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
and Verwendungszweck
Generic type and use of construction product
Einbetonierte Ankerschiienen
Cast-in anchor channels

Geltungsdauer: vom
Validity: from
15 February 2010

bis to
15 February 2015

Herstellwerk
Manufacturing plant
Werk Langenfeld
Liebigstraße 14
40764 Langenfeld
I LEGAL BASES AND GENERAL CONDITIONS

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

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4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

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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 documentation 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.

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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
3. Steel failure - special screw
4. Steel failure - connection channel/ anchor
5. Steel failure - local flexure of channel lips
6. Steel failure - flexure resistance of channel
7. Steel failure - transfer of setting torque into prestressing force
8. Concrete failure - pullout
9. Concrete failure - concrete cone
10. Concrete failure - splitting due to installation
11. Concrete failure - splitting due to loading
12. Concrete failure - blow-out
13. Reinforcement
14. Displacement under tension loads

**Verifications for shear loads for**

1. Distribution of acting shear loads
2. Steel failure without lever arm - special screw
3. Steel failure without lever arm - flexure channel lips
4. Steel failure with lever arm
5. Concrete failure - pry-out
6. Concrete failure - concrete edge
7. Reinforcement
8. Displacement under shear loads

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 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 $h_{\text{min}}$ 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 $c_{\text{min}}$ indicated in Annex 8, Table 9 and 10 and $c_{\text{min, s}}$ indicated in Annex 9, Table 11.

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

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

The effective anchorage depth is not less than $\min h_{\text{eff}}$ 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. $T_{\text{inst}}$ 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
HALFEN Anchor Channel HTA

Product and intended use
Anchor channel hot rolled profile

2. Anchor (also possible as weld-on anchor, as I-profile or as round anchor)

1. Channel e.g. HTA 40/22

3. HALFEN-special screw e.g. HS M12 x 30

4. Washer

5. Hexagonal Nut

Legend
- \( h_{\text{ch}} \): Channel height
- \( b_{\text{ch}} \): Width of the channel
- \( h_{\text{ef}} \): Effective anchorage depth
- \( h_{\text{nom}} \): 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

HALFEN: Identifying mark of the producer
HTA 40/22: Type of anchor channel
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

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>
<thead>
<tr>
<th>Item no.</th>
<th>Specification</th>
<th>Intended use</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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)</td>
<td>Dry internal conditions</td>
<td>Stainless steel 1.4401/1.4404/1.4571 1.4362 EN 10088</td>
</tr>
<tr>
<td>2</td>
<td>Channel profile Steel 1.0038; 1.0044 EN 10025 hot-dip galv. ≥ 50 μm 6) Steel 1.0038; 1.0214, 1.0401, 1.1132, 1.5525 EN 10263, EN 10269 hot-dip galv. ≥ 50 μm 6)</td>
<td>Internal conditions with usual humidity</td>
<td>Stainless steel 1.4401/1.4404/1.4571 1.4362 EN 10088</td>
</tr>
<tr>
<td>3</td>
<td>HALFEN special screws shaft and thread according EN ISO 4018 Steel, strength grade 4.6 / 8.8 EN ISO 898-1 electroplated ≥ 5 μm 4)</td>
<td>Medium corrosion exposure</td>
<td>Stainless steel 1.4401/1.4404/1.4571 1.4362 EN ISO 3506-1</td>
</tr>
<tr>
<td>4</td>
<td>Washer, EN ISO 7089 and EN ISO 7093-1 production class A, 200 HV Steel EN 10025 electroplated ≥ 5 μm 4)</td>
<td>High corrosion exposure</td>
<td>Stainless steel 1.4401/1.4404/1.4571 1.4362 EN 10088</td>
</tr>
<tr>
<td>5</td>
<td>Hexagonal nuts EN ISO 4032 Steel strength grade 5/8 EN 20898-2 electroplated ≥ 5 μm 4)</td>
<td></td>
<td>Stainless steel 1.4401/1.4404/1.4571 EN ISO 3506-2</td>
</tr>
</tbody>
</table>

1) or electroplated special coating ≥ 12μm  
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 ≥50μm
Table 2: Geometrical profile properties

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>Figure</th>
<th>Dimensions [mm]</th>
<th>Material</th>
<th>( I_y ) [mm^4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>28/15</td>
<td>3</td>
<td>26.00 15.25 2.25 2.25 12.00 2.25</td>
<td>Steel</td>
<td>4060</td>
</tr>
<tr>
<td>38/17</td>
<td>3</td>
<td>38.00 17.50 3.00 3.00 18.00 3.00</td>
<td>Steel</td>
<td>8547</td>
</tr>
<tr>
<td>40/25</td>
<td>2</td>
<td>40.00 25.00 2.75 2.75 18.00 5.60</td>
<td>Steel</td>
<td>20570</td>
</tr>
<tr>
<td>49/30</td>
<td>2</td>
<td>50.00 30.00 3.00 3.00 22.00 7.39</td>
<td>Steel</td>
<td>41827</td>
</tr>
<tr>
<td>54/33</td>
<td>2</td>
<td>53.50 33.00 4.50 4.50 22.00 7.90</td>
<td>Steel</td>
<td>72079</td>
</tr>
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<td>72/49</td>
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<td>72.00 49.00 6.00 6.00 33.00 9.90</td>
<td>Steel</td>
<td>293579</td>
</tr>
<tr>
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<td>Stainless steel</td>
<td>19703</td>
</tr>
<tr>
<td>50/30</td>
<td>1</td>
<td>49.00 30.00 3.00 2.75 22.50 7.85</td>
<td>Stainless steel</td>
<td>51904</td>
</tr>
<tr>
<td>52/34</td>
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<td>52.50 33.50 4.10 4.00 22.50 10.50</td>
<td>Stainless steel</td>
<td>93252</td>
</tr>
<tr>
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<td>187464</td>
</tr>
<tr>
<td>72/48</td>
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<td>349721</td>
</tr>
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<td>28.00 15.25 2.25 2.25 12.00 2.25</td>
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<td>4060</td>
</tr>
<tr>
<td>38/17</td>
<td>3</td>
<td>38.00 17.50 3.00 3.00 18.00 3.00</td>
<td>Stainless steel</td>
<td>8547</td>
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<td>19097</td>
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<td>50.00 30.00 3.00 3.00 22.00 7.39</td>
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</tr>
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<td>54/33</td>
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<td>53.50 33.00 4.50 4.50 22.00 7.90</td>
<td>Stainless steel</td>
<td>72079</td>
</tr>
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<td>72.00 49.00 6.00 6.00 33.00 9.90</td>
<td>Stainless steel</td>
<td>293579</td>
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<td>1</td>
<td>39.50 23.00 2.40 2.40 18.00 6.00</td>
<td>Stainless steel</td>
<td>19759</td>
</tr>
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<td>50/30</td>
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<td>49.00 30.00 3.00 2.75 22.50 7.85</td>
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<td>52/34</td>
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<td>52.50 33.50 4.10 4.00 22.50 10.50</td>
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<td>72.00 48.50 4.50 5.00 33.00 15.50</td>
<td>Stainless steel</td>
<td>349721</td>
</tr>
</tbody>
</table>

HALFEN Anchor Channel HTA

Geometrical profile properties

Annex 4
of European technical approval
ETA- 09/0339
Table 3: Types of round anchors

<table>
<thead>
<tr>
<th>Type</th>
<th>Shaft $\varnothing$ $d_1$</th>
<th>Head $\varnothing$ $d_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>25</td>
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<tr>
<td>14</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Types of I-anchors

<table>
<thead>
<tr>
<th>Type</th>
<th>Height $h$</th>
<th>Head width $a$</th>
<th>Web thickness $t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 62</td>
<td>62</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>I 89</td>
<td>69</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>I 128</td>
<td>128</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>I 140</td>
<td>140</td>
<td>20</td>
<td>7.1</td>
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</tbody>
</table>

HALFEN Anchor Channel HTA

Types of anchor

Annex 5
of European technical approval

ETA- 09/0339
Table 5: Anchor positioning

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>Anchor spacing</th>
<th>End spacing x</th>
<th>min Channel length min l</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$S_{min}$</td>
<td>$S_{max}$</td>
<td>Round anchor Fig. 1</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
<td>--------</td>
<td>---------------------</td>
</tr>
<tr>
<td>28/15</td>
<td>50</td>
<td>200</td>
<td>25</td>
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<tr>
<td>38/17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40/22</td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>40/25</td>
<td>100 (50)</td>
<td>250</td>
<td>25</td>
</tr>
<tr>
<td>49/30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/30</td>
<td>100 (80)</td>
<td>250</td>
<td>35</td>
</tr>
<tr>
<td>52/34</td>
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<td>250</td>
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</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55/42</td>
<td>100 (80)</td>
<td>300</td>
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</tr>
<tr>
<td>72/48</td>
<td>100 (80)</td>
<td>400</td>
<td>35</td>
</tr>
<tr>
<td>72/49</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

( ) 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- special screw, Hook- head geometry

alternative Hook- head geometry

Table 6: Dimensions, special screw, Hook-head

<table>
<thead>
<tr>
<th>HS</th>
<th>Thread</th>
<th>Width</th>
<th>Length</th>
<th>b3</th>
<th>Thickness</th>
<th>Width</th>
<th>Length</th>
<th>Thickness</th>
<th>Length</th>
<th>Anchor channel</th>
</tr>
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<tbody>
<tr>
<td>40/22</td>
<td>M 10</td>
<td>15.0</td>
<td>30.8</td>
<td>16.0</td>
<td>7.5</td>
<td>14</td>
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<td>7</td>
<td>20-150</td>
<td>40/22</td>
</tr>
<tr>
<td>40/22</td>
<td>M 12</td>
<td>15.0</td>
<td>30.8</td>
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<td>17.4</td>
<td>30.3</td>
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<td>17</td>
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<td>50/30</td>
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<td>72/49</td>
</tr>
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<table>
<thead>
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<th>Thickness</th>
<th>Width</th>
<th>Length</th>
<th>Thickness</th>
<th>Length</th>
<th>Anchor channel</th>
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<td>22.7</td>
<td>(22.2)</td>
<td>4</td>
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<td>10.0</td>
<td>4.0</td>
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<tr>
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<td>(22.2)</td>
<td>4</td>
<td>10.6</td>
<td>21.1</td>
<td>10.0</td>
<td>4.5</td>
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<tr>
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<td>M 10</td>
<td>10.1</td>
<td>22.7</td>
<td>(22.2)</td>
<td>5 (4)</td>
<td>10.9</td>
<td>20.2</td>
<td>10.0</td>
<td>5.0</td>
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<td>10.1</td>
<td>22.7</td>
<td>(22.2)</td>
<td>5.5</td>
<td>10.8</td>
<td>20.1</td>
<td>-</td>
<td>6.5</td>
</tr>
<tr>
<td>38/17</td>
<td>M 10</td>
<td>13 (12)</td>
<td>30.5</td>
<td>6</td>
<td>13.6-14.1</td>
<td>29.0</td>
<td>15.5</td>
<td>6.0</td>
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<td>38/17</td>
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<td>13 (12)</td>
<td>30.5</td>
<td>7 (6)</td>
<td>13.6-14.1</td>
<td>29.0</td>
<td>15.5</td>
<td>6.0</td>
<td>20-200</td>
</tr>
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<td>30.5</td>
<td>7</td>
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<td>29.0</td>
<td>15.5</td>
<td>8.5</td>
<td>20-200</td>
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Table 7: Dimensions, special screw, Hammer-head

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<th>k</th>
<th>Thickness</th>
<th>Width</th>
<th>Length</th>
<th>b3</th>
<th>Thickness</th>
<th>Length</th>
<th>Anchor channel</th>
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<tr>
<td>28/15</td>
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<td>10.1</td>
<td>22.7</td>
<td>(22.2)</td>
<td>4</td>
<td>10.6</td>
<td>21.1</td>
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<td>4.0</td>
<td>15-60</td>
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<td>(22.2)</td>
<td>4</td>
<td>10.6</td>
<td>21.1</td>
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<td>4.5</td>
<td>15-150</td>
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<td>28/15</td>
<td>M 10</td>
<td>10.1</td>
<td>22.7</td>
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<td>5 (4)</td>
<td>10.9</td>
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<td>5.0</td>
<td>15-200</td>
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<td>M 12</td>
<td>10.1</td>
<td>22.7</td>
<td>(22.2)</td>
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<tr>
<td>38/17</td>
<td>M 10</td>
<td>13 (12)</td>
<td>30.5</td>
<td>6</td>
<td>13.6-14.1</td>
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<td>6.0</td>
<td>20-175</td>
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<tr>
<td>38/17</td>
<td>M 12</td>
<td>13 (12)</td>
<td>30.5</td>
<td>7 (6)</td>
<td>13.6-14.1</td>
<td>29.0</td>
<td>15.5</td>
<td>6.0</td>
<td>20-200</td>
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<td></td>
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<tr>
<td>38/17</td>
<td>M 16</td>
<td>16</td>
<td>30.5</td>
<td>7</td>
<td>16.0</td>
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<td>15.5</td>
<td>8.5</td>
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Table 8: Strength grade

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<th>Stainless steel</th>
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<td>Strength grade</td>
<td>4.6</td>
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<tr>
<td>( f_y ) [N/mm²]</td>
<td>400</td>
</tr>
<tr>
<td>( f_y ) [N/mm²]</td>
<td>240</td>
</tr>
<tr>
<td>Finish</td>
<td>gy, fV</td>
</tr>
</tbody>
</table>

HALFEN Anchor Channel HTA

Halfen-special screws, dimensions, strength grade

Annex 7
of European technical approval

ETA- 09/0339
Table 9: Minimum anchorage depth, edge distance and member thickness for cold rolled profiles

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
<th>40/25</th>
<th>49/30</th>
<th>54/33</th>
<th>72/49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. anchorage depth</td>
<td>$h_{\text{ref}}$</td>
<td>45</td>
<td>76</td>
<td>79</td>
<td>94</td>
<td>155</td>
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<tr>
<td>Min. edge distance</td>
<td>$c_{\text{min}}$</td>
<td>40</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Min. member thickness</td>
<td>$h_{\text{min}}$</td>
<td>$h_{\text{ref}} + \Delta^1 + c_{\text{nom}}$</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>40/22</th>
<th>50/30</th>
<th>52/34</th>
<th>55/42</th>
<th>72/48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. anchorage depth</td>
<td>$h_{\text{ref}}$</td>
<td>min</td>
<td>79</td>
<td>94</td>
<td>155</td>
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<tr>
<td>Min. edge distance</td>
<td>$c_{\text{min}}$</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Min. member thickness</td>
<td>$h_{\text{min}}$</td>
<td>$h_{\text{ref}} + \Delta^1 + c_{\text{nom}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^1$ $\Delta$ = anchor head thickness  
$^2$ $c_{\text{min}}, s_{\text{max}}$ acc. to Table 5, Annex 6  
$^3$ $c_{\text{max}}, s_{\text{max}}$ acc. to Table 11, Annex 9 subjected to special screw Ø

HALFEN Anchor Channel HTA

Installation parameters of cold rolled and hot rolled anchor channels

Annex 8
of European technical approval

ETA- 09/0339
Table 11: Minimum edge distance, spacing and setting torque of HALFEN – special screws

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>Special screw Ø</th>
<th>Min. edge distance $c_{\text{min,s}}$ and min. spacing $s_{\text{min,s}}$ of the special screws</th>
<th>Setting Torque $T_{\text{inst}}$ (^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>General (^2)</td>
</tr>
<tr>
<td></td>
<td>[mm]</td>
<td>[mm]</td>
<td>Steel – steel contact (^3)</td>
</tr>
<tr>
<td>28/15</td>
<td>6</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>40</td>
<td>4.6; 8.8; A4 – 50; A4 – 70 (^1)</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>50</td>
<td>4.6; A4 – 50 (^1)</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>80</td>
<td>8.8; A4 – 70 (^1)</td>
</tr>
<tr>
<td>38/17</td>
<td>10</td>
<td>50</td>
<td>4.6; 8.8; A4 – 50; A4 – 70 (^1)</td>
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<td></td>
<td>16</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>40/22/40/25</td>
<td>10</td>
<td>50</td>
<td>4.6; 8.8; A4 – 50; A4 – 70 (^1)</td>
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<td>16</td>
<td>80</td>
<td></td>
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<td>49/30/50/30</td>
<td>10</td>
<td>50</td>
<td>4.6; 8.8; A4 – 50; A4 – 70 (^1)</td>
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<td>4.6; A4 – 50 (^1)</td>
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<td>16</td>
<td>80</td>
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<tr>
<td>52/34/54/33</td>
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<td>12</td>
<td>60</td>
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<td>16</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>55/42</td>
<td>10</td>
<td>50</td>
<td></td>
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<tr>
<td></td>
<td>12</td>
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<td>16</td>
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<td></td>
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<tr>
<td>72/48/72/49</td>
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<td>24</td>
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<td>27</td>
<td>135</td>
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</tr>
<tr>
<td></td>
<td>30</td>
<td>150</td>
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</tr>
</tbody>
</table>

1\(^\text{)}) Materials according to Tab. 1, Annex 3
2\(^\text{)}) Acc. to figure 1, Annex 10
3\(^\text{)}) According to figure 2, Annex 10
4\(^\text{)}) See Annex 8, plan view
5\(^\text{)}) See Annex 11, Fig. 1
6\(^\text{)}) $T_{\text{inst}}$ must not be exceeded

HALFEN Anchor Channel HTA

Installation parameters of HALFEN – special screw

Annex 9

of European technical approval

ETA- 09/0339
**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**

[Diagram showing anchor channel HTA with washer]
Table 12: Characteristic values for tension loads - steel failure channel

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
<th>40/22</th>
<th>40/25</th>
<th>49/30</th>
<th>50/30</th>
<th>52/34</th>
<th>54/33</th>
<th>55/42</th>
<th>72/48</th>
<th>72/49</th>
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<tr>
<td>Characteristic resistance</td>
<td>$N_{Rk,s,a}$ [kN]</td>
<td>not relevant</td>
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<tr>
<td>Partial safety factor</td>
<td>$\gamma_{Ms,1}^{1)}$</td>
<td>1.8</td>
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<td>Steel failure, connection channel anchor</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic resistance</td>
<td>$N_{Rk,s,c}$ [kN]</td>
<td>9</td>
<td>18</td>
<td>20</td>
<td>31</td>
<td>55</td>
<td>80</td>
<td>100</td>
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</tr>
<tr>
<td>Partial safety factor</td>
<td>$\gamma_{Ms,cs,1}^{2)}$</td>
<td>1.8</td>
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<tr>
<td>Steel failure, local flexure of channel lips for $s_a \geq s_{slb}$</td>
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<td></td>
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</tr>
<tr>
<td>Spacing of special screws for $N_{Rk,s,i}$</td>
<td>$s_{slb}$ [mm]</td>
<td>42</td>
<td>52</td>
<td>65</td>
<td>81</td>
<td>88</td>
<td>109</td>
<td>129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic resistance</td>
<td>$N_{Rk,s,i}$ [kN]</td>
<td>9</td>
<td>18</td>
<td>20</td>
<td>31</td>
<td>55</td>
<td>80</td>
<td>100</td>
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</tr>
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<td>Partial safety factor</td>
<td>$\gamma_{Ms,i}^{3)}$</td>
<td>1.8</td>
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<tr>
<td>Steel failure, local flexure of channel lips for $s_{slb} \geq s_a \geq s_{min,s}$</td>
<td></td>
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</tr>
<tr>
<td>Characteristic resistance</td>
<td>$N_{Rk,s,i}$ [kN]</td>
<td>0.5 $(1+s_a/s_{slb}) N_{Rk,s,i} \leq N_{Rk,s,c}$</td>
<td></td>
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</tr>
<tr>
<td>Partial safety factor</td>
<td>$\gamma_{Ms,i}^{3)}$</td>
<td>1.8</td>
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</tbody>
</table>

$^{1)}$ in absence of other national regulations  
$^{2)}$ $s_{min,s}$ acc. to Table 11, Annex 9

Fig. 1

![Figure 1](image1)

Fig. 2: Assumption of system

![Figure 2](image2)

Table 13: Flexure resistance of channel

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
<th>40/25</th>
<th>49/30</th>
<th>54/33</th>
<th>72/49</th>
<th>40/22</th>
<th>50/30</th>
<th>52/34</th>
<th>55/42</th>
<th>72/48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic flexure resistance of channel</td>
<td>$M_{Rk,s,flex}$ [Nm]</td>
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<tr>
<td>Steel</td>
<td>317</td>
<td>580</td>
<td>1099</td>
<td>1673</td>
<td>2984</td>
<td>8617</td>
<td>1076</td>
<td>2038</td>
<td>3373</td>
<td>6447</td>
<td>8593</td>
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<tr>
<td>Stainless steel</td>
<td>324</td>
<td>593</td>
<td>1071</td>
<td>1708</td>
<td>2984</td>
<td>8617</td>
<td>1080</td>
<td>2081</td>
<td>3445</td>
<td>-</td>
<td>8775</td>
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<td>Partial safety factor</td>
<td>$\gamma_{Ms,flex}^{4)}$</td>
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</tbody>
</table>

$^{4)}$ in absence of other national regulations

HALFEN Anchor Channel HTA

Annex 11

Characteristic values for tension loads - steel failure channel

ETA- 09/0339
### Table 14: Characteristic values for tension load - steel failure of HALFEN-special screws

<table>
<thead>
<tr>
<th>Special Screw Ø</th>
<th>M 6</th>
<th>M 8</th>
<th>M 10</th>
<th>M 12</th>
<th>M 16</th>
<th>M 20</th>
<th>M 24</th>
<th>M 27</th>
<th>M 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic resistance (N&lt;sub&gt;max,s&lt;/sub&gt;)&lt;sup&gt;1)&lt;/sup&gt; (kN)</td>
<td>8.8</td>
<td>16.1</td>
<td>29.3</td>
<td>46.4</td>
<td>67.4</td>
<td>125.6</td>
<td>196.0</td>
<td>282.4</td>
<td>367.2</td>
</tr>
<tr>
<td>Partial safety factor (Y&lt;sub&gt;max&lt;/sub&gt;)&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>1.50</td>
<td>1.97</td>
<td>2.00</td>
<td>2.06</td>
<td>2.08</td>
<td>2.15</td>
<td>2.22</td>
<td>2.29</td>
<td>2.36</td>
</tr>
</tbody>
</table>

<sup>1)</sup> Materials according to EN ISO 8841:1989
<sup>2)</sup> In absence of other national regulations

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**HALFEN Anchor Channel HTA**

**Characteristic values for tension loads - steel failure special screws**

**Annex 12**

of European technical approval

**ETA- 09/0339**
Table 15: Characteristic values for tension loads – concrete failure

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
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<th>40/22</th>
<th>49/30</th>
<th>50/30</th>
<th>54/33</th>
<th>52/34</th>
<th>55/42</th>
<th>72/49</th>
<th>72/48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pullout failure</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic resistance in cracked concrete C12/15</td>
<td>$N_{Rk,p}$ [kN]</td>
<td>7.6</td>
<td>13.5</td>
<td>13.5</td>
<td>21.1</td>
<td>33.9</td>
<td>41.5</td>
<td>54.3</td>
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</tr>
<tr>
<td>Welded anchors</td>
<td>$\Psi_c$ [-]</td>
<td>11.7</td>
<td>11.7</td>
<td>14.0</td>
<td>21.1</td>
<td>25.7</td>
<td>37.2</td>
<td>46.4</td>
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<tr>
<td>Increasing factor for $N_{Rk,p}$</td>
<td>$\Psi_{ker,N}$</td>
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<td>1.4</td>
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</tr>
<tr>
<td>Concrete cone failure $N_{Rk,c}$ see CEN/TS 1992-4-3 section 6.2.5</td>
<td>$\gamma_{M_b} \times \gamma_{M_c}$</td>
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<tr>
<td>Effective anchorage depth</td>
<td>$a_{eh}$</td>
<td>0.81</td>
<td>0.88</td>
<td>0.88</td>
<td>0.91</td>
<td>0.98</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Characteristic edge distance</td>
<td>$h_{er}$</td>
<td>45</td>
<td>76</td>
<td>79</td>
<td>94</td>
<td>155</td>
<td>175</td>
<td>179</td>
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<tr>
<td>Characteristic spacing</td>
<td>$c_{er,N}$ [mm]</td>
<td>111</td>
<td>171</td>
<td>176</td>
<td>199</td>
<td>260</td>
<td>269</td>
<td>270</td>
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<tr>
<td>$\Psi_{ker,N}$</td>
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<td>Partial safety factor</td>
<td>$\gamma_{Ac}$</td>
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<td>Splitting</td>
<td>Verification of splitting is not relevant</td>
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</table>

Table 16: Displacements under tension loads

<table>
<thead>
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<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
<th>40/25</th>
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<th>52/34</th>
<th>55/42</th>
<th>72/49</th>
<th>72/48</th>
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</thead>
<tbody>
<tr>
<td>Tension load $N_{Ek}$ [kN]</td>
<td>3.6</td>
<td>7.1</td>
<td>8.3</td>
<td>12.3</td>
<td>21.8</td>
<td>31.7</td>
<td>39.7</td>
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<tr>
<td>Short time displacement $\delta_{N0}$ [mm]</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
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<td>0.5</td>
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<tr>
<td>Long time displacement $\delta_N$ [mm]</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
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</table>

HALFEN Anchor Channel HTA

Characteristic values for tension loads - concrete failure and displacements

Annex 13
of European technical approval

ETA- 09/0339
Table 17: Characteristic values for shear loads

<table>
<thead>
<tr>
<th>Anchor channel</th>
<th>28/15</th>
<th>38/17</th>
<th>40/25</th>
<th>40/22</th>
<th>49/30</th>
<th>50/30</th>
<th>54/33</th>
<th>52/34</th>
<th>55/42</th>
<th>72/49</th>
<th>72/48</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel failure, local flexure of channel lips</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic resistance $V_{Rk,s,l}$ [kN]</td>
<td>9</td>
<td>18</td>
<td>20</td>
<td>31</td>
<td>55</td>
<td>104</td>
<td>100</td>
<td>130</td>
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</tr>
<tr>
<td>Partial safety factor $\gamma_{Mk,l}$</td>
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<td></td>
<td></td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pry out failure</strong></td>
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</tr>
<tr>
<td>Factor k in equation (31) of CEN/TS 1992-4-3 $k_s$</td>
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</tr>
<tr>
<td>Partial safety factor $\gamma_{Mk}$</td>
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<td></td>
<td></td>
<td>1.5</td>
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<td></td>
</tr>
<tr>
<td><strong>Concrete edge failure</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Crack</td>
<td>$\alpha_p \cdot \Psi_{s,e,V}$</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracked concrete with straight edge reinforcement (≥Ø 12 mm)</td>
<td>$\alpha_p \cdot \Psi_{s,e,V}$</td>
<td>3.0</td>
<td>3.5</td>
<td>3.5</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>4.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-cracked concrete or cracked concrete with edge reinforcement and stirrups with a spacing as 100 mm and $\leq 2c_t$</td>
<td>$\alpha_p \cdot \Psi_{s,e,V}$</td>
<td>3.5</td>
<td>4.0</td>
<td>4.0</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>5.3</td>
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</tr>
<tr>
<td>Effect of the thickness of the structural component</td>
<td>$\alpha_{h,V}$</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>$(h/h_{cr,V})^{2/3}$</td>
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</tr>
<tr>
<td>Characteristic height</td>
<td>$h_{cr,V}$</td>
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<td>$2c_t + 2h_{ch}$</td>
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<tr>
<td>Characteristic edge distance</td>
<td>$c_{cr,V}$</td>
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<td></td>
<td></td>
<td>$2c_t + b_{ch}$</td>
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</tr>
<tr>
<td>Characteristic spacing</td>
<td>$s_{cr,V}$</td>
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<td></td>
<td></td>
<td>$4c_t + 2b_{ch}$</td>
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<tr>
<td>Partial safety factor</td>
<td>$\gamma_{Mk}$</td>
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<td>1.5</td>
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</tr>
</tbody>
</table>

1) in absence of other national regulations


3) Without supplementary reinforcement. In case of supplementary reinforcement the factor $k_s$ should be multiplied with 0.75
### Table 18: Characteristic values for shear load - steel failure of HALFEN-special screws

<table>
<thead>
<tr>
<th>Characteristic resistance</th>
<th>( V_{\text{Ir,k,e}} ) ( \geq ) [kN]</th>
<th>( M_{\text{f,k,e}} ) ( \geq ) [Nm]</th>
<th>( V_{\text{Ms,e}} ) ( \geq ) [kN]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel failure 2)</strong></td>
<td>4.6</td>
<td>4.6</td>
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<td>224.4</td>
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<td>224.4</td>
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<tr>
<td>A4-50 (^1)</td>
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<td>A4-70 (^1)</td>
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<td>A4-50 (^1)</td>
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<td>A4-70 (^1)</td>
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<td>A4-50 (^1)</td>
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<td>A4-70 (^1)</td>
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1) Materials according Table 1, Annex 3
2) In conformity to DIN EN 898-1:1999
3) in absence of other national regulations
Verification for anchor channels for shear loads with reinforcement (only for loading perpendicular to the edge)

\[ V_{Ed} \leq V_{Rd, re} = V_{Rk, re}/\gamma_M \]
\[ V_{Ed} = \max\left[V_{Ed}, V_{Ed}^a\right] \]  \hspace{1cm} (1)
\[ V_{Rk, re} = V_{Rk, c, re}/\chi \]  \hspace{1cm} (2)
\[ V_{Rk, c, re} = V_{Rk, c, hook} + V_{Rk, c, bond} \leq V_{Rk, c, re, max} \]  \hspace{1cm} (3)
\[ \sum_{m+n} A_s \cdot f_{y,k} \]
\[ V_{Rk, c, hook} = \sum_{j=1}^m \left(\psi_1 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{y,k} \cdot \left(\frac{f_{pk}}{30}\right)^{0.1}\right) + \sum_{j=1}^n \left(\psi_2 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{y,k} \cdot \left(\frac{f_{pk}}{30}\right)^{0.1}\right) \]  \hspace{1cm} (4)
\[ V_{Rk, c, bond} = \sum_{j=1}^{m+n} (\pi \cdot d_s \cdot l_i \cdot f_{b,k}) \]  \hspace{1cm} (5)
\[ V_{Rk, c, re, max} = 4,2 \cdot c_i^{-0.12} \cdot V_{Rk, c} \]  \hspace{1cm} (6)
\[ V_{Rk, c} = V_{Rk, c}^0 \cdot \alpha_{s,v} \cdot \alpha_{c,v} \cdot \alpha_{h,v} \]  \hspace{1cm} (7)

Reinforcement requirements

\[ 50 \text{ mm} \leq a \leq \begin{cases} s \\ 150 \text{ mm} \\ \left((c_i - c_c + 0,7 \cdot b_{ch} - 4 \cdot d_s)/0,35ight) \\ c_1 - c_c \end{cases} \]  \hspace{1cm} (8)
\[ 6 \text{ mm} \leq d_s \leq 20 \text{ mm} \]  \hspace{1cm} (9)
\[ \Psi_1 = \text{effectiveness factor} \]
\[ = 0.67 \text{ for stirrups directly besides a shear load} \quad (1) \]
\[ \text{• for a stirrup at the location of a shear load} \quad (2) \]
\[ \text{• for a stirrup between 2 shear loads acting on an anchor channel (distance between the loads } \rho \leq s_{cr,v} \text{ according to Table 17)} \quad (3) \]
\[ \Psi_2 = \text{effectiveness factor} \quad (4) \]
\[ \Psi_3 = (d_{s,u}/d_s)^{0.33} \]
\[ d_s = \text{diameter of stirrup [mm]} \]
\[ d_{s,L} = \text{diameter of edge bars [mm]} \]
\[ \Psi_4 = \left( \frac{l_j}{c_1} \right)^{0.4} \left( \frac{10}{d_j} \right)^{0.25} \]
\[ l_j = \text{anchorage length of a stirrup leg in the concrete cone [mm]} \]
\[ c_1 = \text{edge distance [mm]} \]
\[ c_c = \text{concrete cover [mm]} \]
\[ c_{ij} = \text{distance of the stirrup leg to the point of load action [mm]} \]
\[ b_{ch} = \text{width of the anchor channel [mm] (acc. to Table 2)} \]
\[ A_s = \text{cross section of one leg of the stirrup [mm}^2] \]
\[ f_{yk} = \text{characteristic yield strength of the reinforcement [N/mm}^2] \]
\[ f_{ck} = \text{char. concrete strength measured on cubes with a side length of 150 mm [N/mm}^2] \]
\[ f_{bk} = \text{characteristic bond strength [N/mm}^2] \]
\[ m = \text{number of stirrups in the assumed concrete cone with } \Psi_1 \]
\[ n = \text{number of stirrups in the assumed concrete cone with } \Psi_2 \]
\[ a = \text{spacing of stirrups} \]
\[ x = \frac{\varepsilon}{z} + 1 \text{ [-]} \]
\[ e_{s} = \text{factor taking into account eccentricity between reinforcement force and load} \]
\[ e_{sl} = \text{distance between reinforcement and shear force acting on the anchor channel according to CEN/TS 1992-4-3 chap. 5.3.4} \]
\[ z = \text{internal lever arm} \]
\[ 0.85d \text{ [mm]} \quad ; \quad d = \min (2\cdot h_{ref} / 2\cdot c_1) \]
\[ V_{Rk,c} = \text{acc. CEN/TS 1992-4-3: 2009, section 6.3.5.3} \]
\[ V_{Ed} = \text{acc. CEN/TS 1992-4-1: 2009, section 3.2.2} \]

**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**

of European technical approval

**ETA- 09/0339**
Selection of anchor channel, in accordance to the planning document
Placing channel into formwork
Cast in and compact the concrete
Hardening of the concrete
Striking the formwork
Removing the foam filler
6.1 Polystyrene bed filler
6.2 Combination strip filler
Installation of the anchor-channel is finished

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

1. Selection of the HALFEN special screws in accordance with the planning document
2. 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)
3. 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.
4. Tighten the hexagonal nut to the setting torque ($T_{net}$) acc. Table 20. $T_{net}$ must not be exceeded.
5. 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

<table>
<thead>
<tr>
<th>Position of fixture (acc. Ann.10)</th>
<th>Strength/ Material grade</th>
<th>Anchor channel</th>
<th>M8</th>
<th>M10</th>
<th>M12</th>
<th>M16</th>
<th>M20</th>
<th>M24</th>
<th>M27</th>
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<td>38/17</td>
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<td>25</td>
<td>40</td>
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<td>25</td>
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<td>25</td>
<td>60</td>
<td>75</td>
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<td>F4-70</td>
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<td>25</td>
<td>60</td>
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<td>25</td>
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<td>120</td>
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<td>Steel to steel contact</td>
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</tbody>
</table>

$T_{net}$ must not be exceeded

HALFEN Anchor Channel HTA

Manufacturer’s specification
HALFEN special screw

Annex 19
of European technical approval
ETA- 09/0339
HALFEN is represented in more than 45 countries worldwide. Please contact us: www.halfen.com

The Quality Management System of Halfen GmbH is certified for the locations in Germany, Austria, Poland, Switzerland and the Czech Republic according to DIN EN ISO 9001:2008, Certificate No. QS-281 HH.