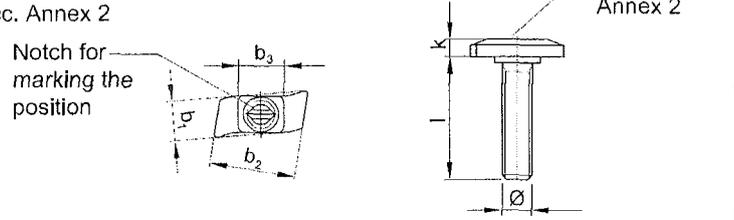
**HALFEN- special screw,
Hook- head geometry**



alternative Hook- head geometry



**HALFEN- special screw,
Hammer- head geometry**



alternative Hammer- head geometry

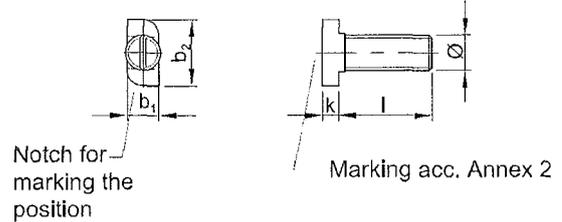


Table 6: Dimensions, special screw, Hook-head

HS	Thread Ø	Special screws, Hook-head				Special screws, alternative Hook-head geometry			Length l	Anchor channel
		Width b ₁	Length b ₂	b ₃	Thickness k	Width b ₁	Length b ₂	Thickness k		
40/22	M 10	15.0	30.8	16.0	7.5	14 (13)	32.5	7	20-150	40/22
40/22	M 12	15.0	30.8	16.0	7.5	14	32.5	7	20-250	40/25
40/22	M 16	17.4	30.3	16.0	8.5	17	32.5	8	30-300	
50/30	M 10	16.3	40.2	20.0	10.0	13	41	10	25-50	49/30
50/30	M 12	16.3	40.2	20.0	10.0	13	41	10	30-200	50/30
50/30	M 16	19.4	40.2	20.0	11.0	17	41	11	30-300	52/34
50/30	M 20	21.0	39.5	20.0	12.5	21	41	12	35-300	54/33
50/30	M 24					24.5	41	18	40-300	55/42
72/48	M 20					23	58	14	50-200	
72/48	M 24					25	58	16	50-250	72/48
72/48	M 27					28	58	18	50-250	72/49
72/48	M 30					31	58	20	50-300	

Table 7: Dimensions, special screw, Hammer-head

HS	Thread Ø	Screws, Hammer-head			Screws, alternative Hammer-head geometry				Length l	Anchor channel
		Width b ₁	Length b ₂	Thickness k	Width b ₁	Length b ₂	b ₃	Thickness k		
28/15	M 6	10.1	22.7 (22.2)	4	10.6	21.1	10.0	4.0	15-60	
28/15	M 8	10.1	22.7 (22.2)	4	10.6	21.1(20.7)	10.0	4.5	15-150	28/15
28/15	M 10	10.1	22.7 (22.2)	5 (4)	10.9	20.2	10.0	5.0	15-200	
28/15	M 12	10.1	22.7 (22.2)	5.5	10.8	20.1	-	6.5	20-200	
38/17	M 10	13 (12)	30.5	6	13.6-14.1	29.0	15.5	6.0	20-175	
38/17	M 12	13 (12)	30.5	7 (6)	13.6-14.1	29.0	15.5	6.0	20-200	38/17
38/17	M 16	16	30.5	7	16.0	29.0	15.5	8.5	20-200	

¹⁾ Materials according Annex 3, Tab.1

Marking of the screw head acc. to Annex 2

Table 8: Strength grade

Strength grade	Steel ¹⁾		Stainless steel ¹⁾	
	4.6	8.8	A4-50	A4-70; FA-70
f _{uk} [N/mm ²]	400	800	500	700
f _{yk} [N/mm ²]	240	640	210	450
Finish	gv, fv		-	

HALFEN Anchor Channel HTA

**Halfen-special screws,
dimensions, strength grade**

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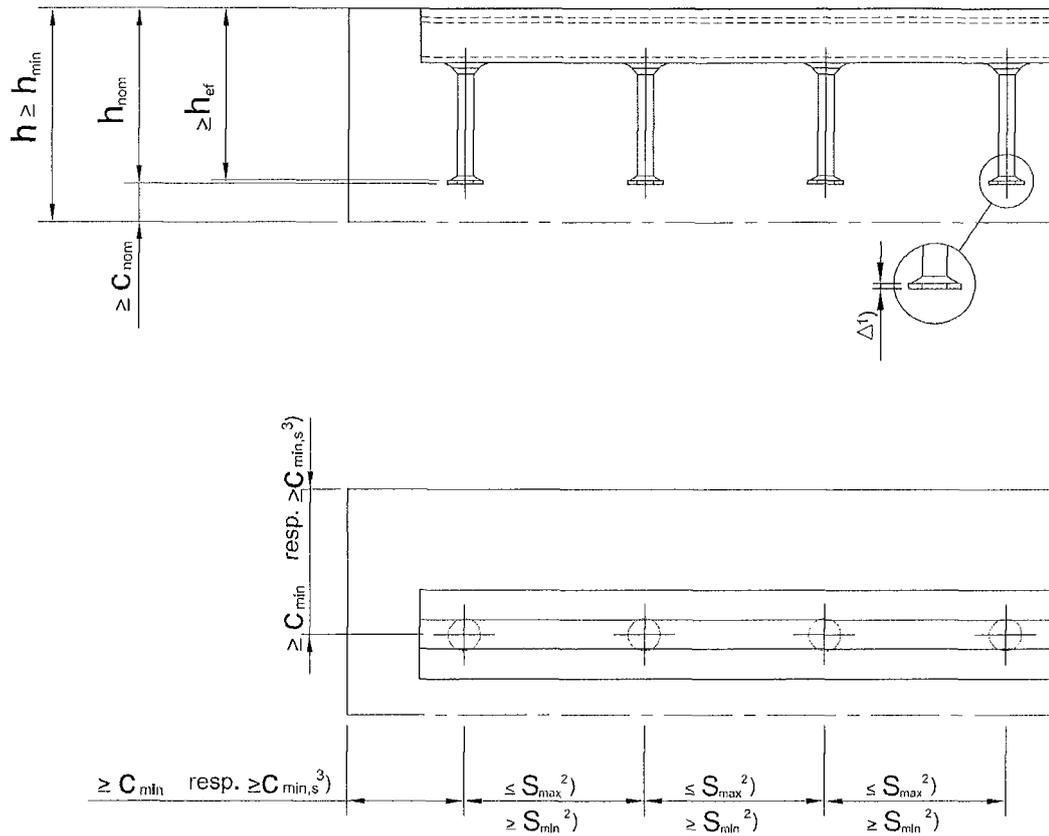


Table 9: Minimum anchorage depth, edge distance and member thickness for cold rolled profiles

Anchor channel			28/15	38/17	40/25	49/30	54/33	72/49
Min. anchorage depth	[mm]	min h_{ef}	45	76	79	94	155	179
Min. edge distance		C_{min}	40	50	50	75	100	150
Min. member thickness		h_{min}	$h_{ef} + \Delta^1) + C_{nom}$					

Table 10: Minimum anchorage depth, edge distance and member thickness for hot rolled profiles

Anchor channel			40/22	50/30	52/34	55/42	72/48
Min. anchorage depth	[mm]	min h_{ef}	79	94	155	175	179
Min. edge distance		C_{min}	50	75	100	100	150
Min. member thickness		h_{min}	$h_{ef} + \Delta^1) + C_{nom}$				

¹⁾ Δ = anchor head thickness

²⁾ S_{min} , S_{max} acc. to Table 5, Annex 6

³⁾ $C_{min,s}$ acc. to Table 11, Annex 9 subjected to special screw \emptyset

HALFEN Anchor Channel HTA

Installation parameters of cold rolled and hot rolled anchor channels

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Table 11: Minimum edge distance, spacing and setting torque of HALFEN – special screws

Anchor channel	Special screw \varnothing	Min. edge distance $c_{min,s}^{4)}$ and min. spacing $s_{min,s}^{5)}$ of the special screws	Setting Torque $T_{inst}^{6)}$		
			General ²⁾		Steel – steel contact ³⁾
			4.6; 8.8; A4 – 50; A4 – 70 ¹⁾	4.6; A4 – 50 ¹⁾	8.8; A4 – 70 ¹⁾
	[mm]	[mm]	[Nm]		
28/15	6	30	-	3	-
	8	40	8	8	20
	10	50	13	15	40
	12	60	15	25	70
38/17	10	50	15	15	40
	12	60	25	25	70
	16	80	40	65	180
40/22 40/25	10	50	15	15	40
	12	60	25	25	70
	16	80	45	65	180
49/30 50/30	10	50	15	15	40
	12	60	25	25	70
	16	80	60	65	180
	20	100	75	130	360
52/34 54/33	10	50	15	15	40
	12	60	25	25	70
	16	80	60	65	180
	20	100	120	130	360
55/42	10	50	15	15	40
	12	60	25	25	70
	16	80	60	65	180
	20	100	120	130	360
	24	120	200	230	620
72/48 72/49	20	100	120	130	360
	24	120	200	230	620
	27	135	300	340	900
	30	150	380	460	1200

¹⁾ Materials according to Tab. 1, Annex 3

²⁾ Acc. to figure 1, Annex 10

³⁾ Acc. to figure 2, Annex 10

⁴⁾ See Annex 8, plan view

⁵⁾ See Annex 11, Fig. 1

⁶⁾ T_{inst} must not be exceeded

HALFEN Anchor Channel HTA

**Installation parameters of
HALFEN – special screw**

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General

The fixture is braced to concrete or to the anchor channel respectively braced to concrete and anchor channel. The setting torques according to Annex 9, Table 11 shall be applied and must not be exceeded.

Steel- steel contact

The fixture is braced to the anchor channel by suitable washer. The setting torques according to Annex 9, Table 11 shall be applied and must not be exceeded.

Fig. 1

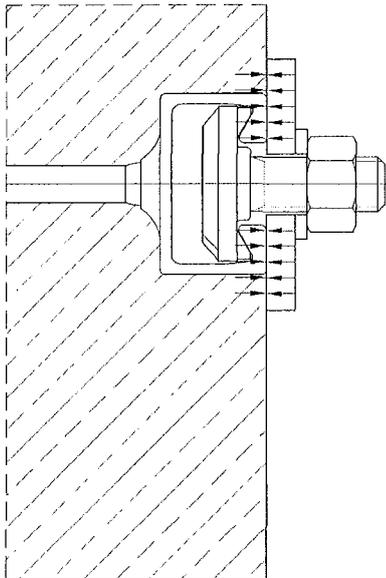
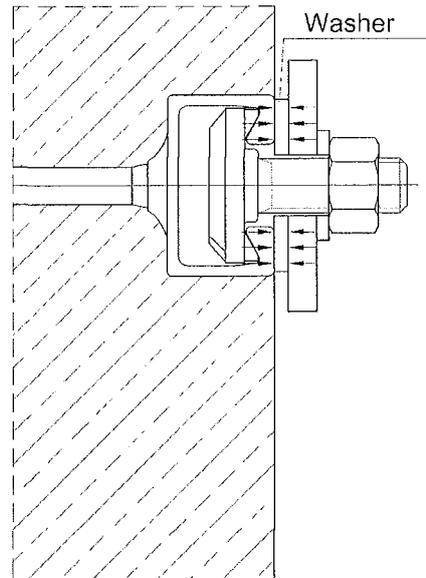


Fig. 2



HALFEN Anchor Channel HTA

Positions of the fixture

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Table 12: Characteristic values for tension loads - steel failure channel

Anchor channel		28/15	38/17	40/22 40/25	49/30 50/30	52/34 54/33	55/42	72/48 72/49
Steel failure, anchor								
Characteristic resistance	$N_{Rk,s,a}$ [kN]	not relevant						
Partial safety factor	γ_{Ms}	1.8						
Steel failure, connection channel anchor								
Characteristic resistance	$N_{Rk,s,c}$ [kN]	9	18	20	31	55	80	100
Partial safety factor	$\gamma_{Ms,ca}^{1)}$	1.8						
Steel failure, local flexure of channel lips for $s_s \geq s_{slb}$								
Spacing of special screws for $N_{Rk,s,l}$	s_{slb} [mm]	42	52	65	81	88	109	129
Characteristic resistance	$N_{Rk,s,l}$ [kN]	9	18	20	31	55	80	100
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 Table 11, Annex 9

Fig. 1

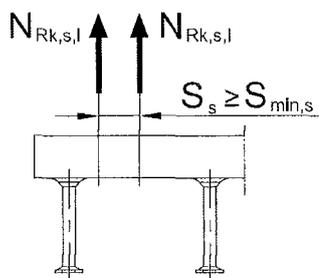


Fig. 2: Assumption of system

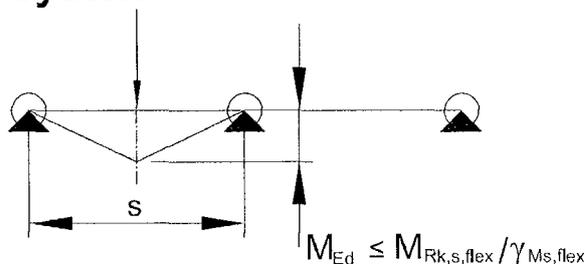


Table 13: Flexure resistance of channel

Anchor channel		28/15	38/17	40/25	49/30	54/33	72/49	40/22	50/30	52/34	55/42	72/48
Characteristic flexure resistance of channel	Steel	317	580	1099	1673	2984	8617	1076	2038	3373	6447	8593
	Stainless steel	324	593	1071	1708	2984	8617	1080	2081	3445	-	8775
Partial safety factor	$\gamma_{Ms,flex}^{1)}$	1.15										

¹⁾ in absence of other national regulations

HALFEN Anchor Channel HTA

Characteristic values for tension loads - steel failure channel

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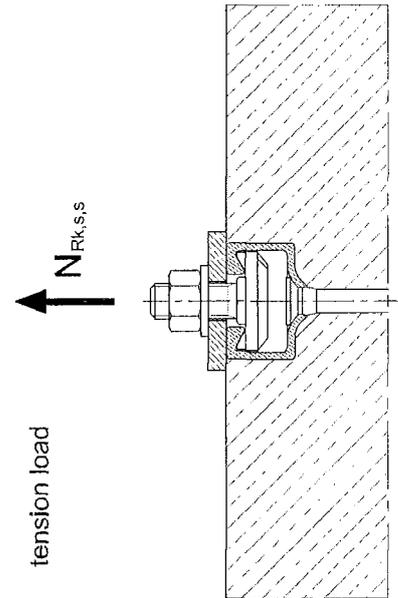
Table 14: Characteristic values for tension load - steel failure of HALFEN-special screws

Special Screw Ø		M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Steel failure										
Characteristic resistance	$N_{Rk,s,s}^2)$ [kN]	4.6	14.6	23.2	33.7	62.8	98.0	141.2	183.6	224.4
		8.8	29.3	46.4	67.4	125.6	196.0	282.4	367.2	448.8
Partial safety factor	$\gamma_{Ms,s}^3)$	A4-50 ₁₎	18.3	29.0	42.2	78.5	122.5	176.5	229.5	280.5
		A4-70 ₁₎	14.1	25.6	40.6	59.0	109.9	171.5	247.1	321.3
			4.6				2.00			
						1.50				
						2.86				
						1.87				

¹⁾ Materials according Table 1, Annex 3

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

³⁾ in absence of other national regulations



HALFEN Anchor Channel HTA

Characteristic values for tension loads - steel failure special screws

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Table 15: Characteristic values for tension loads – concrete failure

Anchor channel			28/15	38/17	40/25 40/22	49/30 50/30	54/33 52/34	55/42	72/49 72/48	
Pullout failure										
Characteristic resistance in cracked concrete C12/15	Round anchors	$N_{Rk,p}$	[kN]	7.6	13.5	13.5	21.1	33.9	41.5	54.3
	Welded anchors			11.7	11.7	14.0	21.1	25.7	37.2	46.4
Increasing factor for $N_{Rk,p}$	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 $N_{Rk,c}$ see CEN/TS 1992-4-3 section 6.2.5										
		α_{ch}		0.81	0.88	0.88	0.91	0.98	1.00	1.00
Effective anchorage depth	h_{ef}	[mm]		45	76	79	94	155	175	179
Characteristic edge distance	$c_{cr,N}$			111	171	176	199	260	269	270
Characteristic spacing	$s_{cr,N}$			223	342	352	399	521	538	540
		$\Psi_{ucr,N}$		1.4						
Partial safety factor		$\gamma_{Mc}^1)$		1.5						
Splitting										
Verification of splitting is not relevant										

¹⁾ in absence of other national regulations

Table 16: Displacements under tension loads

Anchor channel			28/15	38/17	40/25 40/22	49/30 50/30	54/33 52/34	55/42	72/49 72/48
Tension load	N_{Ek}	[kN]	3.6	7.1	8.3	12.3	21.8	31.7	39.7
Short time displacement	δ_{N0}	[mm]	0.3	0.3	0.4	0.4	0.5	0.5	0.5
Long time displacement	δ_N	[mm]	1.2	1.2	1.2	1.2	1.2	1.2	1.2

HALFEN Anchor Channel HTA

Characteristic values for tension loads - concrete failure and displacements

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Table 17: Characteristic values for shear loads

Anchor channel			28/15	38/17	40/25	49/30	54/33	55/42	72/49
					40/22	50/30	52/34		72/48
Steel failure, local flexure of channel lips									
Characteristic resistance	$V_{Rk,s,l}$	[kN]	9	18	20	31	55	104	100
					26	40.3	71.5		130
Partial safety factor	$\gamma_{Ms,l}$ ¹⁾		1.8						
Pry out failure									
Factor k in equation (31) of CEN/TS 1992-4-3	k_5 ³⁾		2.0						
Partial safety factor	γ_{Mc} ¹⁾		1.5						
Concrete edge failure									
Product of factor α_p and $\Psi_{re,V}$	Cracked concrete without edge reinforcement or stirrups	$\alpha_p \cdot \Psi_{re,V}$	2.5	3.0	3.0	3.5	3.5	3.5	4.0
	Cracked concrete with straight edge reinforcement ($\geq \emptyset 12$ mm)	$\alpha_p \cdot \Psi_{re,V}$	3.0	3.5	3.5	4.1	4.1	4.1	4.7
	Non-cracked concrete ²⁾ or cracked concrete with edge reinforcement and stirrups with a spacing $a \leq 100$ mm and $a \leq 2c_1$	$\alpha_p \cdot \Psi_{re,V}$	3.5	4.0	4.0	4.7	4.7	4.7	5.3
Effect of the thickness of the structural component	$\alpha_{h,V}$		$(h/h_{cr,V})^{2/3}$						
Characteristic height	$h_{cr,V}$		$2c_1 + 2h_{ch}$						
Characteristic edge distance	$c_{cr,V}$		$2c_1 + b_{ch}$						
Characteristic spacing	$s_{cr,V}$		$4c_1 + 2b_{ch}$						
Partial safety factor	γ_{Mc} ¹⁾		1.5						

1) in absence of other national regulations

2) Proof acc. to CEN/TS 1992-4-1: 2009, section 5

3) Without supplementary reinforcement. In case of supplementary reinforcement the factor k_5 should be multiplied with 0.75

HALFEN Anchor Channel HTA

Characteristic values for shear loads

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Table 18: Characteristic values for shear load - steel failure of HALFEN-special screws

Special Screw \emptyset	M 6	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30
Steel failure ²⁾									
Characteristic resistance	4.6	8.8	13.9	20.2	37.7	58.8	84.7	110.2	134.6
	8.8	14.6	23.2	33.7	62.8	98.0	141.2	183.6	224.4
$V_{Rk,s}^2$ [kN]	A4-50 ¹⁾	6.0	17.4	25.3	47.1	73.5	105.9	137.7	168.3
	A4-70 ¹⁾	8.4	15.4	24.4	35.4	65.9	148.3	192.8	235.6
Characteristic flexure resistance	4.6	6.3	29.9	52.4	133.2	259.6	449.0	665.8	899.6
	8.8	12.2	59.8	104.8	266.4	519.3	898.0	1331.5	1799.2
$M_{Rk,s}^0$ [Nm]	A4-50 ¹⁾	7.6	37.4	65.5	166.5	324.5	561.3	832.2	1124.5
	A4-70 ¹⁾	10.7	26.2	52.3	91.7	233.1	454.4	785.8	1165.1
Partial safety factor	4.6	1.67							
	8.8	1.25							
	A4-50 ¹⁾	2.38							
	A4-70 ¹⁾	1.56							

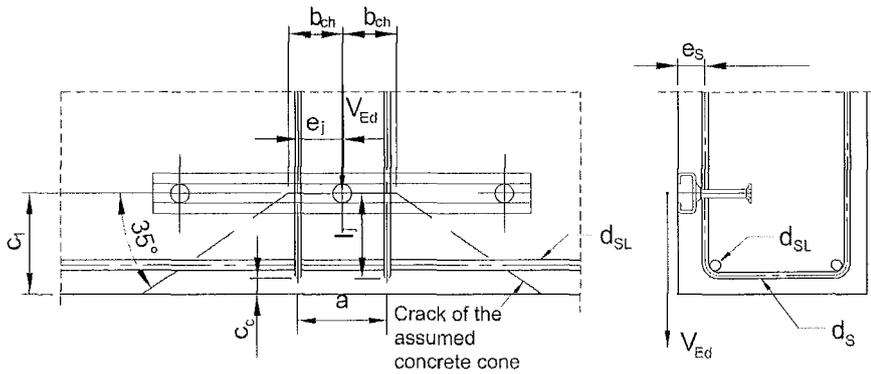
¹⁾ Materials according Table 1, Annex 3²⁾ In conformity to DIN EN 898-1: 1999³⁾ in absence of other national regulations

Table 19: Displacements under shear loads

Anchor channel			28/15	38/17	40/25 40/22	49/30 50/30	54/33 52/34	55/42	72/49 72/48
Shear load	V_{Ek}	[kN]	3.6	7.1	8.3	12.3	21.8	31.7	39.7
Short time displacement	δ_{V0}	[mm]	0.6	0.6	0.6	0.6	1.2	1.2	1.2
Long time displacement	δ_V	[mm]	0.9	0.9	0.9	0.9	1.8	1.8	1.8

HALFEN Anchor Channel HTA**Characteristic values for shear loads -
Steel failure special screws and displacements****Annex 15**of European
technical approval**ETA- 09/0339**

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



$$V_{Ed} \leq V_{Rd,re} = V_{Rk,re} / \gamma_M \quad V_{Ed} = \max[V_{Ed}; V_{Ed}^a] \quad (1)$$

$$V_{Rk,re} = V_{Rk,c,re} / \chi \quad (2)$$

$$V_{Rk,c,re} = V_{Rk,c,hook} + V_{Rk,c,bond} \leq V_{Rk,c,re,max} \leq \sum_{m+n} A_s \cdot f_{y,k} \quad (3)$$

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

$$V_{Rk,c,bond} = \sum_{j=1}^{m+n} (\pi \cdot d_s \cdot l_j \cdot f_{b,k}) \quad (5)$$

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

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

Reinforcement requirements

$$50 \text{ mm} \leq a \leq \begin{cases} s \\ 150 \text{ mm} \\ (c_1 - c_c + 0,7 \cdot b_{ch} - 4 \cdot d_s) / 0,35 \\ c_1 - c_c \end{cases} \quad (8)$$

$$6 \text{ mm} \leq d_s \leq 20 \text{ mm} \quad (9)$$

HALFEN Anchor Channel HTA

Verification for shear loads with 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 17) ②
- Ψ_2 = effectiveness factor
 = 0.11 for other stirrups in the concrete cone ④
- $\Psi_3 = (d_{s,L}/d_s)^{2/3}$
 d_s = diameter of stirrup [mm]
 $d_{s,L}$ = diameter of edge bars [mm]
- $\Psi_4 = \left(\frac{l_j}{c_1}\right)^{0,4} \cdot \left(\frac{10}{d_s}\right)^{0,25}$
 l_j = anchorage length of a stirrup leg in the concrete cone [mm]
 = $c_1 - c_c - 0.7 \cdot (e_j - b_{ch})$ [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
 $\geq 4 \cdot d_s$
- c_1 = edge distance [mm]
 c_c = concrete cover [mm]
 e_j = distance of the stirrup leg to the point of load action [mm]
 b_{ch} = width of the anchor channel [mm] (acc. to Table 2)
 A_s = cross section of one leg of the stirrup [mm²]
 $f_{y,k}$ = characteristic yield strength of the reinforcement [N/mm²]
 f_{ck} = char. 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
 $x = e_s/z + 1$ [-]
 factor taking into account eccentricity between reinforcement force and load
 e_s = distance between reinforcement and shear force acting on the anchor channel according to CEN/TS 1992-4-3 chap. 5.3.4
 z = internal lever arm
 $\approx 0.85d$ [mm] ; $d = \min(2 \cdot h_{ef} / 2 \cdot c_1)$
 $V_{Rk,c}^0$ = acc. CEN/TS 1992-4-3: 2009, section 6.3.5.3
 V_{Ed}^a = acc. CEN/TS 1992-4-1: 2009, section 3.2.2

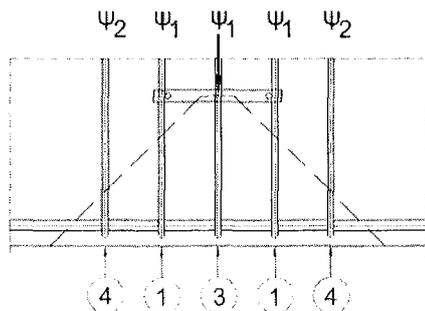


Fig. 1: Effectiveness factor for one load

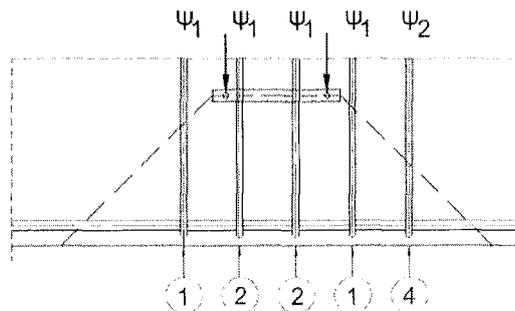


Fig. 2: Effectiveness factor for two loads

HALFEN Anchor Channel HTA

**model for reinforcement
 under shear loading towards the edge**

Annex 17

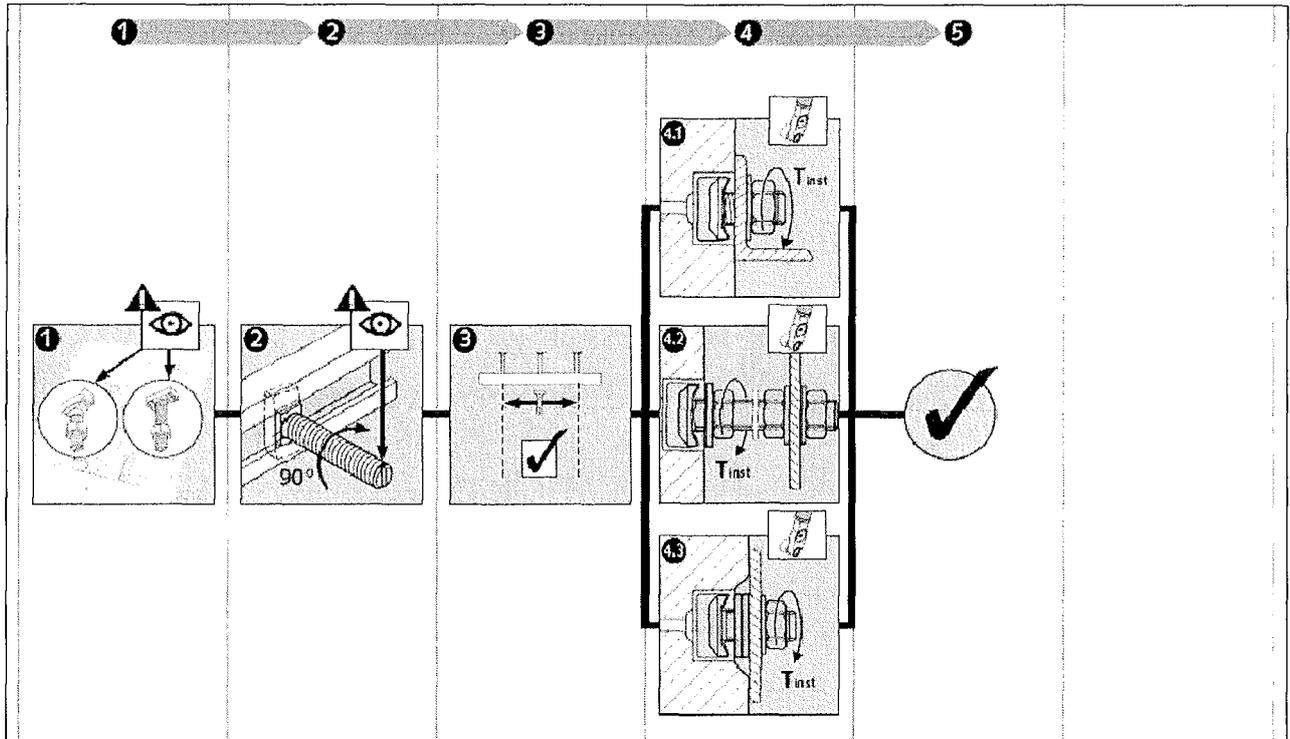
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 technical approval

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	<p>1 Selection of anchor channel, in accordance to the planning document</p> <p>2 Placing channel into formwork</p> <p>3 Cast in and compact the concrete</p> <p>4 Hardening of the concrete</p> <p>5 Striking the formwork</p> <p>6 Removing the foam filler 6.1 Polystyrene bed filler 6.2 Combination strip filler</p> <p>7 Installation of the anchor-channel is finished</p>
<p>HALFEN Anchor Channel HTA</p> <p>Manufacturers' specification anchor channel</p>	<p>Annex 18</p> <p>of European technical approval</p> <p>ETA- 09/0339</p>

- 2.1 steel formwork: Fixing with HALFEN special screws through the form
- 2.2 steel formwork: Fixing with rivets
- 2.3 wood formwork: Fixing with nails
- 2.4 wood formwork: Fixing with staples
- 2.5 fixing in the top surface of concrete: Fixing by using auxiliary construction
- 2.6 fixing in the top surface of concrete: Fixing from above directly to the reinforcement
- 2.7 fixing in the top surface of concrete: Fixing to the reinforcement, using the HALFEN ChanClip

Installation of HALFEN special screws



Selection of the HALFEN special screws in accordance with the planning document

Insert the special screw into the channel. After a 90° turn clockwise, the special screw locks into the channel. (Check of the position of the screw by notch)

Positioning of the special screw: At the channel ends a minimum clearance must be maintained, which corresponds with the overhang beyond the last anchor acc. Annex 6.

Tighten the hexagonal nut to the setting torque (T_{inst}) acc. Table 20. T_{inst} must not be exceeded.
4.1: general
4.2 and 4.3: steel to steel contact

After fixing the nuts: check the correct position of the screw: If the notch is not perpendicular to the channel length axis, the special screw must be released completely, inserted and tightened again.

Fixing is completed

Table 20: Setting torques

Position of fixture (acc. Ann.10)	Strength/ Material grade	Anchor channel	T_{inst} [Nm] ¹⁾								
			M8	M10	M12	M16	M20	M24	M27	M30	
general	4.6 8.8 A4-50 A4-70 F4-70	28/15	8	13	15	-	-	-	-	-	
		38/17	-	15	25	40	-	-	-	-	
		40/25	-	15	25	45	-	-	-	-	
		40/22	-	15	25	45	-	-	-	-	
		49/30	-	15	25	60	75	-	-	-	
		50/30	-	15	25	60	75	-	-	-	
		54/33	-	15	25	60	120	-	-	-	
		53/34	-	15	25	60	120	-	-	-	
Steel to steel contact	4.6 A4-70 8.8 A4-70 F4-70	all anchor channels	55/42	-	15	25	60	120	200	-	-
			72/49	-	-	-	-	120	200	300	380
			72/48	-	-	-	-	120	200	300	380
			8	15	25	65	130	230	340	460	
			20	40	70	180	360	620	900	1200	

¹⁾ T_{inst} must not be exceeded

HALFEN Anchor Channel HTA

**Manufacturer's specification
HALFEN special screw**

Annex 19

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