Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment

# ETA-11/0006 of 24 October 2022

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | Hilti anchor channels (HAC) with channel bolts (HBC) |
| Product family to which the construction product belongs | Anchor channels |
| Manufacturer | Hilti AG<br>Feldkircherstraße 100<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Manufacturing plant | Hilti Werke |
| This European Technical Assessment contains | 40 pages including 3 annexes which form an integral part of this assessment |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of | EAD 330008-04-0601, Edition 06/2022 |
| This version replaces | ETA-11/0006 issued on 27 September 2019 |

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## Specific Part

### 1 Technical description of the product

The Hilti anchor channel (HAC) with channel bolts (HBC) is a system consisting of V-shaped channel profile of carbon steel and at least two metal anchors non-detachably fixed to the channel back and channel bolts.

The anchor channel is embedded surface-flush in the concrete. Hilti channel bolts with appropriate hexagon nuts and washers are fixed to the channel.

The product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor channel is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor channel of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

### 3 Performance of the product and references to the methods used for its assessment

### 3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic | Performance |
|---|---|
| Characteristic resistance under tension load (static and quasi-static loading) | |
| - Resistance to steel failure of anchors | $N_{Rk,s,a}$ see Annex C1 and C2 |
| - Resistance to steel failure of the connection between anchors and channel | $N_{Rk,s,c}$ see Annex C1 and C2 |
| - Resistance to steel failure of channel lips and subsequently pull-out of channel bolt | $N^0_{Rk,s,l}$ ; $s_{l,N}$ see Annex C1 and C2 |
| - Resistance to steel failure of channel bolt | $N_{Rk,s}$ see Annex C9 |
| - Resistance to steel failure by exceeding the bending strength of the channel | $s_{max}$ see Annex B3<br>$M_{Rk,s,flex}$ see Annex C1 and C2 |
| - Maximum installation torque to avoid damage during installation | $T_{inst,g}$ ; $T_{inst,s}$ see Annex B5 |
| - Resistance to pull-out failure of the anchor | $N_{Rk,p}$ see Annex C3 and C4 |
| - Resistance to concrete cone failure | $h_{ef}$ see Annex B3 and B4<br>$k_{cr,N}$ ; $k_{ucr,N}$ see Annex C3 and C4 |
| - Minimum edge distances, spacing and member thickness to avoid concrete splitting during installation | $s_{min}$ ; $c_{min}$ ; $h_{min}$ see Annex B3 and B4 |
| - Characteristic edge distance and spacing to avoid splitting of concrete under load | $s_{cr,sp}$ ; $c_{cr,sp}$ see Annex C3 and C4 |
| - Resistance to blowout failure - bearing area of anchor head | $A_h$ see Annex A4 |

| **Essential characteristic** | **Performance** |
|---|---|
| Characteristic resistance under shear load (static and quasi-static loading) | |
| - Resistance to steel failure of channel bolt under shear loading without lever arm | $V_{Rk,s}$ see Annex C9 |
| - Resistance to steel failure by bending of the channel bolt under shear load with lever arm | $M^0_{Rk,s}$ see Annex C10 |
| - Resistance to steel failure of channel lips, steel failure of connection between anchor and channel and steel failure of anchor (shear load in transverse direction) | $V^0_{Rk,s,l,y}$ ; $s_{l,V}$ ; $V_{Rk,s,c,y}$ ; $V_{Rk,s,a,y}$ see Annex C5 and C6 |
| - Resistance to steel failure of connection between channel lips and channel bolt (shear load in longitudinal channel axis) | $V_{Rk,s,l,x}$ see Annex C7 |
| - Factor for sensitivity to installation (longitudinal shear) | $\gamma_{inst}$ see Annex C7 |
| - Resistance to steel failure of the anchor (longitudinal shear) | $V_{Rk,s,a,x}$ see Annex C5 and C6 |
| - Resistance to steel failure of connection between anchor and channel (longitudinal shear) | $V_{Rk,s,c,x}$ see Annex C5 and C6 |
| - Resistance to concrete pry-out failure | $k_8$ see Annex C7 |
| - Resistance to concrete edge failure | $k_{cr,V}$ ; $k_{ucr,V}$ see Annex C7 |
| Characteristic resistance under combined tension and shear load (static and quasi-static load) | |
| - Resistance to steel failure of the anchor channel | $k_{13}$ ; $k_{14}$ see Annex C8 |
| Characteristic resistance under fatigue tension loading | |
| - Fatigue resistance to steel failure of the whole system (continuous or tri-linear function, test method A1, A2) | $\Delta N_{Rk,s,0,n}$ ($n$ = 1 to $n$ = ∞) see Annex C11 |
| - Fatigue limit resistance to steel failure of the whole system (test method B) | $\Delta N_{Rk,s,0,\infty}$ see Annex C12 |
| - Fatigue resistance to concrete related failure (exponential function, test method A1, A2) | $\Delta N_{Rk,c,0,n}$ ; $\Delta N_{Rk,p,0,n}$ ($n$ = 1 to $n$ = ∞) see Annex C12 |
| - Fatigue limit resistance to concrete related failure (test method B) | $\Delta N_{Rk,c,0,\infty}$ ; $\Delta N_{Rk,p,0,\infty}$ see Annex C12 |

| Essential characteristic | Performance |
|---|---|
| Characteristic resistance under seismic loading (seismic performance category C1) | |
| - Resistance to steel failure under seismic tension loading (seismic performance category C1) | $N_{Rk,s,a.eq}$ ; $N_{Rk,s,c.eq}$ ; $N^0{}_{Rk,s,l.eq}$ ; $N_{Rk,s.eq}$ ; $M_{Rk,s,flex.eq}$ see Annex C13 and C16 |
| - Resistance to steel failure under seismic shear loading for shear load in transverse direction (seismic performance category C1) | $V_{Rk,s.eq}$ ; $V^0{}_{Rk,s,l,y.eq}$ ; $V_{Rk,s,c,y.eq}$ ; $V_{Rk,s,a,y.eq}$ see Annex C14 and C16 |
| - Resistance to steel failure under seismic shear loading for shear load in longitudinal channel axis (seismic performance category C1) | $V_{Rk,s,l,x.eq}$ ; $V_{Rk,s,a,x.eq}$ ; $V_{Rk,s,c,x.eq}$ see Annex C14 and C15 |
| Characteristic resistance under static and quasi-static tension and/or shear loading | |
| - Displacements (static and quasi-static load) | $\delta_{N0}$ ; $\delta_{N\infty}$ see Annex C5 $\delta_{V,y,0}$ ; $\delta_{V,y,\infty}$ ; $\delta_{V,x,0}$ ; $\delta_{V,x,\infty}$ see Annex C8 |

### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Class A1 |
| Resistance to fire | See Annex C17 and C18 |

### 3.3 Other essential characteristics

| Essential characteristic | Performance |
|---|---|
| Durability | See Annex B1 |

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

In accordance with EAD No. 330008-04-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1

## 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

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

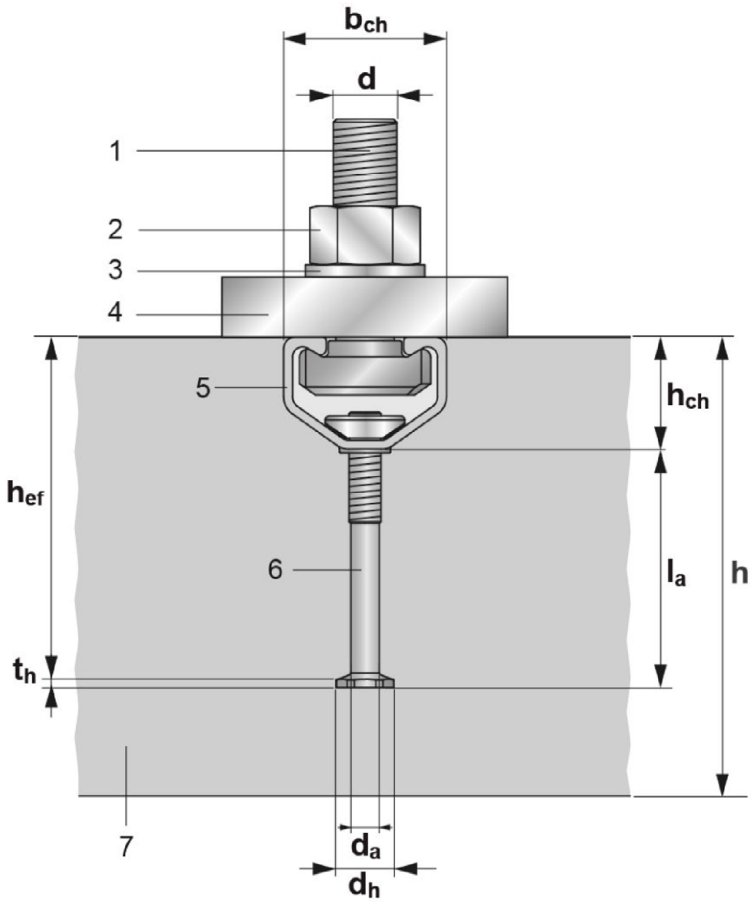
Issued in Berlin on 24 October 2022 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

*beglaubigt:*
Müller

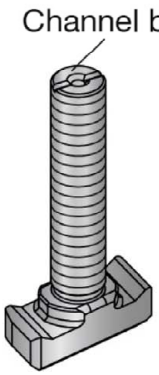
Deutsches Institut für Bautechnik DIBt

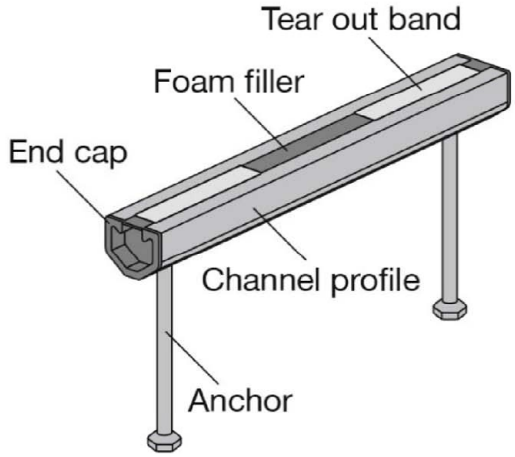
## Product and installation condition




**Key**

1 channel bolt
2 hexagonal nut
3 washer
4 fixture
5 channel profile
6 anchor
7 concrete member



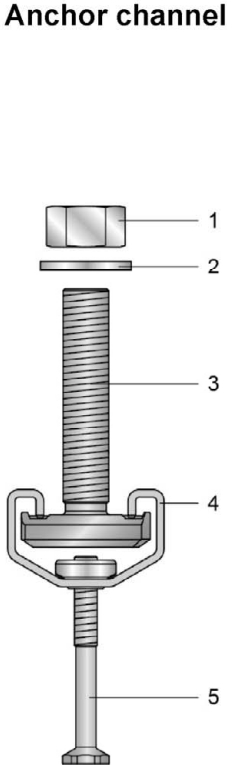




**Hilti anchor channels (HAC) with channel bolts (HBC)**

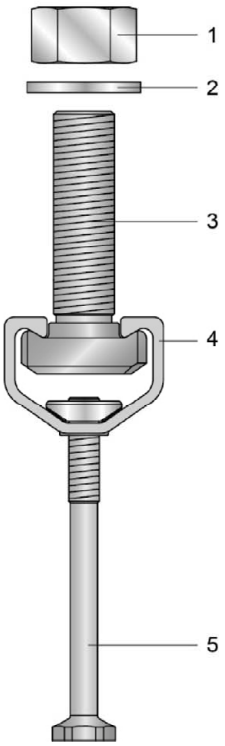
**Product Description**
Installed condition

Annex A1

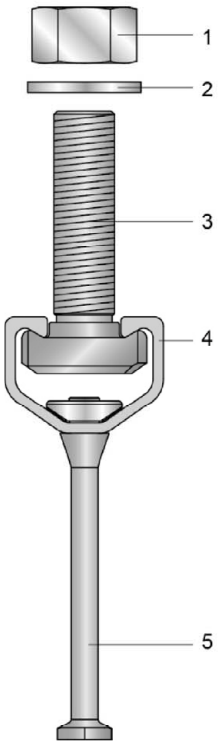
## Anchor channel types




HAC-30F
HAC-V-T 30F
with HBC-B




HAC-40F, HAC(-T)50F,
HAC-60F, HAC-(-T)70F
with HBC-C, HBC-C-E,
HBC-C-N and HBC-T




HAC-V 35, HAC-V 40F, HAC-V(-T) 50F
HAC-V 60F, HAC-V(-T) 70F
with HBC-C, HBC-C-E,
HBC-C-N and HBC-T

**Key**

1 hexagonal nut
2 washer
3 channel bolt
4 channel profile
5 anchor

### Marking of the Hilti anchor channel:

HAC-(T)XZ Y/W

HAC = Identifying mark of the manufacturer (**H**ilti **A**nchor **C**hannel)
T = Additional marking for serrated channels
X = Size of the channel
Z = Corrosion class
Y = Min effective embedment depth
W = Channel length



(e.g. HAC-40F 91/300)

40 = Anchor channel size 40
F = Hot dip galvanized
91 $h_{ef}$ = 91 mm minimum effective embedment depth (Identification letter “a” marked on the anchor)
300 $l_{ch}$ = 300 mm channel length

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Product Description**
Anchor channel types and marking

Annex A2

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**Table 1: Anchor marking (identification letter) and relative minimum effective embedment depth**

| Anchor channel | | HAC-V-T 30 | HAC-V 35 | HAC-V 40 | | HAC-V(-T) 50 | | HAC-V 60 | | HAC-V(-T) 70 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Min. effective embedment depth | [mm] | 68 | 91 | 91 | 110 | 71 | 106 | 148 | 183 | 175 | 295 |
| Anchor marking | | z | a | a | b | c | e | f | n | k | l |

## Marking of the Hilti channel bolt:

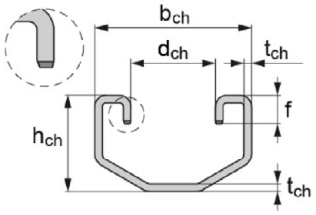
HBC-X-(N) YZ

HBC = Identifying mark of the manufacturer (**H**ilti **B**olt **C**hannel)
X = Type of channel bolt
N = Additional marking for notching bolt
Y = Steel grade
Z = Corrosion class

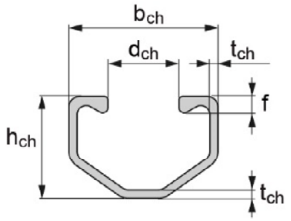

(e.g. HBC-C 8.8F)

C = Channel bolt type (see Table 4)
8.8 = Steel grade
F = Hot dip galvanized

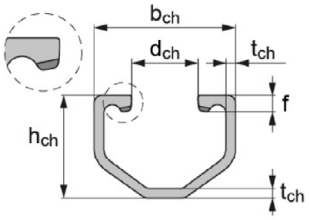
## Anchor Channels




HAC-30, HAC-V-T 30 (serrated)




HAC-40, HAC-50, HAC-60, HAC-70, HAC-V 35, HAC-V 40, HAC-V 50, HAC-V 60, HAC-V 70




HAC-T 50, HAC-T 70, HAC-V-T 50, HAC-V-T 70 (serrated)

**Table 2: Dimensions of channel profile**

| Anchor channel | $b_{ch}$ | $h_{ch}$ | $t_{ch}$ | $d_{ch}$ | f | $I_y$ |
|---|---|---|---|---|---|---|
| | [mm] | | | | | [mm$^4$] |
| HAC-30, HAC-V-T 30 | 41,3 | 25,6 | 2,00 | 22,3 | 7,5 | 15349 |
| HAC-V 35, HAC-40, HAC-V 40 | 40,9 | 28,0 | 2,25 | 19,5 | 4,5 | 21463 |
| HAC-50, HAC-V 50 | 41,9 | 31,0 | 2,75 | 19,5 | 5,3 | 33125 |
| HAC-T50, HAC-V-T 50 | 41,9 | 31,0 | 2,75 | 19,5 | 5,2 | 32049 |
| HAC-60, HAC-V 60 | 43,4 | 35,5 | 3,50 | 19,5 | 6,3 | 57930 |
| HAC- 70, HAC-V 70 | 45,4 | 40,0 | 4,50 | 19,5 | 7,4 | 95457 |
| HAC-T70, HAC-V-T70 | 45,4 | 40,0 | 4,50 | 19,5 | 7,1 | 92192 |

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Product Description**
Anchor channels (HAC)

Annex A3

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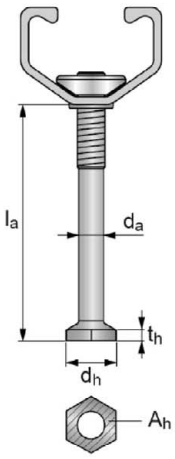
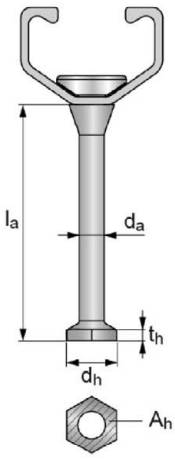
**Table 3: Dimensions of anchor (welded or bolted to the channel profile)**

| Anchor channel | $d_a$ | $d_h$ | $t_h$ | min $l_a$ | Head area $A_h$ |
|---|---|---|---|---|---|
| | [mm] | | | | [mm²] |
| HAC-30, HAC-V-T 30 | 5,4 | 11,5 | 2,0 | 44,4 | 89 |
| HAC-V 35, HAC-40, HAC-V 40 | 7,2 | 17,5 | 3,0 | 66,0 | 209 |
| HAC-50, HAC-V 50 | 9,0 | 19,5 | 3,5 | 78,5 | 258 |
| HAC-T50, HAC-V-T 50 | 9,0 | 19,5 | 3,5 | 78,5 | 258 |
| HAC-60, HAC-V 60 | 9,0 | 19,5 | 4,5 | 117,0 | 258 |
| HAC- 70, HAC-V 70 | 10,9 | 23,0 | 5,0 | 140,0 | 356 |
| HAC-T70, HAC-V-T70 | 10,9 | 23,0 | 5,0 | 140,0 | 356 |

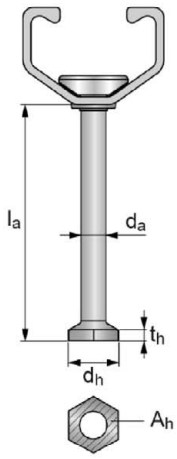
**HAC with bolted anchor**




**HAC-V with bolted anchor**




**welded anchor**




**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Product Description**
Anchor channels (HAC)

Annex A4

## Channel bolts

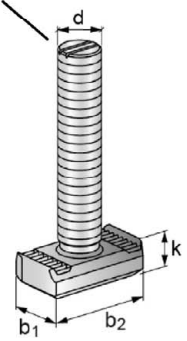
**Table 4: Dimensions of channel bolt**

| Anchor channel | Channel bolt type | Steel grade | Dimensions | | | |
|---|---|---|---|---|---|---|
| | | | $b_1$ | $b_2$ | k | d |
| | | | [mm] | | | |
| HAC- 30<br>HAC-V-T 30 | HBC-B | 4.6,<br>A4-50 | 19,0 | 34,0 | 9,2 | 10 |
| | | | | | | 12 |
| HAC-40<br>HAC-50<br>HAC-V 35<br>HAC-V 40<br>HAC-V 50 | HBC-C-E | 4.6,<br>8.8,<br>A4-50 | 14,0 | 33,0 | 10,4 | 12 |
| | | | 17,0 | | 13,4 | 16 |
| HAC-40<br>HAC-50<br>HAC-60<br>HAC-70<br>HAC-V 35<br>HAC-V 40<br>HAC-V 50<br>HAC-V 60<br>HAC-V 70 | HBC-C | 4.6,<br>8.8,<br>A4-50 | 14,0 | 33,0 | 10,4 | 10 |
| | | | | | | 12 |
| | | | 18,5 | | 11,4 | 16 |
| | | | | | 13,9 | 20 |
| | HBC-C-N | 8.8 | 18,5 | 33,0 | 11,4 | 12 |
| | | | | | | 16 |
| | | | | | 13,9 | 20 |
| HAC-T 50<br>HAC-T 70<br>HAC-V-T 50<br>HAC-V-T 70 | HBC-T | 8.8 | 18,5 | 35,4 | 12,0 | 12 |
| | | | | | | 16 |
| | | | | | | 20 |

[1] Material properties according to Annex A5

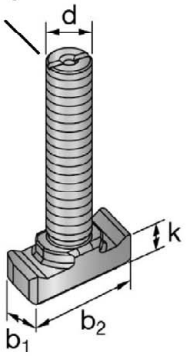
**HBC-B**

Single groove for marking the position



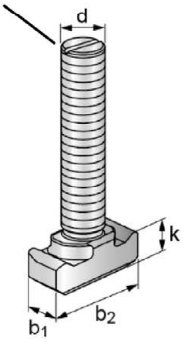

**HBC-C-E**

Single groove for marking the position




**HBC-C**

Single groove for marking the position




**HBC-C-N**

Double groove for marking the position

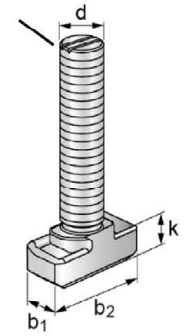


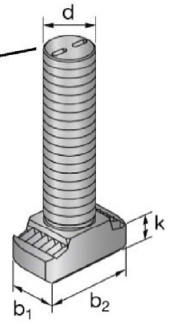

**Table 5: Steel grade and corrosion protection**

| Channel Bolt | Carbon steel [1] | | Stainless steel [2] |
|---|---|---|---|
| Steel grade | 4.6 | 8.8 | A4-50 |
| $f_{uk}$ [N/mm²] | 400 | 800 / 830 [2] | 500 |
| $f_{yk}$ [N/mm²] | 240 | 640 / 660 [2] | 210 |
| Corrosion protection | G [3]<br>F [4] | | R |

[1] Material properties according to Annex A5
[2] Material properties according to EN ISO 898-1:2013
[3] Electroplated
[4] Hot dip galvanized

**HBC-T**

Single groove for marking the position




**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Product Description**
Channel bolts (HBC)

Annex A5

Deutsches Institut für Bautechnik DIBt

**Table 6: Materials**

| Component | Carbon steel | | | Stainless steel |
|---|---|---|---|---|
| | Material properties | Coating | | Material properties |
| 1 | 2a | 2b | 2c | 3 |
| Channel Profile | Carbon steel according to EN 10025-2: 2019 | Hot dip galvanized ≥ 55 µm [1] Hot dip galvanized ≥ 70 µm [2] according to EN ISO 1461: 2009 | | - |
| Rivet | Carbon steel | Hot dip galvanized ≥ 45 µm [5] according to EN ISO 1461: 2009 | | - |
| Anchor | Carbon steel | Hot dip galvanized ≥ 45 µm [5] according to EN ISO 1461: 2009 | | - |
| Channel bolt | Steel grade 4.6 and 8.8 according to EN ISO 898-1: 2013 | Electroplated ≥ 8 µm according to DIN EN ISO 4042: 2018 | Hot dip galvanized ≥ 45 µm [5] according to EN ISO 1461: 2009 | Steel grade 50 according to EN ISO 3506-1: 2020<br>1.4401 / 1.4404 / 1.4571 / 1.4362 / 1.4578 / 1.4439 |
| Plain washer [3] according to EN ISO 7089: 2000 and EN ISO 7093-1: 2000 | Hardness class A ≥ 200 HV | Electroplated ≥ 8 µm | Hot dip galvanized ≥ 45 µm [5] | Hardness class A ≥ 200 HV<br>1.4401 / 1.4404 / 1.4571 / 1.4362 / 1.4578 / 1.4439 |
| Hexagonal nut according to EN ISO 4032: 2012 or DIN 934: 1987-10 [4] | Property class 8 according to EN ISO 898-2: 2012 | Electroplated ≥ 8 µm | Hot dip galvanized ≥ 45 µm [5] | Property class 70 according to EN ISO 3506-2: 2020<br>1.4401 / 1.4404 / 1.4571 / 1.4362 / 1.4578 / 1.4439 |

[1] For HAC-30F, HAC-V-T 30F, HAC-V 35F, HAC-40F, HAC-V 40F, HAC(-T) 50F and HAC-V(-T) 50F.
[2] For HAC-60F, HAC-V 60F, HAC(-T)70F and HAC-V(-T) 70F.
[3] Not in scope of delivery.
[4] Hexagonal nuts according to DIN 934: 1987-10 for channel bolts made from carbon steel (4.6) and stainless steel.
[5] Hot dip galvanized according to EN ISO 1461: 2009.

## Specifications of intended use

**Anchor channels and channel bolts subject to:**

- Static and quasi-static tension and shear perpendicular to the longitudinal axis of the channel for HAC and HAC-V in combination with HBC-C and HBC-C-E as well as static and quasi-static tension, shear perpendicular to the longitudinal axis of the channel and shear in the direction of the longitudinal axis of the channel for HAC and HAC-V in combination with HBC-B, HBC-C-N and HAC-T and HAC-V-T in combination with HBC-T.
- Fatigue cyclic tension loads.
- Seismic tension, seismic shear perpendicular to the longitudinal axis of the channel and seismic shear in the direction of the longitudinal axis of the channel (seismic performance category C1).
- Fire exposure: only for concrete class C20/25 to C50/60.

**Base materials:**

- Reinforced or unreinforced normal weight concrete according to EN 206-1: 2000.
- Strength classes C12/15 to C90/105 according to EN 206-1: 2000.
- Cracked or uncracked concrete.

**Use conditions (Environmental conditions):**

- Structures subject to dry internal conditions
  (anchor channels and channel bolts according to Annex A6, Table 6, column 2 and 3).
- 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 and channel bolts according to Annex A6, Table 6, column 2c and 3).
- According to EN 1993-1-4:2006+A2:2015 relating to corrosion resistance class CRC III
  (channel bolts, washers and nuts made of stainless steel number 1.4401, 1.4404, 1.4571, 1.4362 und 1.4578 according to Annex A6, Table 6, column 3).
- According to EN 1993-1-4:2006+A2:2015 relating to corrosion resistance class CRC IV
  (channel bolts, washers and nuts made of stainless steel number 1.4439 according to Annex A6, Table 6, column 3).

**Design:**

- Anchor channels are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor channel and channel bolts are indicated on the design drawings (e.g. position of the anchor channel relative to the reinforcement or to supports).
- For static and quasi-static loading as well as seismic loading (performance category C1) and fire exposure the anchor channels are designed in accordance with EOTA TR 047 “Design of Anchor Channels”, May 2021 or EN 1992-4: 2018.
- For fatigue loading the anchor channels are designed in accordance with EOTA TR 050 “Calculation Method for the Performance of Anchor Channels under Fatigue Loading”, October 2018.
- The characteristic resistances are calculated with the minimum effective embedment depth.

| **Hilti anchor channels (HAC) with channel bolts (HBC)** | Annex B1 |
|---|---|
| **Intended Use**<br>Specifications | |

**Installation:**

- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer - without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex B3, Table 7 and 8 as well as Annex B4, Table 9 are generated including end spacing and minimum channel length and only to be used in dry internal conditions.
- Installation in accordance with the installation instructions given in Annexes B7, B8, B9, B10 and B11.
- The anchor channels are fixed on the formwork, reinforcement or auxiliary construction such that no movement of the channels will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The concrete under the head of the anchors are properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Washer may be chosen according to Annex A6 and provided separately by the user.
- Orientating the channel bolt (groove according to Annex B8, B9, B10 and B11) rectangular to the channel axis.
- The required installation torques given in Annex B5 must be applied and must not be exceeded.

| | |
|---|---|
| **Hilti anchor channels (HAC) with channel bolts (HBC)** | Annex B2 |
| **Intended Use**<br>Specifications | |

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**Table 7: Installation parameters for anchor channel HAC**

| **Anchor channel** | | | **HAC-30** | **HAC-40** | **HAC-50** | **HAC-T50** | **HAC-60** | **HAC-70** | **HAC-T70** |
|---|---|---|---|---|---|---|---|---|---|
| Min. effective embedment depth | $h_{ef,min}$ | [mm] | 68 | 91 | 106 | 106 | 148 | 175 | 175 |
| Min. spacing | $s_{min}$ | | 50 | 100 | | | | | |
| Maximum spacing | $s_{max}$ | | 250 | | | | | | |
| End spacing | x | | 25 | | | | | | |
| Min. channel length | $l_{min}$ | | 100 | 150 | | | | | |
| Min edge distance | $c_{min}$ | | 50 | | | | 75 | | |
| Minimum thickness of concrete member | $h_{min}$ | | 80 | 105 | 125 | 125 | 168 | 196 | 196 |
| | | | $h_{ef} + t_h + c_{nom}$ [1)] | | | | | | |

[1)] $c_{nom}$ according to EN 1992-1-1:2004 + AC: 2010

**Table 8: Installation parameters for anchor channel HAC-V**

| **Anchor channel** | | | **HAC-V-T 30** | **HAC-V 35** | **HAC-V 40** | |
|---|---|---|---|---|---|---|
| Min. effective embedment depth | $h_{ef,min}$ | [mm] | 68 | 91 | 91 | 110 |
| Min. spacing | $s_{min}$ | | 50 | 100 | | |
| Maximum spacing | $s_{max}$ | | 250 | | | |
| End spacing | x | | 25 | | | |
| Min. channel length | $l_{min}$ | | 100 | 150 | | |
| Min edge distance | $c_{min}$ | | 50 | | | |
| Minimum thickness of concrete member | $h_{min}$ | | 80 | 105 | 105 | 125 |
| | | | $h_{ef} + t_h + c_{nom}$ [1)] | | | |

[1)] $c_{nom}$ according to EN 1992-1-1:2004 + AC: 2010

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation parameters for anchor channels (HAC) and channel bolts (HBC)

Annex B3

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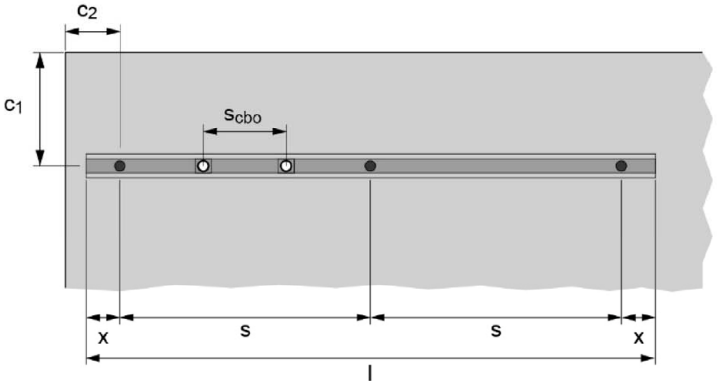
**Table 9: Installation parameters for anchor channel HAC-V**

| Anchor channel | | | HAC-V(-T) 50 | | | | HAC-V 60 | | HAC-V(-T) 70 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Min. effective embedment depth | $h_{ef,min}$ | [mm] | 71 | | | 106 | 148 | 183 | 175 | 295 |
| Min. spacing | $s_{min}$ | | 100 | 150 | | 100 | 100 | | | |
| Maximum spacing | $s_{max}$ | | | 250 | | | | | | |
| End spacing | x | | 25 | | | | | | | |
| Min. channel length | $l_{min}$ | | 150 | 200 | | 150 | 150 | | | |
| Min edge distance | $c_{min}$ | | 50 | 50 | 100 | 50 | 75 | 63,5 | 75 | 63,5 |
| Minimum thickness of concrete member | $h_{min}$ | | 125 | 125 | 90 | 125 | 168 | 400 | 196 | 400 |
| | | | $h_{ef} + t_h + c_{nom}$ [1)] | | | | | | | |

[1)] $c_{nom}$ according to EN 1992-1-1:2004 + AC: 2010



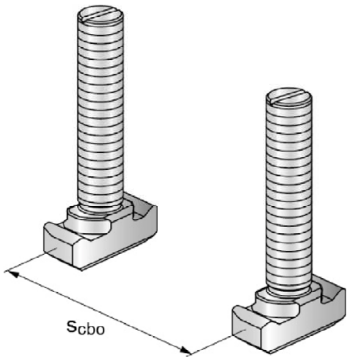




**Table 10: Minimum spacing for channel bolts**

| Channel bolt | | | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|
| Minimum spacing between channel bolts | $s_{cbo,min}$ | [mm] | 50 | 60 | 80 | 100 |

$s_{cbo}$ = center to center spacing between channel bolts ($s_{cbo,min}$ = 5d)

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation parameters for anchor channels (HAC) and channel bolts (HBC)

Annex B4

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**Table 11: Required installation torque $T_{inst}$ for HBC-B**

| Channel bolt | | $T_{inst}$ [Nm] [1] | |
|---|---|---|---|
| | | General $T_{inst,g}$ | Steel-steel contact $T_{inst,s}$ |
| | | HAC-30, HAC-V-T 30 | HAC-30, HAC-V-T 30 |
| M10 | 4.6, A4-50 | 15 | 15 |
| M12 | 4.6, A4-50 | 25 | 25 |

**Table 12: Required installation torque $T_{inst}$ for HBC-C and HBC-C-E**

| Channel bolt | | $T_{inst}$ [Nm] [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | General $T_{inst,g}$ | | | | Steel-steel contact $T_{inst,s}$ | | | |
| | | HAC-V35 HAC-40 HAC-V40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-V35 HAC-40 HAC-V40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 |
| M10 | 4.6, A4-50 | 15 | | | | 15 | | | |
| | 8.8 | 15 | | | | 48 | | | |
| M12 | 4.6, A4-50 | 25 | | | | 25 | | | |
| | 8.8 | 25 | | | | 75 | | | |
| M16 | 4.6, A4-50 | 60 | | | | 60 | | | |
| | 8.8 | 60 | | | | 185 | | | |
| M20 | 4.6, A4-50 | 70 | 105 | 120 | | 120 | | | |
| | 8.8 | 70 | 105 | 120 | | 320 | | | |

**Table 13: Required installation torque $T_{inst}$ for HBC-C-N**

| Channel bolt | | $T_{inst}$ [Nm] [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | General $T_{inst,g}$ | | | | Steel-steel contact $T_{inst,s}$ | | | |
| | | HAC-V35 HAC-40 HAC-V40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-V35 HAC-40 HAC-V40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 |
| M12 | 8.8 | 75 | | | | 75 | | | |
| M16 | 8.8 | 185 | | | | 185 | | | |
| M20 | 8.8 | - | 320 | | | - | 320 | | |

**Table 14: Required installation torque $T_{inst}$ for HBC-T**

| Channel bolt | | $T_{inst}$ [Nm] [1] | | | |
|---|---|---|---|---|---|
| | | General $T_{inst,g}$ | | Steel-steel contact $T_{inst,s}$ | |
| | | HAC-T50 HAC-V-T50 | HAC-T70 HAC-V-T70 | HAC-T50 HAC-V-T50 | HAC-T70 HAC-V-T70 |
| M12 | 8.8 | 75 | | 75 | |
| M16 | 8.8 | 100 | | 185 | |
| M20 | 8.8 | 120 | | 320 | |

[1] $T_{inst}$ must not be exceeded.

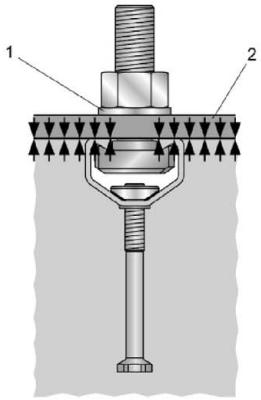
**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation parameters for channel bolts (HBC)

Annex B5

Deutsches Institut für Bautechnik DIBt

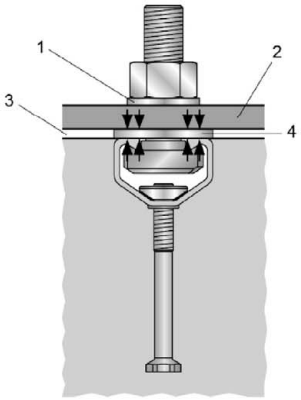
**General:** The fixture is in contact with the channel profile and the concrete surface




**Key**

1 washer
2 fixture
3 gap
4 suitable steel part

**Steel-steel contact:** The fixture is not in contact with the concrete surface. The fixture is fastened to the anchor channel by suitable steel part (e.g. washer).




| Hilti anchor channels (HAC) with channel bolts (HBC) | Annex B6 |
|---|---|
| **Intended Use**<br>Installation parameters for channel bolts (HBC) | |

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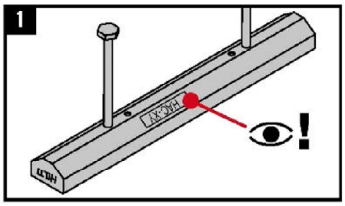
HILTI

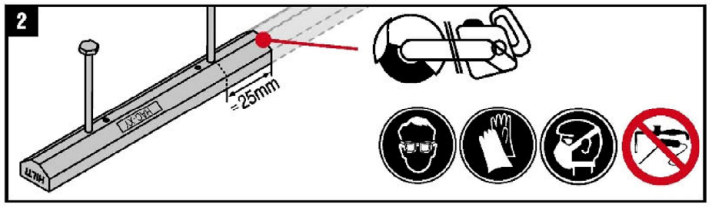
HAC-(V)-(T)

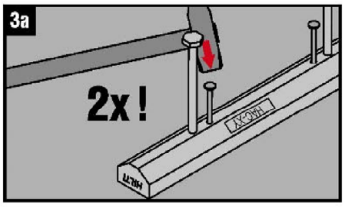
CE
11
Hilti AG
FL-9494 Schaan
Hilti Werke
2873-CPR-201-18/07, 14
ETA-11/0006
Notified body 2873
EAD330008-03-0601
Anchor channels for fixing to concrete
www.hilti.group

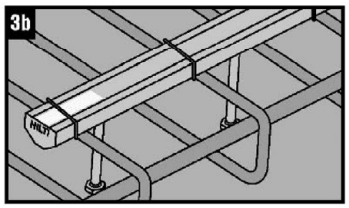
ICC ES
ESR-3520

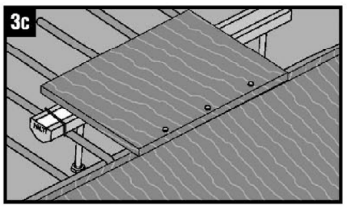
2015302-07.2021

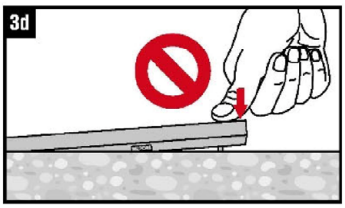


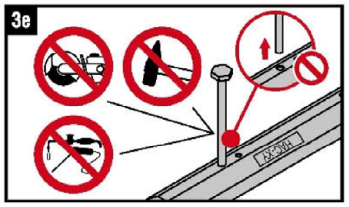



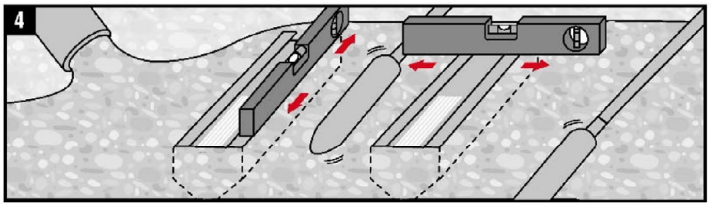



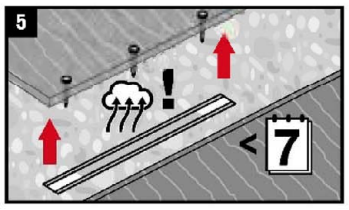



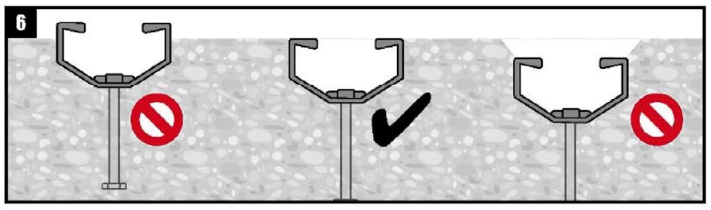



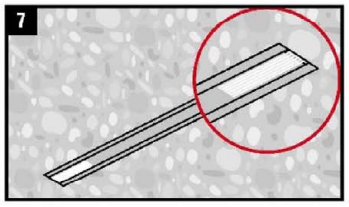



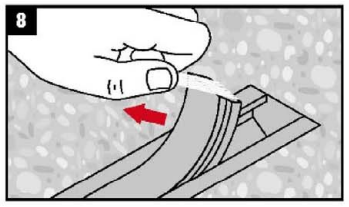




**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation instructions for anchor channels (HAC and HAC-T)

Annex B7

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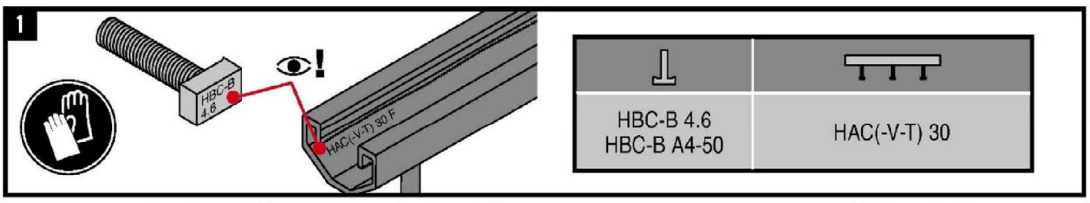
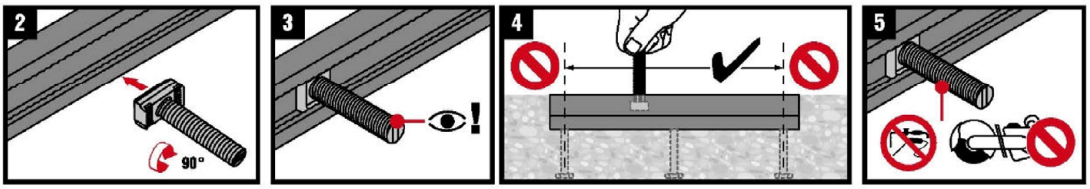
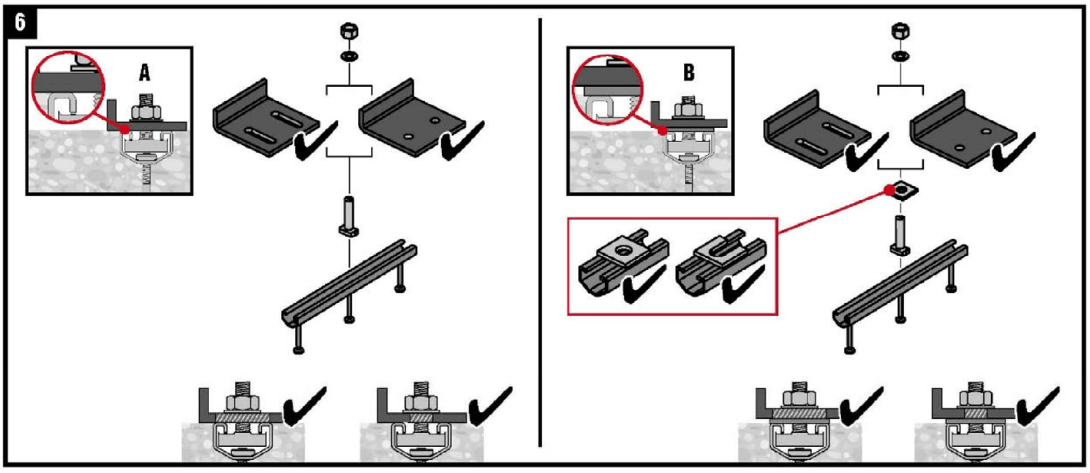
HILTI

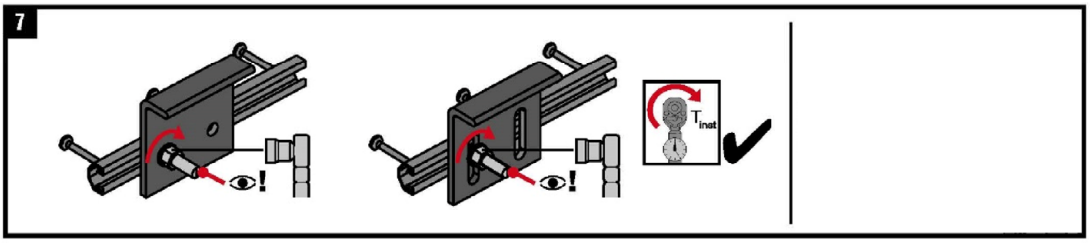
HBC-B




2214763 A3-07.2021




| | | $T_{inst}$ | |
|---|---|---|---|
| | | A | B |
| | | HAC(-V-T)-30 | HAC(-V-T)-30 |
| M10 | 4.6, A4-50 | 15 Nm / 11 ft-lb | 15 Nm / 11 ft-lb |
| M12 | 4.6, A4-50 | 25 Nm / 19 ft-lb | 25 Nm / 19 ft-lb |

$T_{inst}$ is the installation torque that shall be applied with a torque wrench and must not be exceeded.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation parameters for channel bolts (HBC-B)

Annex B8

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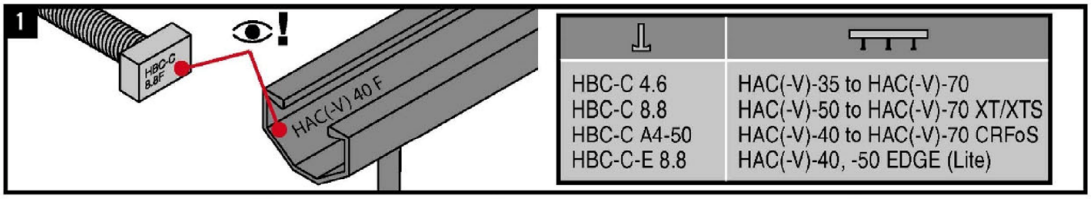
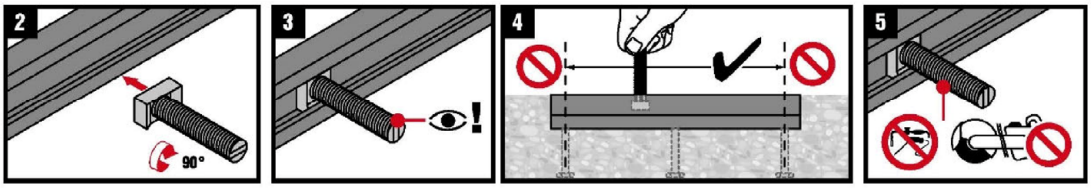
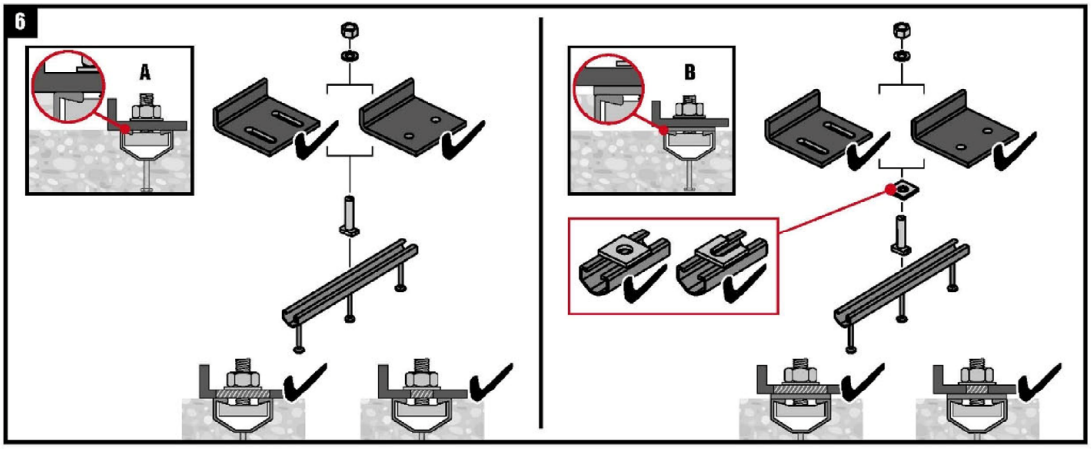
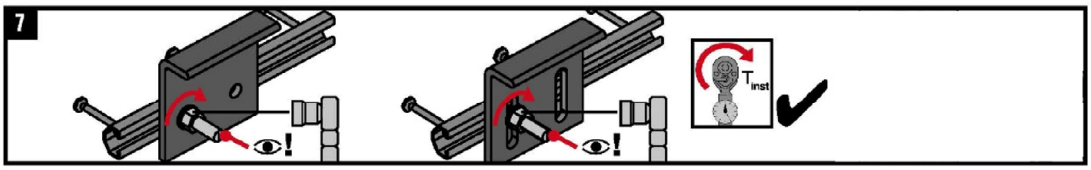
HILTI / HBC-C




| | |
|---|---|
| HBC-C 4.6 | HAC(-V)-35 to HAC(-V)-70 |
| HBC-C 8.8 | HAC(-V)-50 to HAC(-V)-70 XT/XTS |
| HBC-C A4-50 | HAC(-V)-40 to HAC(-V)-70 CRFoS |
| HBC-C-E 8.8 | HAC(-V)-40, -50 EDGE (Lite) |




| | | $T_{inst}$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | | | | | B | | | | |
| | | HAC(-V)-35 | HAC(-V)-40 | HAC(-V)-50 | HAC(-V)-60 | HAC(-V)-70 | HAC(-V)-35 | HAC(-V)-40 | HAC(-V)-50 | HAC(-V)-60 | HAC(-V)-70 |
| M10 | 4.6, A4-50 | 15 Nm / 11 ft-lb | | | | | 15 Nm / 11 ft-lb | | | | |
| | 8.8 | 15 Nm / 11 ft-lb | | | | | 48 Nm / 35 ft-lb | | | | |
| M12 | 4.6, A4-50 | 25 Nm / 19 ft-lb | | | | | 25 Nm / 19 ft-lb | | | | |
| | 8.8 | 25 Nm / 19 ft-lb | | | | | 75 Nm / 55 ft-lb | | | | |
| M16 | 4.6, A4-50 | 60 Nm / 44 ft-lb | | | | | 60 Nm / 44 ft-lb | | | | |
| | 8.8 | 60 Nm / 44 ft-lb | | | | | 185 Nm / 136 ft-lb | | | | |
| M20 | 4.6, A4-50 | 70 Nm / 52 ft-lb | | 105 Nm / 78 ft-lb | 120 Nm / 89 ft-lb | | 120 Nm / 89 ft-lb | | | | |
| | 8.8 | 70 Nm / 52 ft-lb | | 105 Nm / 78 ft-lb | 120 Nm / 89 ft-lb | | 320 Nm / 236 ft-lb | | | | |

$T_{inst}$ is the installation torque that shall be applied with a torque wrench and must not be exceeded.

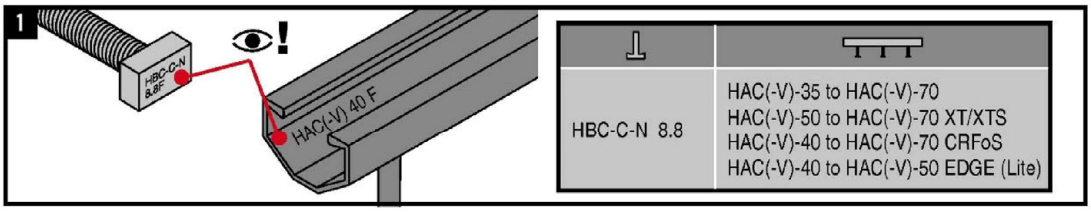
**Hilti anchor channels (HAC) with channel bolts (HBC)**

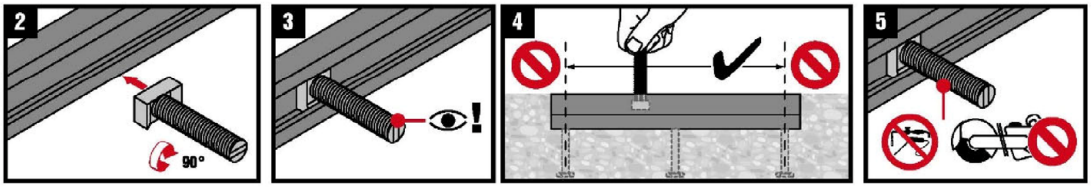
**Intended Use**
Installation parameters for channel bolts (HBC-C and HBC-C-E)

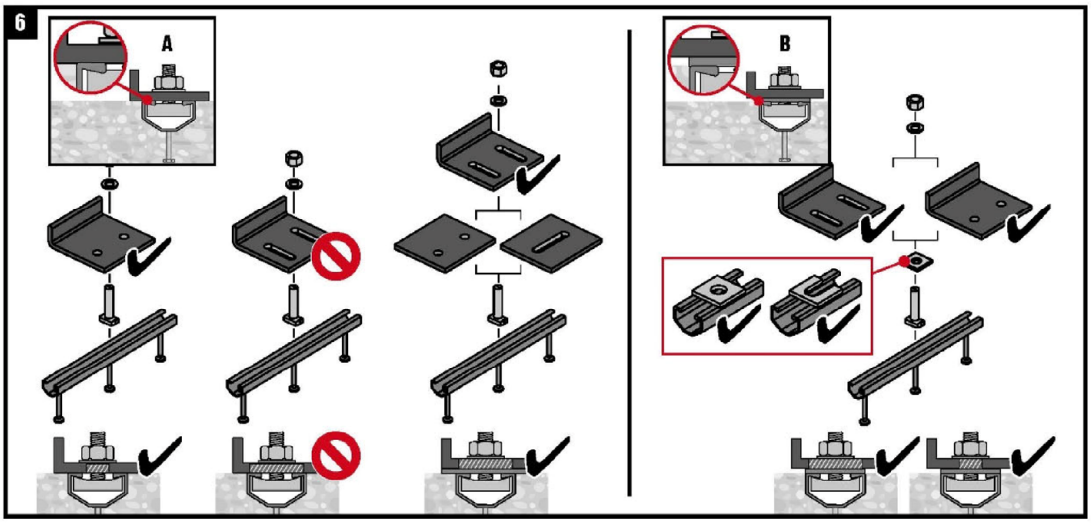
Annex B9

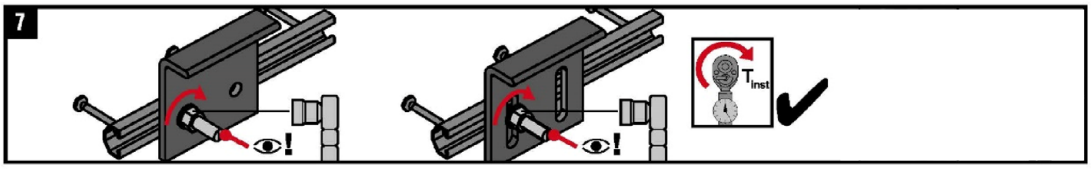
Deutsches Institut für Bautechnik DIBt

HILTI / HBC-C-N




| | | $T_{inst}$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | | | | | B | | | | |
| | | HAC(-V)-35 | HAC(-V)-40 | HAC(-V)-50 | HAC(-V)-60 | HAC(-V)-70 | HAC(-V)-35 | HAC(-V)-40 | HAC(-V)-50 | HAC(-V)-60 | HAC(-V)-70 |
| M12 | 8.8 | 75 Nm / 55 ft-lb | | | | | 75 Nm / 55 ft-lb | | | | |
| M16 | 8.8 | 185 Nm / 136 ft-lb | | | | | 185 Nm / 136 ft-lb | | | | |
| M20 | 8.8 | – | | 320 Nm / 236 ft-lb | | | – | | 320 Nm / 236 ft-lb | | |

$T_{inst}$ is the installation torque that shall be applied with a torque wrench and must not be exceeded.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

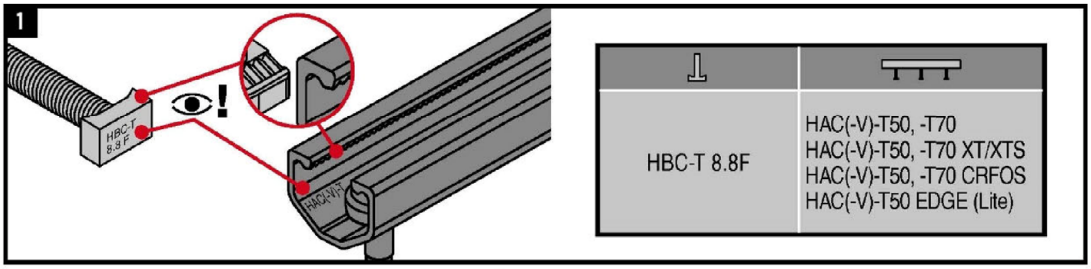
**Intended Use**
Installation instructions for channel bolts (HBC-C-N)

Annex B10

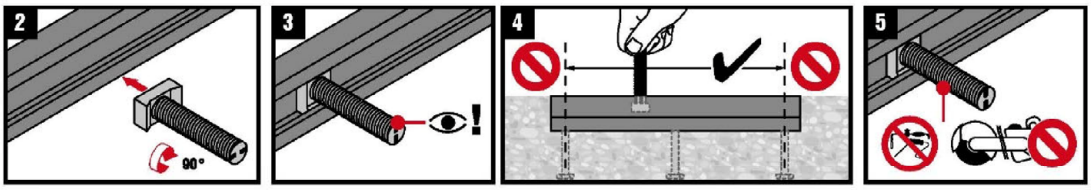
Deutsches Institut für Bautechnik DIBt

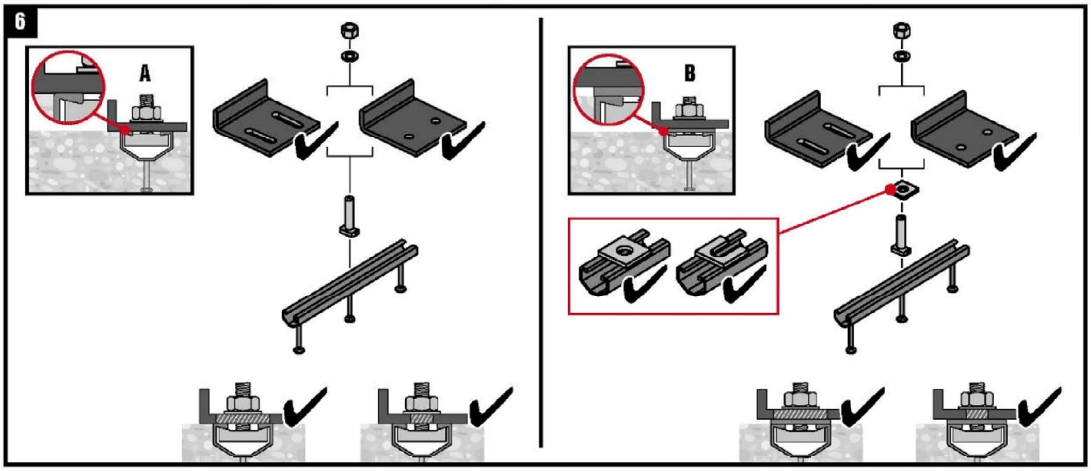
HILTI

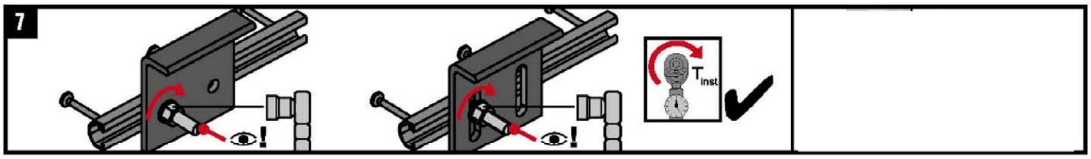
HBC-T




2155164 A4-07.2021




| | | $T_{inst}$ | | | |
|---|---|---|---|---|---|
| | | A | | B | |
| | | HAC(-V)-T50 | HAC(-V)-T70 | HAC(-V)-T50 | HAC(-V)-T70 |
| M12 | 8.8 | 75 Nm / 55 ft-lb | | 75 Nm / 55 ft-lb | |
| M16 | 8.8 | 100 Nm / 74 ft-lb | | 185 Nm / 136 ft-lb | |
| M20 | 8.8 | 120 Nm / 89 ft-lb | | 320 Nm / 236 ft-lb | |

$T_{inst}$ is the installation torque that shall be applied with a torque wrench and must not be exceeded.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Intended Use**
Installation instructions for channel bolts (HBC-T)

Annex B11

**Table 15: Characteristic resistances under tension load – steel failure of anchor channel HAC**

| Anchor channel | | HAC-30 | HAC-40 | HAC-50 | HAC-T50 | HAC-60 | HAC-70 | HAC-T70 |
|---|---|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,a}$ [kN] | 18,2 | 33,1 | 52,5 | 52,5 | 52,5 | 76,3 | 76,3 |
| Partial factor | $\gamma_{Ms}$ [1)] | 1,8 | | | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,c}$ [kN] | 18,2 | 25,0 | 35,0 | 35,0 | 50,1 | 71,0 | 71,0 |
| Partial factor | $\gamma_{Ms,ca}$ [1)] | 1,8 | | | | | | |
| **Steel failure: Local flexure of channel lips** | | | | | | | | |
| Characteristic spacing of channel bolts for $N_{Rk,s,l}$ | $s_{l,N}$ [mm] | 83 | 82 | 84 | 84 | 87 | 91 | 91 |
| Characteristic resistance | $N^0_{Rk,s,l}$ [kN] | 19,9 | 25,0 | 35,0 | 35,0 | 50,1 | 71,0 | 71,0 |
| Partial factor | $\gamma_{Ms,l}$ [1)] | 1,8 | | | | | | |

[1)] In absence of other national regulations.

**Table 16: Characteristic flexural resistance of HAC channel under tension load**

| Anchor channel | | | HAC-30 | HAC-40 | HAC-50 | HAC-T50 | HAC-60 | HAC-70 | HAC-T70 |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Flexure of channel** | | | | | | | | | |
| Characteristic flexural resistance of channel | $M_{Rk,s,flex}$ [Nm] | HBC-B | 755 | - [2)] | - [2)] | - [2)] | - [2)] | - [2)] | - [2)] |
| | | HBC-C | - [2)] | 1136 | 1596 | - [2)] | 2187 | 3160 | - [2)] |
| | | HBC-C-E | - [2)] | 1136 | 1596 | - [2)] | - [2)] | - [2)] | - [2)] |
| | | HBC-C-N | - [2)] | 980 | 1345 | - [2)] | 2156 | 3005 | - [2)] |
| | | HBC-T | - [2)] | - [2)] | - [2)] | 1596 | - [2)] | - [2)] | 2975 |
| Partial factor | | $\gamma_{Ms,flex}$ [1)] | 1,15 | | | | | | |

[1)] In absence of other national regulations.

[2)] No performance assessed

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels (HAC) under tension load – Steel failure

Annex C1

Deutsches Institut für Bautechnik DIBt

**Table 17: Characteristic resistances under tension load – steel failure of anchor channel HAC-V**

| Anchor channel | | HAC-V-T 30 | HAC-V 35 | HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,a}$ [kN] | 18,2 | 31,4 | 31,4 | 55,0 | | 55,0 | 75,0 | |
| Partial factor | $\gamma_{Ms}$ [1)] | 1,8 | | | | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,c}$ [kN] | 18,2 | 31,4 | 31,4 | 42,0 | | 55,0 | 71,0 | 75,0 |
| Partial factor | $\gamma_{Ms,ca}$ [1)] | 1,8 | | | | | | | |
| **Steel failure: Local flexure of channel lips** | | | | | | | | | |
| Characteristic spacing of channel bolts for $N_{Rk,s,l}$ | $s_{l,N}$ [mm] | 83 | 82 | 82 | 84 | | 87 | 91 | |
| Characteristic resistance | $N^0_{Rk,s,l}$ [kN] | 19,9 | 31,4 | 31,4 | 41,0 | | 55,0 | 71,0 | |
| Partial factor | $\gamma_{Ms,l}$ [1)] | 1,8 | | | | | | | |

[1)] In absence of other national regulations.

**Table 18: Characteristic flexural resistance of HAC-V channel under tension load**

| Anchor channel | | | HAC-V-T 30 | HAC-V 35 | HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Flexure of channel** | | | | | | | | | | |
| Characteristic static flexural resistance of channel | $M_{Rk,s,flex}$ [Nm] | HBC-B | 786 | - [2)] | - [2)] | - [2)] | - [2)] | - [2)] | - [2)] | - [2)] |
| | | HBC-C | - [2)] | 1318 | 1318 | 1853 | - [2)] | 2538 | 3668 | - [2)] |
| | | HBC-C-E | - [2)] | 1318 | 1318 | 1853 | - [2)] | - [2)] | - [2)] | - [2)] |
| | | HBC-C-N | - [2)] | 1137 | 1137 | 1551 | - [2)] | 2503 | 3488 | - [2)] |
| | | HBC-T | - [2)] | - [2)] | - [2)] | - [2)] | 1853 | - [2)] | - [2)] | 3455 |
| Partial factor | | $\gamma_{Ms,flex}$ [1)] | 1,15 | | | | | | | |

[1)] In absence of other national regulations.

[2)] No performance assessed

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels (HAC-V) under tension load – steel failure

Annex C2

Deutsches Institut für Bautechnik DIBt

**Table 19: Characteristic resistances under tension load – concrete failure of anchor channel HAC**

| **Anchor channel** | | | **HAC-30** | **HAC-40** | **HAC-50** | **HAC-T50** | **HAC-60** | **HAC-70** | **HAC-T70** |
|---|---|---|---|---|---|---|---|---|---|
| **Concrete failure: Pull-out failure** | | | | | | | | | |
| Characteristic resistance in cracked concrete C12/15 | | $N_{Rk,p}$ [kN] | 8,0 | 18,8 | 23,2 | 23,2 | 23,2 | 32,0 | 32,0 |
| Characteristic resistance in uncracked concrete C12/15 | | | 11,2 | 26,3 | 32,5 | 32,5 | 32,5 | 44,9 | 44,9 |
| Factor for $N_{Rk,p} = N_{Rk,p(C12/15)} \cdot \Psi_c$ | C16/20 | $\Psi_c$ | 1,33 | | | | | | |
| | C20/25 | | 1,67 | | | | | | |
| | C25/30 | | 2,08 | | | | | | |
| | C30/37 | | 2,50 | | | | | | |
| | C35/45 | | 2,92 | | | | | | |
| | C40/50 | | 3,33 | | | | | | |
| | C45/55 | | 3,75 | | | | | | |
| | C50/60 | | 4,17 | | | | | | |
| | C55/67 | | 4,58 | | | | | | |
| | ≥ C60/75 | | 5,00 | | | | | | |
| Partial factor | | $\gamma_{Mp} = \gamma_{Mc}$ [1)] | 1,5 | | | | | | |
| **Concrete failure: Concrete cone failure** | | | | | | | | | |
| Product factor $k_1$ | cracked | $k_{cr,N}$ | 7,7 | 8,0 | 8,2 | 8,2 | 8,6 | 8,9 | 8,9 |
| | un-cracked | $k_{ucr,N}$ | 11,0 | 11,5 | 11,7 | 11,7 | 12,3 | 12,7 | 12,7 |
| Partial factor | | $\gamma_{Mc}$ [1)] | 1,5 | | | | | | |
| **Concrete failure: Splitting** | | | | | | | | | |
| Characteristic edge distance | | $c_{cr,sp}$ [mm] | 204 | 273 | 318 | 318 | 444 | 525 | 525 |
| Characteristic spacing | | $s_{cr,sp}$ [mm] | 408 | 546 | 636 | 636 | 888 | 1050 | 1050 |
| Partial factor | | $\gamma_{Msp} = \gamma_{Mc}$ [1)] | 1,5 | | | | | | |

[1)] In absence of other national regulations.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels (HAC) under tension load – concrete failure

Annex C3

Deutsches Institut für Bautechnik DIBt

**Table 20: Characteristic resistances under tension load – concrete failure of anchor channel HAC-V**

| **Anchor channel** | | | **HAC-V-T 30** | **HAC-V 35** | **HAC-V 40** | **HAC-V(-T) 50** | **HAC-V 60** | **HAC-V(-T) 70** |
|---|---|---|---|---|---|---|---|---|
| **Concrete failure: Pull-out failure** | | | | | | | | |
| Characteristic resistance in cracked concrete C12/15 | | $N_{Rk,p}$ [kN] | 8,0 | 18,8 | 18,8 | 23,2 | 23,2 | 32,0 |
| Characteristic resistance in uncracked concrete C12/15 | | | 11,2 | 26,3 | 26,3 | 32,5 | 32,5 | 44,9 |
| Factor for $N_{Rk,p} = N_{Rk,p(C12/15)} \cdot \Psi_c$ | C16/20 | $\Psi_c$ | 1,33 | | | | | |
| | C20/25 | | 1,67 | | | | | |
| | C25/30 | | 2,08 | | | | | |
| | C30/37 | | 2,50 | | | | | |
| | C35/45 | | 2,92 | | | | | |
| | C40/50 | | 3,33 | | | | | |
| | C45/55 | | 3,75 | | | | | |
| | C50/60 | | 4,17 | | | | | |
| | C55/67 | | 4,58 | | | | | |
| | ≥ C60/75 | | 5,00 | | | | | |
| Partial factor | | $\gamma_{Mp} = \gamma_{Mc}$ [1)] | 1,5 | | | | | |
| **Concrete failure: Concrete cone failure** | | | | | | | | |
| Min. effective embedment depth | | $h_{ef}$ [mm] | 68 | 91 | 91 | 110 | 71 | 106 | 148 | 183 | 175 | 295 |
| Product factor $k_1$ | cracked | $k_{cr,N}$ | 7,7 | 8,0 | 8,0 | 8,3 | 8,9 | 8,2 | 8,6 | 8,9 | 8,9 | 9,6 |
| | un-cracked | $k_{ucr,N}$ | 11,0 | 11,5 | 11,5 | 11,8 | 12,7 | 11,7 | 12,3 | 12,7 | 12,6 | 13,7 |
| Partial factor | | $\gamma_{Mc}$ [1)] | 1,5 | | | | | | | | | |
| **Concrete failure: Splitting** | | | | | | | | | | | | |
| Characteristic edge distance | | $c_{cr,sp}$ [mm] | 204 | 273 | 273 | 330 | 213 | 318 | 444 | 549 | 525 | 885 |
| Characteristic spacing | | $s_{cr,sp}$ [mm] | 408 | 546 | 546 | 660 | 426 | 636 | 888 | 1098 | 1050 | 1770 |
| Partial factor | | $\gamma_{Msp} = \gamma_{Mc}$ [1)] | 1,5 | | | | | | | | | |

[1)] In absence of other national regulations.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels (HAC-V) under shear load – concrete failure

Annex C4

**Table 21: Displacements under tension load**

| Anchor channel | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-T50 HAC-V-T 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-T70 HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|
| Tension load | N [kN] | 6,6 | 11,3 | 11,3 | 14,3 | 14,7 | 18,8 | 26,6 | 25,2 |
| Short-term displacement [1] | $\delta_{N0}$ [mm] | 1,6 | 1,7 | 1,7 | 1,1 | 1,7 | 1,1 | 1,0 | 1,5 |
| Long-term displacement [1] | $\delta_{N\infty}$ [mm] | 3,2 | 3,4 | 3,4 | 2,2 | 3,4 | 2,2 | 2,0 | 3,0 |

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips, bending of the channel and slip of the anchor channel in concrete.

**Table 22: Characteristic resistances under shear load – steel failure of anchor channel HAC**

| Anchor channel | | HAC-30 | HAC-40 | HAC-(T) 50 | HAC-60 | HAC-(T) 70 |
|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | |
| Characteristic static resistance | $V_{Rk,s,a,y}$ [kN] | 23,7 | 39,6 | 53,6 | 77,3 | 114,8 |
| | $V_{Rk,s,a,x}$ [kN] | 10,2 | 18,4 | 29,0 | 29,0 | 41,9 |
| Partial factor | $\gamma_{Ms}$ [1] | 1,5 | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | |
| Characteristic static resistance | $V_{Rk,s,c,y}$ [kN] | 23,7 | 39,6 | 53,6 | 77,3 | 114,8 |
| | $V_{Rk,s,c,x}$ [kN] | 9,1 | 12,5 | 17,5 | 25,1 | 35,5 |
| Partial factor | $\gamma_{Ms,ca}$ [1] | 1,8 | | | | |
| **Steel failure: Local flexure of channel lips under shear load perpendicular to the longitudinal axis of the channel** | | | | | | |
| Characteristic spacing of channel bolts for $V_{Rk,s,l}$ | $s_{l,V}$ [mm] | 83 | 82 | 84 | 87 | 91 |
| Characteristic static resistance | $V^0_{Rk,s,l,y}$ [kN] | 23,7 | 34,9 | 47,5 | 72,2 | 95,8 |
| Partial factor | $\gamma_{Ms,l}$ [1] | 1,8 | | | | |

[1] In absence of other national regulations.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Displacements under tension load
Characteristic resistances of anchor channels (HAC) under shear load – steel failure

Annex C5

**Table 23: Characteristic resistances under shear load – steel failure of anchor channel HAC-V**

| Anchor channel | | HAC-V-T 30 | HAC-V 35 HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | | | |
| Characteristic static resistance | $V_{Rk,s,a,y}$ [kN] | 26,9 | 42,5 | 57,5 | 57,9 | 82,9 | 116,5 | 114,8 |
| | $V_{Rk,s,a,x}$ [kN] | 9,1 | 15,7 | 27,5 | 27,5 | 25,5 | 37,5 | 37,5 |
| Partial factor | $\gamma_{Ms}$ 1) | 1,5 | | | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | | | |
| Characteristic static resistance | $V_{Rk,s,c,y}$ [kN] | 26,9 | 42,5 | 57,5 | 57,9 | 82,9 | 116,5 | 114,8 |
| | $V_{Rk,s,c,x}$ [kN] | 9,1 | 15,7 | 27,5 | 27,5 | 25,5 | 37,5 | 37,5 |
| Partial factor | $\gamma_{Ms,ca}$ 1) | 1,8 | | | | | | |
| **Steel failure: Local flexure of channel lips under shear load perpendicular to the longitudinal axis of the channel** | | | | | | | | |
| Characteristic spacing of channel bolts for $V_{Rk,s,l}$ | $s_{l,V}$ [mm] | 83 | 82 | 84 | 84 | 87 | 91 | |
| Characteristic static resistance | $V^0_{Rk,s,l,y}$ [kN] | 27,7 | 37,4 | 55,0 | 60,5 | 82,9 | 102,9 | 118,8 |
| Partial factor | $\gamma_{Ms,l}$ 1) | 1,8 | | | | | | |

1) In absence of other national regulations.

**Table 24: Characteristic resistances under shear load in direction of the longitudinal axis of the channel – steel failure of anchor channel**

| Anchor channel | | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-T50 HAC-V-T 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-T70 HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Connection between channel lips and channel bolt** | | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,l,x}$ [kN] | HBC-B M12 4.6 | 3,5 | - [1] | | | - [1] | - [1] | | - [1] |
| | | HBC-C-N M12 8.8 | - [1] | 8,5 | 8,5 | 8,5 | - [1] | 8,5 | 8,5 | - [1] |
| | | HBC-C-N M16 8.8 | | 19,7 | 19,7 | 19,7 | | 19,7 | 19,7 | |
| | | HBC-C-N M20 8.8 | | - [1] | - [1] | 24,1 | | 24,1 | 24,1 | |
| | | HBC-T M12 8.8 | | - [1] | - [1] | - [1] | 15,1 | - [1] | - [1] | 15,1 |
| | | HBC-T M16 8.8 | | | | | 20,1 | | | 20,1 |
| | | HBC-T M20 8.8 | | | | | 20,1 | | | 20,1 |
| Installation factor | | $\gamma_{inst}$ | 1,4 | | | | 1,2 | 1,4 | | 1,2 |

[1] No performance assessed

**Table 25: Characteristic resistances under shear load – concrete failure**

| Anchor channel | | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-V(-T) 50 | HAC-(T)50 HAC-V(-T) 50 | HAC-60 HAC-V 60 | HAC-(T)70 HAC-V(-T) 70 |
|---|---|---|---|---|---|---|---|---|---|
| **Concrete failure: Pry out failure** | | | | | | | | | |
| Product factor | | $k_8$ | 2,0 | | | | | | |
| Partial factor | | $\gamma_{Mc}$ [1] | 1,5 | | | | | | |
| **Concrete failure: Concrete edge failure** | | | | | | | | | |
| Min. effective embedment depth | | $h_{ef}$ [mm] | 68 | 91 | 91/110 | 71 | 106 | 149/183 | 175/295 |
| Product factor $k_{12}$ | cracked concrete | $k_{cr,V}$ | 7,5 | 7,5 | 7,5 | 4,5 | 7,5 | 7,5 | 7,5 |
| | uncracked concrete | $k_{ucr,V}$ | 10,5 | 10,5 | 10,5 | 6,3 | 10,5 | 10,5 | 10,5 |
| Partial factor | | $\gamma_{Mc}$ [1] | 1,5 | | | | | | |

[1] In absence of other national regulations

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels under shear load

Annex C7

Deutsches Institut für Bautechnik DIBt

**Table 26: Displacements under shear load perpendicular to longitudinal axis of the channel**

| Anchor channel | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-T50 HAC-V-T 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-T70 HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|
| Shear load | $V_y$ [kN] | 8,0 | 13,9 | 13,9 | 18,9 | 21,0 | 29,0 | 38,0 | 45,6 |
| Short-term displacement [1] | $\delta_{V,y,0}$ [mm] | 1,0 | 1,0 | 1,0 | 1,5 | 2,7 | 1,5 | 1,5 | 2,4 |
| Long-term displacement [1] | $\delta_{V,y,\infty}$ [mm] | 1,5 | 1,5 | 1,5 | 2,3 | 4,1 | 2,3 | 2,3 | 3,6 |

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips and slip of the anchor channel in concrete.

**Table 27: Displacements under shear load in direction of the longitudinal axis of the channel**

| Anchor channel | | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-T50 HAC-V-T 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-T70 HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Channel bolt** | | | **HBC-B** | **HBC-C-N** | | | **HBC-T** | **HBC-C-N** | | **HBC-T** |
| Shear load | $V_x$ [kN] | M12 | 1,4 | 3,4 | | | 6,7 | 3,4 | | 6,7 |
| | | M16 | - [2] | 7,8 | | | 8,9 | 7,8 | | 8,9 |
| | | M20 | | - [2] | | 9,6 | 8,9 | 9,6 | | 8,9 |
| Short-term displacement [1] | $\delta_{V,x,0}$ [mm] | M12 | 0,1 | 0,05 | | | 1,4 | 0,05 | | 1,4 |
| | | M16 | - [2] | 0,4 | | | 1,7 | 0,4 | | 1,7 |
| | | M20 | | - [2] | | 0,1 | 1,7 | 0,1 | | 1,7 |
| Short-term displacement [1] | $\delta_{V,x,\infty}$ [mm] | M12 | 0,2 | 0,1 | | | 2,1 | 0,1 | | 2,1 |
| | | M16 | - [2] | 0,6 | | | 2,5 | 0,6 | | 2,5 |
| | | M20 | | - [2] | | 0,2 | 2,5 | 0,2 | | 2,5 |

[1] Displacements of the anchor channel, including slip of channel bolt, deformation of channel lips and slip of the anchor channel in concrete.
[2] No performance assessed

**Table 28: Characteristic resistances under combined tension and shear load**

| Anchor channel | | HAC-30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-T50 HAC-V-T 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 | HAC-T70 HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Local flexure of channel lips and flexure of channel** | | | | | | | | | |
| Product factor | $k_{13}$ | Values according to EN 1992-4: 2018, Section 7.4.3.1 | | | | | | | |
| **Steel failure: Anchor and connection between anchor and channel** | | | | | | | | | |
| Product factor | $k_{14}$ | Values according to EN 1992-4: 2018, Section 7.4.3.1 | | | | | | | |

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Displacements under shear load.
Characteristic resistances under combined tension and shear load

Annex C8

**Table 29: Characteristic resistances under tension and shear load – steel failure of Hilti channel bolts HBC-B, HBC-C, HBC-C-E, HBC-C-N and HBC-T**

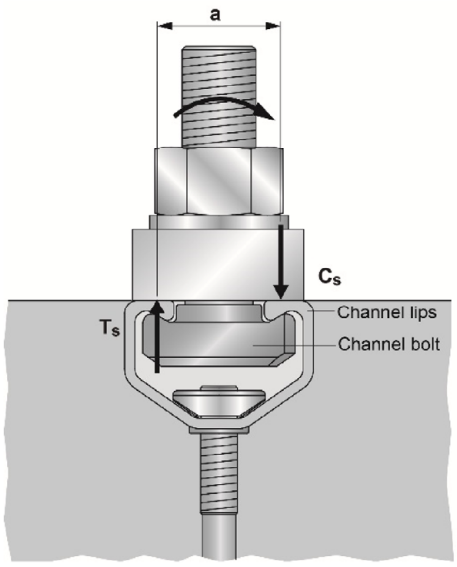
| **Channel bolt diameter** | | | | | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ [2] | [kN] | HBC-B | 4.6 | 23,2 | 33,7 | - [4] | - [4] |
| | | | | A4-50 [1] | 29,0 | 42,2 | - [4] | - [4] |
| | | | HBC-C HBC-C-E | 4.6 | 23,2 | 33,7 | 62,8 | 98,0 |
| | | | | 8.8 | 46,4 | 67,4 | 125,6 | 174,3 |
| | | | | A4-50 [1] | 29,0 | 42,2 | 78,5 | 122,5 |
| | | | HBC-C-N | 8.8 | - [4] | 67,4 | 125,6 | 174,3 |
| | | | HBC-T | 8.8 | - [4] | 67,4 | 125,6 | 177,4 |
| Partial factor | | $\gamma_{Ms}$ [3] | | 4.6 | 2,0 | | | |
| | | | | 8.8 | 1,5 | | | |
| | | | | A4-50 [1] | 2,86 | | | |
| Characteristic resistance | $V_{Rk,s}$ [2] | [kN] | HBC-B | 4.6 | 13,9 | 20,2 | - [4] | - [4] |
| | | | | A4-50 [1] | 17,4 | 25,3 | - [4] | - [4] |
| | | | HBC-C HBC-C-E | 4.6 | 13,9 | 20,2 | 37,7 | 58,8 |
| | | | | 8.8 | 23,2 | 33,7 | 62,8 | 101,7 |
| | | | | A4-50 [1] | 17,4 | 25,3 | 47,1 | 73,5 |
| | | | HBC-C-N | 8.8 | - [4] | 33,7 | 62,8 | 101,7 |
| | | | HBC-T | 8.8 | - [4] | 33,7 | 62,8 | 101,7 |
| Partial factor | | $\gamma_{Ms}$ [3] | | 4.6 | 1,67 | | | |
| | | | | 8.8 | 1,25 | | | 1,5 |
| | | | | A4-50 [1] | 2,38 | | | |

[1] Materials according to Table 5, Annex A5
[2] In conformity with EN ISO 898-1:2013
[3] In absence of other national regulations
[4] No performance assessed

**Table 30: Characteristic resistances under shear load with lever arm – steel failure of Hilti channel bolts HBC-B, HBC-C, HBC-C-E, HBC-C-N and HBC-T**

| **Channel bolt diameter** | | | | | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | | |
| Characteristic flexure resistance | $M^0_{Rk,s}$ [3] | [Nm] | HBC-B | 4.6 | 29,9 | 52,4 | - [3] | - [3] |
| | | | | A4-50 [1] | 37,4 | 65,5 | - [3] | - [3] |
| | | | HBC-C HBC-C-E | 4.6 | 29,9 | 52,4 | 133,2 | 259,6 |
| | | | | 8.8 | 59,8 | 104,8 | 266,4 | 538,7 |
| | | | | A4-50 [1] | 37,4 | 65,5 | 166,5 | 324,5 |
| | | | HBC-C-N | 8.8 | - [3] | 104,8 | 266,4 | 538,7 |
| | | | HBC-T | 8.8 | - [3] | 104,8 | 266,4 | 538,7 |
| Partial factor | | $\gamma_{Ms}$ [2] | | 4.6 | 1,67 | | | |
| | | | | 8.8 | 1,25 | | | |
| | | | | A4-50 [1] | 2,38 | | | |
| Internal lever arm | a | [mm] | HBC-B | 4.6, A4-50 | 25 | 27 | - [3] | - [3] |
| | | | HBC-C HBC-C-E | 4.6, 8.8, A4-50 | 24 | 26 | 28 | 30 |
| | | | HBC-C-N | 8.8 | - [3)] | 26 | 28 | 30 |
| | | | HBC-T | 8.8 | - [3] | 26 | 28 | 30 |

[1] Materials according to Table 5, Annex A5.
[2] In absence of other national regulations.
[3] No performance assessed




[3] The characteristic flexure resistance according to Table 23 is limited as follows:

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s,l} \cdot a$ ($N_{Rk,s,l}$ according to Table 15 and 17)

and

$M^0_{Rk,s} \leq 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ according to Table 29)

a = internal lever arm according Table 30

$T_s$ = tension force acting on the channel lips

$C_s$ = compression force acting on the channel lips

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of channel bolts under shear load with lever arm

Annex C10

**Table 31: Combination of anchor channels and channel bolts under fatigue tension load (Design method I or II for test method A1 and A2 according to EOTA TR050, October 2018)**

| Anchor channel | Channel bolt type | Diameter | Steel grade | Corrosion protection |
|---|---|---|---|---|
| HAC-30<br>HAC-V-T 30 | HBC-B | M10 | 4.6 | G [1]<br>F [2] |
| | | M12 | | |
| HAC-V 35<br>HAC-40<br>HAC-V 40 | HBC-C | M12 | 4.6 | |
| | | M16 | 8.8 | |
| | | M20 | | |
| HAC-50<br>HAC-V 50 | | M16 | 4.6 | |
| | | M20 | 8.8 | |
| HAC-60<br>HAC-V 60 | | M16 | 4.6 | |
| | | M20 | 8.8 | |
| HAC-70<br>HAC-V 70 | | M20 | 4.6<br>8.8 | |

[1] Electroplated
[2] Hot-dip galvanized

**Table 32: Characteristic resistances under fatigue tension load - steel failure with n load cycles without static preload ($N_{Ed}$ = 0) (Design method I according to EOTA TR050, October 2018)**

| Anchor channel | | HAC- 30<br>HAC-V-T 30 | HAC-V 35 | HAC-40<br>HAC-V 40 | HAC-50<br>HAC-V 50 | HAC-60<br>HAC-V 60 | HAC-70<br>HAC-V 70 |
|---|---|---|---|---|---|---|---|
| **Steel failure** | n | $\Delta N_{Rk,s,0,n}$ [kN] | | | | | |
| Characteristic resistances under fatigue tension load without static preload | $\leq 10^6$ | 1,76 | 1,57 | 1,57 | 2,66 | 3,54 | 6,44 |
| | $\leq 3 \cdot 10^6$ | 1,60 | 1,50 | 1,50 | 2,60 | 3,50 | 6,40 |
| | $\leq 10^7$ | | | | | | |
| | $\leq 3 \cdot 10^7$ | | | | | | |
| | $\leq 6 \cdot 10^7$ | | | | | | |
| | $> 6 \cdot 10^7$ | | | | | | |

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances under fatigue cyclic tension load according to test method A1 and A2

Annex C11

**Table 33: Reduction factor $\eta_{c,fat}$ with n load cycles without static preload ($N_{Ed}$ = 0) (Design method I or II for test method A1 and A2 according to EOTA TR050, October 2018)**

| Anchor channel | | HAC- 30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 |
|---|---|---|---|---|---|---|---|
| **Pull-out failure Concrete cone failure** | n | $\eta_{c,fat}$ [-] | | | | | |
| Reduction factor for $\Delta N_{Rk,p;0;n} = \eta_{c,fat} \cdot N_{Rk,p}$ $\Delta N_{Rk,c;0;n} = \eta_{c,fat} \cdot N_{Rk,c}$ with $N_{Rk,p}$ according to Annex C3 and C4 and $N_{Rk,c}$ calculated according to EOTA TR 047, March 2018 or EN 1992-4: 2018 | $\leq 10^6$ | 0,600 | | | | | |
| | $\leq 3 \cdot 10^6$ | 0,571 | | | | | |
| | $\leq 10^7$ | 0,542 | | | | | |
| | $\leq 3 \cdot 10^7$ | 0,516 | | | | | |
| | $\leq 6 \cdot 10^7$ | 0,500 | | | | | |
| | $> 6 \cdot 10^7$ | | | | | | |

**Table 34: Characteristic resistances under fatigue tension load with n → ∞ load cycles without static preload ($N_{Ed}$ = 0) (Design method II according to EOTA TR050, October 2018)**

| Anchor channel | | HAC- 30 HAC-V-T 30 | HAC-V 35 | HAC-40 HAC-V 40 | HAC-50 HAC-V 50 | HAC-60 HAC-V 60 | HAC-70 HAC-V 70 |
|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | |
| $\Delta N_{Rk,s;0;\infty}$ | [kN] | 1,6 | 1,5 | 1,5 | 2,6 | 3,5 | 6,4 |
| **Concrete cone and pull-out failure** | | | | | | | |
| $\eta_{c,fat}$ | [-] | 0,5 | | | | | |

For the reduction of the characteristic resistances given in Tables 32 and 33 in the transition zone from the static resistance to the fatigue limit resistance the partial safety factors are calculated as follows:

$$\gamma_{M,fat,n} = \gamma_{M,fat} + (\gamma_M - \gamma_{M,fat}) \cdot (\Delta N_{Rk,n} - \Delta N_{Rk,\infty}) / (N_{Rk} - \Delta N_{Rk,\infty})$$

In absence of other national regulations, the following safety factors $\gamma_M$ and $\gamma_{M,fat}$ are recommended for design method I according to EOTA TR 050, October 2018:

$\gamma_M$ according Annex C1

$\gamma_{M,fat}$ = 1,35

In absence of other national regulations, the following safety factor $\gamma_{M,fat}$ is recommended for design method II (Table 34) according to EOTA TR 050, October 2018:

$\gamma_{M,fat}$ = 1,35

| **Hilti anchor channels (HAC) with channel bolts (HBC)** | Annex C12 |
|---|---|
| **Performance** Characteristic resistances under fatigue cyclic tension load according to test method A1 and A2 | |

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**Table 35: Combination of anchor channels and channel bolts under seismic load (performance category C1)**

| Anchor channel | Channel bolt type | Diameter | Steel grade | Corrosion protection |
|---|---|---|---|---|
| HAC-V-T 30 | HBC-B | M12 | 4.6 | G [1] F [2] |
| HAC-V 35<br>HAC-V 40 | HBC-C-N | M12 | 4.6<br>8.8 | |
| | | M16 | | |
| HAC-V 50<br>HAC-V 60<br>HAC-V-T 70 | | M12 | | |
| | | M16 | | |
| | | M20 | | |
| HAC-V-T 50<br>HAC-V-T 70 | HBC-T | M12 | | |
| | | M16 | | |
| | | M20 | | |

[1] Electroplated
[2] Hot-dip galvanized

**Table 36: Characteristic resistances under seismic tension load – steel failure of anchor channel HAC-V**

| Anchor channel | | HAC-V-T 30 | HAC-V 35 | HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,a,eq}$ [kN] | 18,2 | 31,4 | 31,4 | 55,0 | | 55,0 | 75,0 | |
| Partial factor | $\gamma_{Ms,eq}$ [1] | 1,8 | | | | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | | | | |
| Characteristic resistance | $N_{Rk,s,c,eq}$ [kN] | 18,2 | 31,4 | 31,4 | 40,0 | 42,0 | 40,0 | 71,0 | 75,0 |
| Partial factor | $\gamma_{Ms,ca,eq}$ [1] | 1,8 | | | | | | | |
| **Steel failure: Local flexure of channel lips** | | | | | | | | | |
| Characteristic resistance | $N^0_{Rk,s,l,eq}$ [kN] | 19,9 | 31,4 | 31,4 | 40,0 | 41,0 | 40,0 | 71,0 | |
| Partial factor | $\gamma_{Ms,l,eq}$ [1] | 1,8 | | | | | | | |

[1] In absence of other national regulations.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channel under seismic tension load (performance category C1)

Annex C13

**Table 37: Characteristic flexural resistance of HAC-V channel under seismic tension load**

| Anchor channel | | | HAC-V-T 30 | HAC-V 35 | HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Flexure of channel** | | | | | | | | | | |
| Characteristic flexural resistance of channel | $M_{Rk,s,flex,eq}$ [Nm] | HBC-B | 786 | - [2] | - [2] | - [2] | - [2] | - [2] | - [2] | - [2] |
| | | HBC-C | - [2] | 1318 | 1318 | 1853 | - [2] | 2538 | 3668 | - [2] |
| | | HBC-C-E | - [2] | 1318 | 1318 | 1853 | - [2] | - [2] | - [2] | - [2] |
| | | HBC-C-N | - [2] | 1137 | 1137 | 1551 | - [2] | 2503 | 3488 | - [2] |
| | | HBC-T | - [2] | - [2] | - [2] | - [2] | 1853 | - [2] | - [2] | 3455 |
| Partial factor | | $\gamma_{Ms,flex,eq}$ [1] | 1,15 | | | | | | | |

[1] In absence of other national regulations. [2] No performance assessed.

**Table 38: Characteristic resistances under seismic shear load – steel failure of anchor channel HAC-V**

| Anchor channel | | HAC-V-T 30 | HAC-V 35 HAC-V 40 | HAC-V 50 | HAC-V-T 50 | HAC-V 60 | HAC-V 70 | HAC-V-T 70 |
|---|---|---|---|---|---|---|---|---|
| **Steel failure: Anchor** | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,a,y,eq}$ [kN] | 26,9 | 42,5 | 57,5 | 57,9 | 57,5 | 116,5 | 114,8 |
| | $V_{Rk,s,a,x,eq}$ [kN] | 9,1 | 15,7 | 27,5 | 27,5 | 25,5 | 37,5 | 37,5 |
| Partial factor | $\gamma_{Ms,eq}$ [1] | 1,5 | | | | | | |
| **Steel failure: Connection between anchor and channel** | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,c,y,eq}$ [kN] | 26,9 | 42,5 | 57,5 | 57,9 | 57,5 | 116,5 | 114,8 |
| | $V_{Rk,s,c,x,eq}$ [kN] | 9,1 | 15,7 | 27,5 | 27,5 | 25,5 | 37,5 | 37,5 |
| Partial factor | $\gamma_{Ms,ca,eq}$ [1] | 1,8 | | | | | | |
| **Steel failure: Local flexure of channel lips under shear load perpendicular to the longitudinal axis of the channel** | | | | | | | | |
| Characteristic resistance | $V^0_{Rk,s,l,y,eq}$ [kN] | 27,7 | 37,4 | 55,0 | 60,5 | 55,0 | 102,9 | 118,8 |
| Partial factor | $\gamma_{Ms,l,eq}$ [1] | 1,8 | | | | | | |

[1] In absence of other national regulations.

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**Table 39: Characteristic resistances under seismic shear load in direction of the longitudinal axis of the channel – steel failure of anchor channel HAC-V**

| **Anchor channel** | | | **HAC-V-T 30** | **HAC-V 35 HAC-V 40** | **HAC-V 50** | **HAC-V-T 50** | **HAC-V 60** | **HAC-V 70** | **HAC-V-T 70** |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure: Connection between channel lips and channel bolt** | | | | | | | | | |
| Characteristic resistance | $V_{Rk,s,l,x,eq}$ [kN] | HBC-B M12 4.6 | 3,5 | - [1] | - [1] | - [1] | - [1] | | - [1] |
| | | HBC-C-N M12 8.8 | - [1] | 8,5 | 8,5 | | 8,5 | 8,5 | |
| | | HBC-C-N M16 8.8 | | 19,7 | 19,7 | | 19,7 | 19,7 | |
| | | HBC-C-N M20 8.8 | | - [1] | 24,1 | | 24,1 | 24,1 | |
| | | HBC-T M12 8.8 | | - [1] | - [1] | 15,1 | - [1] | - [1] | 15,1 |
| | | HBC-T M16 8.8 | | | | 20,1 | | | 20,1 |
| | | HBC-T M20 8.8 | | | | 20,1 | | | 20,1 |
| Installation factor | | $\gamma_{inst,eq}$ | 1,4 | | | 1,2 | 1,4 | | 1,2 |

[1] No performance assessed.

| **Hilti anchor channels (HAC) with channel bolts (HBC)** | Annex C15 |
|---|---|
| **Performance**<br>Characteristic resistances of anchor channel under seismic shear load in direction of the longitudinal axis of the channel (performance category C1) | |

**Table 40: Characteristic resistances under seismic tension and seismic shear load – steel failure of Hilti channel bolts HBC-B, HBC-C-N and HBC-T**

| **Channel bolt diameter** | | | | | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | |
| Characteristic resistance | $N_{Rk,s,eq}$ [1] | [kN] | HBC-B | 4.6 | 33,7 | - [3] | - [3] |
| | | | HBC-C-N | 8.8 | 67,4 | 125,6 | 174,3 |
| | | | HBC-T | 8.8 | 67,4 | 125,6 | 177,4 |
| Partial factor | | $\gamma_{Ms,eq}$ [3] | | 4.6 | 2,0 | - [3] | |
| | | | | 8.8 | 1,5 | | |
| Characteristic resistance | $V_{Rk,s,eq}$ [1] | [kN] | HBC-B | 4.6 | 20,2 | - [3] | - [3] |
| | | | HBC-C-N | 8.8 | 33,7 | 62,8 | 101,7 |
| | | | HBC-T | 8.8 | 33,7 | 62,8 | 101,7 |
| Partial factor | | $\gamma_{Ms,eq}$ [2] | | 4.6 | 1,67 | - [3] | |
| | | | | 8.8 | 1,25 | | 1,5 |

[1] In conformity with EN ISO 898-1:2013
[2] In absence of other national regulations
[3] No performance assessed

| **Hilti anchor channels (HAC) with channel bolts (HBC)** | Annex C16 |
|---|---|
| **Performance**<br>Characteristic resistances of channel bolts under seismic tension and seismic shear load (performance category C1) | |

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**Table 41: Characteristic resistance under fire exposure – steel failure**

| **Channel bolt** | | | | | **M10** | **M12** | **M16** | **M20** |
|---|---|---|---|---|---|---|---|---|
| **Steel failure of anchor, connection between anchor and channel, local flexure of channel lip** | | | | | | | | |
| Characteristic resistance under fire exposure | HAC-30 HAC-V-T 30 | R60 | $N_{Rk,s,fi}$ = $V_{Rk,s,fi}$ | [kN] | 1,3 | 1,8 | - [2] | - [2] |
| | | R90 | | | 0,9 | 1,1 | | |
| | | R120 | | | 0,7 | 0,8 | | |
| | HAC-V 35 | R60 | | | 1,7 | 2,4 | 2,4 | 2,4 |
| | | R90 | | | 1,3 | 1,8 | 1,8 | 1,8 |
| | | R120 | | | 1,0 | 1,5 | 1,5 | 1,5 |
| | HAC-40 HAC-V 40 | R60 | | | 1,7 | 2,4 | 2,4 | 2,4 |
| | | R90 | | | 1,3 | 1,8 | 1,8 | 1,8 |
| | | R120 | | | 1,0 | 1,5 | 1,5 | 1,5 |
| | HAC-50 HAC-V 50 | R60 | | | 1,7 | 2,4 | 4,0 | 4,0 |
| | | R90 | | | 1,3 | 1,8 | 2,4 | 2,4 |
| | | R120 | | | 1,0 | 1,5 | 1,6 | 1,6 |
| | HAC-60 HAC-V 60 | R60 | | | 1,7 | 2,4 | 4,0 | 4,7 |
| | | R90 | | | 1,3 | 1,8 | 2,4 | 3,0 |
| | | R120 | | | 1,0 | 1,5 | 1,6 | 2,1 |
| | HAC-70 HAC-V 70 | R60 | | | 1,7 | 2,4 | 4,0 | 4,7 |
| | | R90 | | | 1,3 | 1,8 | 2,4 | 3,0 |
| | | R120 | | | 1,0 | 1,5 | 1,6 | 2,1 |
| Partial safety factor | | | $\gamma_{Ms,fi}$ [1] | [-] | 1,0 | | | |

[1] In absence of other national regulations.
[2] No performance assessed.

**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels and channel bolts under fire exposure

Annex C17

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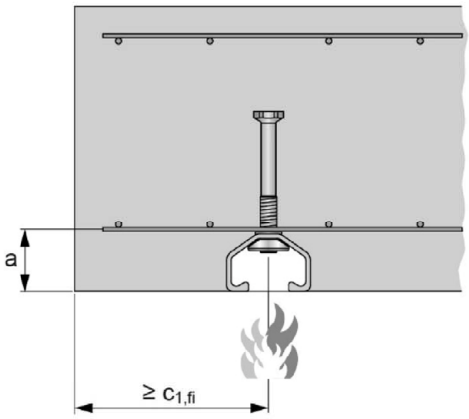
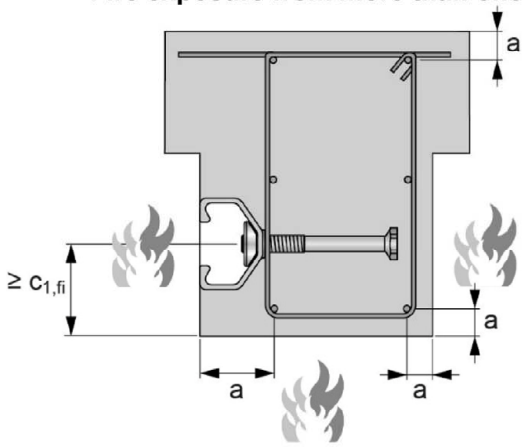
**Table 42: Minimum axis distance**

| Anchor channel | | | | HAC- 30<br>HAC-V-T 30 | HAC-V<br>35 | HAC-40<br>HAC-V 40 | HAC-50<br>HAC-V 50 | HAC-60<br>HAC-V 60 | HAC-70<br>HAC-V 70 |
|---|---|---|---|---|---|---|---|---|---|
| Min. axis distance | R60 | a | [mm] | 35 | 35 | 35 | 50 | 50 | 50 |
| | R90 | | | 45 | 45 | 45 | | | |
| | R120 | | | 60 | 60 | 60 | 60 | 65 | 70 |

**Fire exposure from one side only**




**Fire exposure from more than one side**




**Hilti anchor channels (HAC) with channel bolts (HBC)**

**Performance**
Characteristic resistances of anchor channels and channel bolts under fire exposure

Annex C18