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 Feldkircherstraße 100 9494 Schaan 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 $M_{Rk,s,flex}$ 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 $k_{cr,N}$; $k_{ucr,N}$ 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

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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)	γ_{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

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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)	δ_{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

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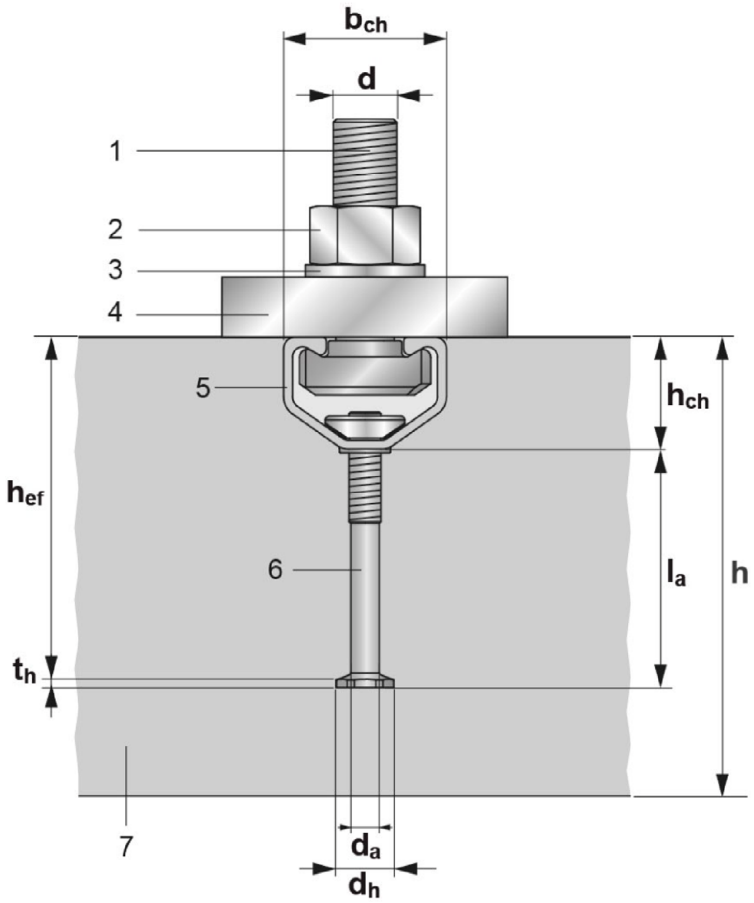
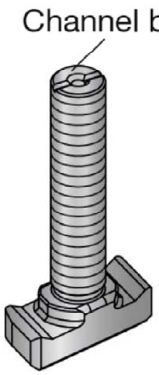
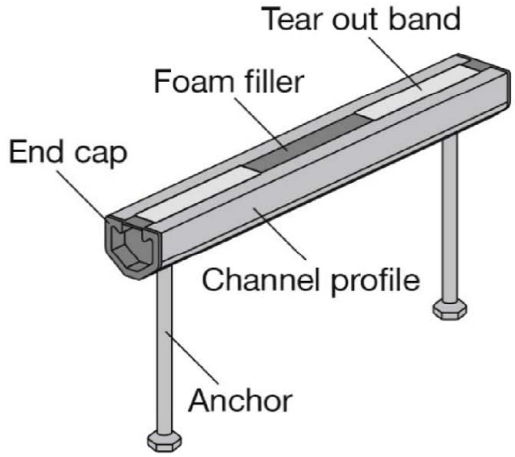
Product and installation condition



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

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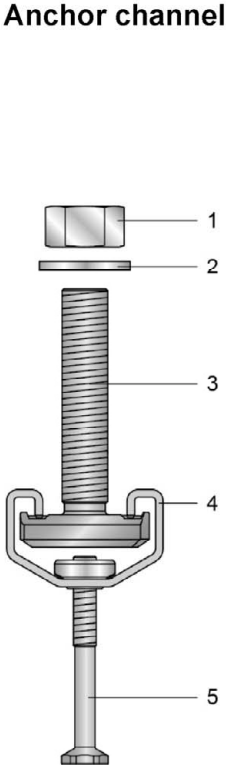
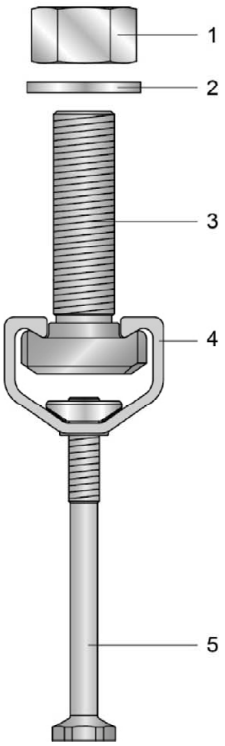
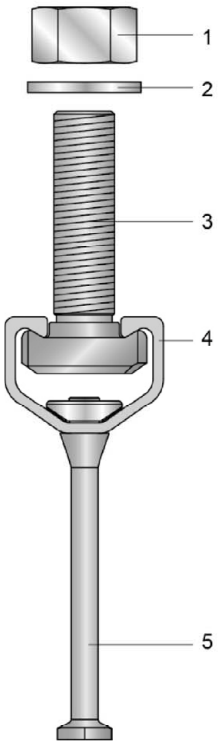
Anchor channel types



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:

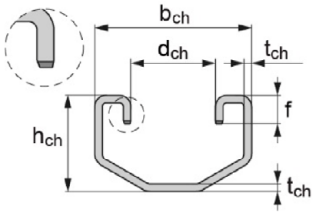
HBC-X-(N) YZ

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

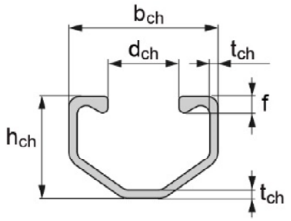
(e.g. HBC-C 8.8F)

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

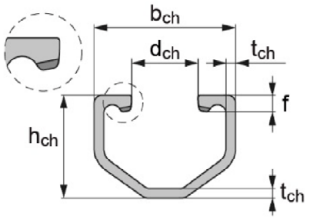
Anchor Channels



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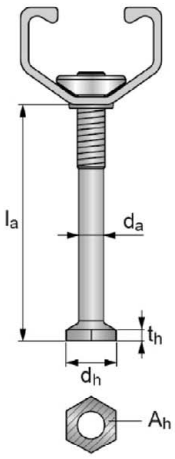
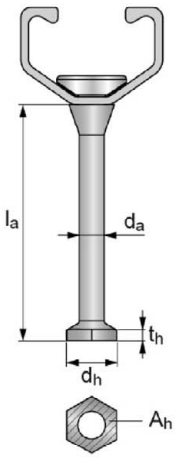
Table 3: Dimensions of anchor (welded or bolted to the channel profile)

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

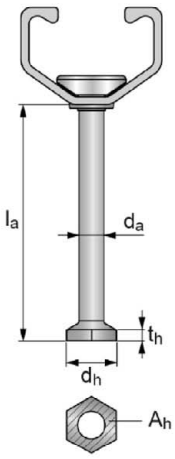
HAC with bolted anchor



HAC-V with bolted anchor



welded anchor



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

Product Description
Anchor channels (HAC)

Annex A4

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Channel bolts

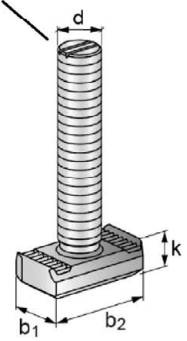
Table 4: Dimensions of channel bolt

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

[1] Material properties according to Annex A5

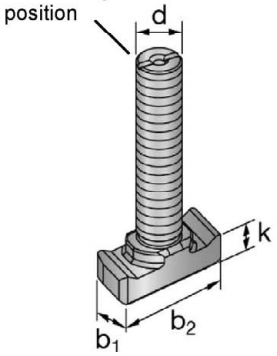
HBC-B

Single groove for marking the position



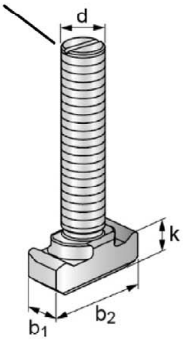
HBC-C-E

Single groove for marking the position



HBC-C

Single groove for marking the position



HBC-C-N

Double groove for marking the position

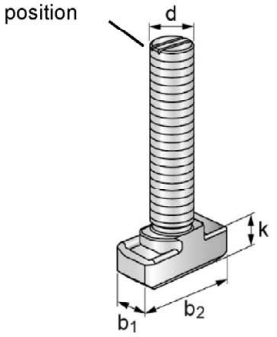


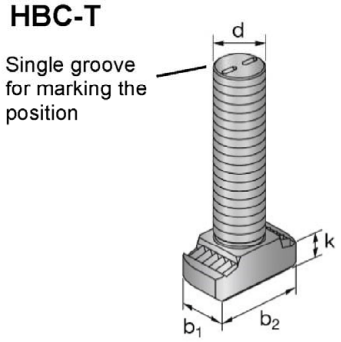
Table 5: Steel grade and corrosion protection

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] 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



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

Product Description
Channel bolts (HBC)

Annex A5

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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 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 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 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.

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

Product Description
Materials

Annex A6

Deutsches Institut für Bautechnik DIBt

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.

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Hilti anchor channels (HAC) with channel bolts (HBC)	Annex B1
Intended Use Specifications	

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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 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

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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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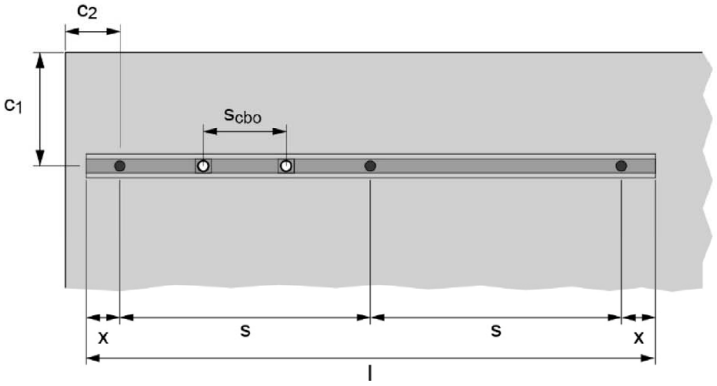
Table 9: Installation parameters for anchor channel HAC-V

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



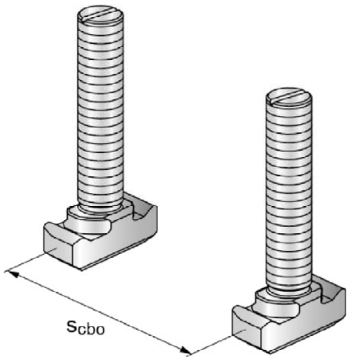


Table 10: Minimum spacing for channel bolts

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)

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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.

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

Intended Use
Installation parameters for channel bolts (HBC)

Annex B5

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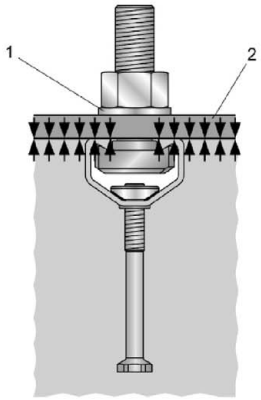
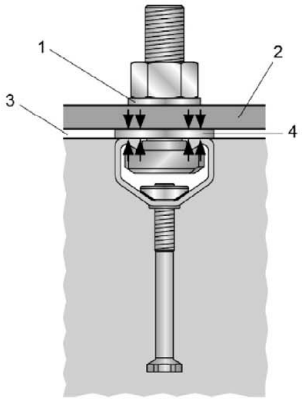
General: The fixture is in contact with the channel profile and the concrete surface



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).



Key

1 washer
2 fixture
3 gap
4 suitable steel part

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Hilti anchor channels (HAC) with channel bolts (HBC)	Annex B6
Intended Use Installation parameters for channel bolts (HBC)	

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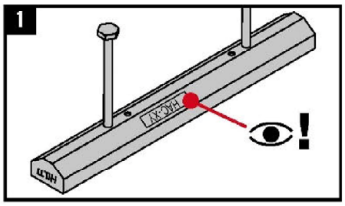
HILTI

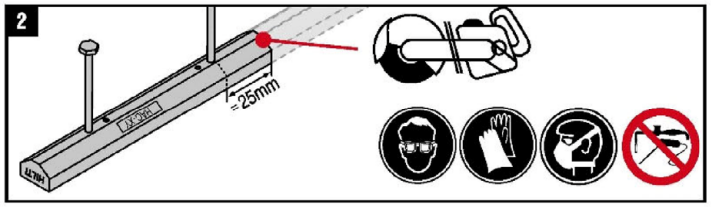
HAC-(V)-(T)

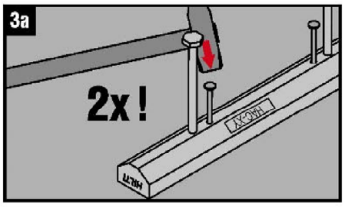
CE
11
Hilti AG
FL-9494 Schaan
Hilti Werke
2873-CPR-201-18/07, 14
ETA-11/0006
Notified body 2873
EAD330008-03-0601
Anchor channels for fixing to concrete
www.hilti.group

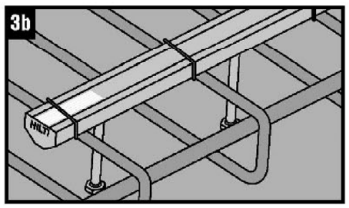
ICC ES
ESR-3520

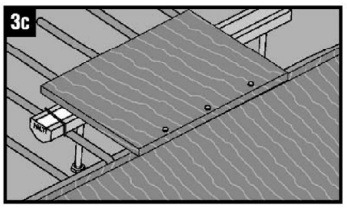
2015302-07.2021

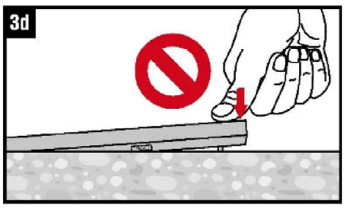


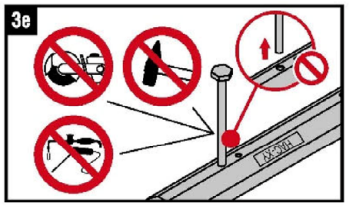


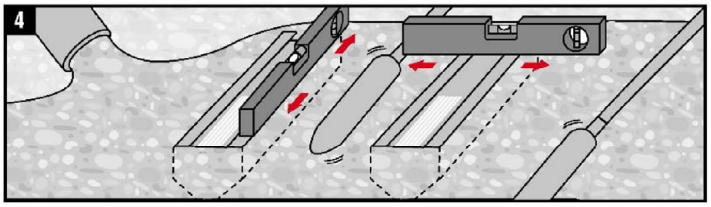


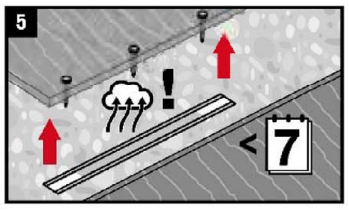


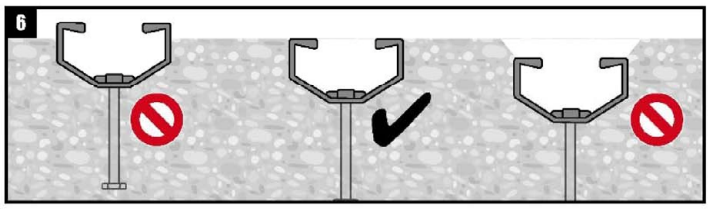


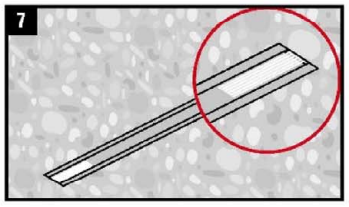


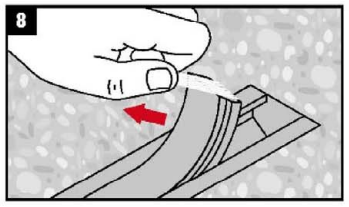












Hilti anchor channels (HAC) with channel bolts (HBC)

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

Annex B7

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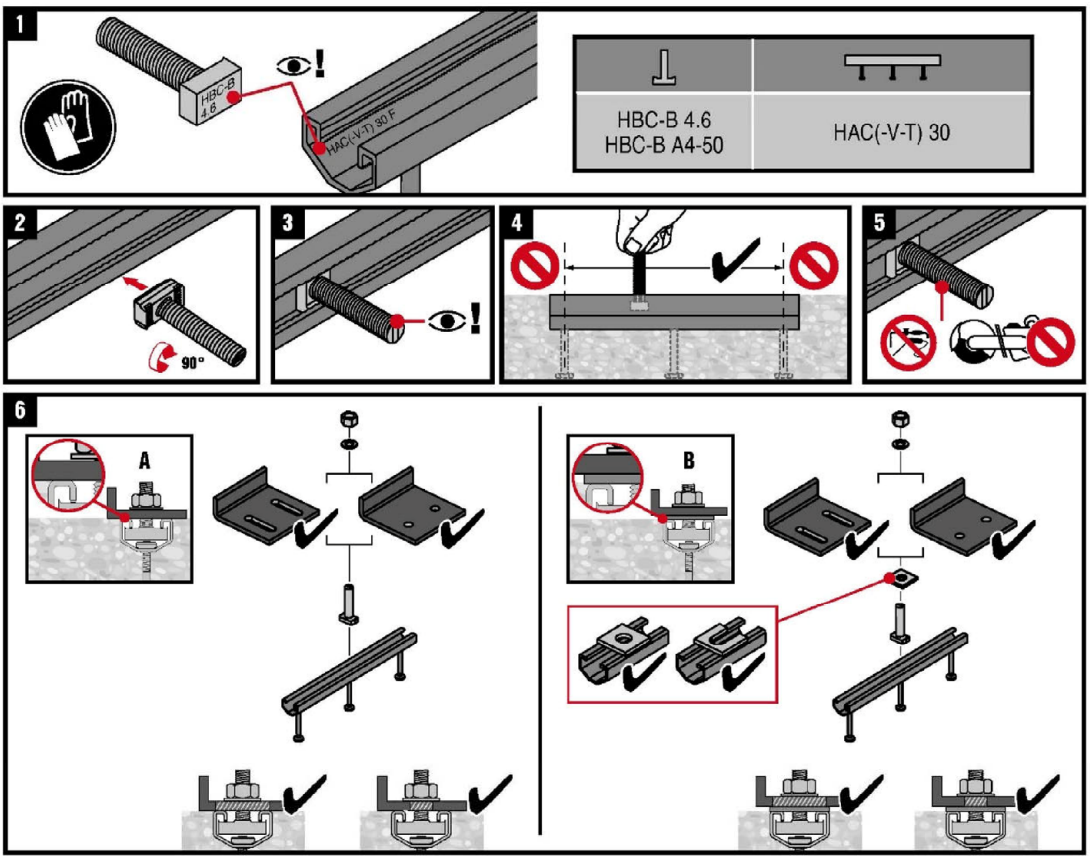
HILTI

HBC-B



		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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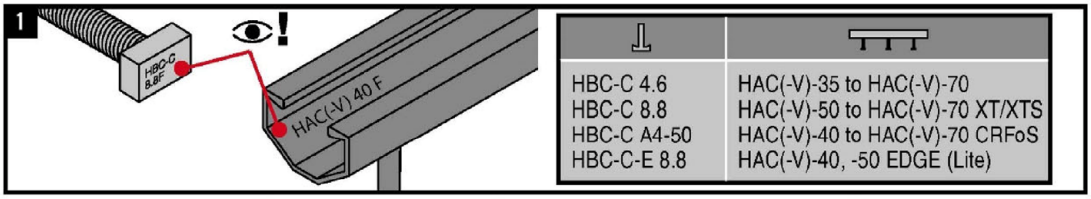
HILTI / HBC-C



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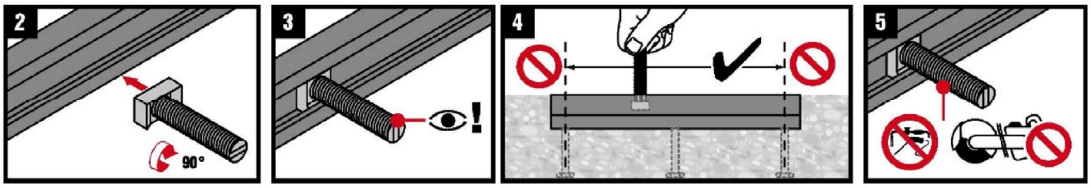

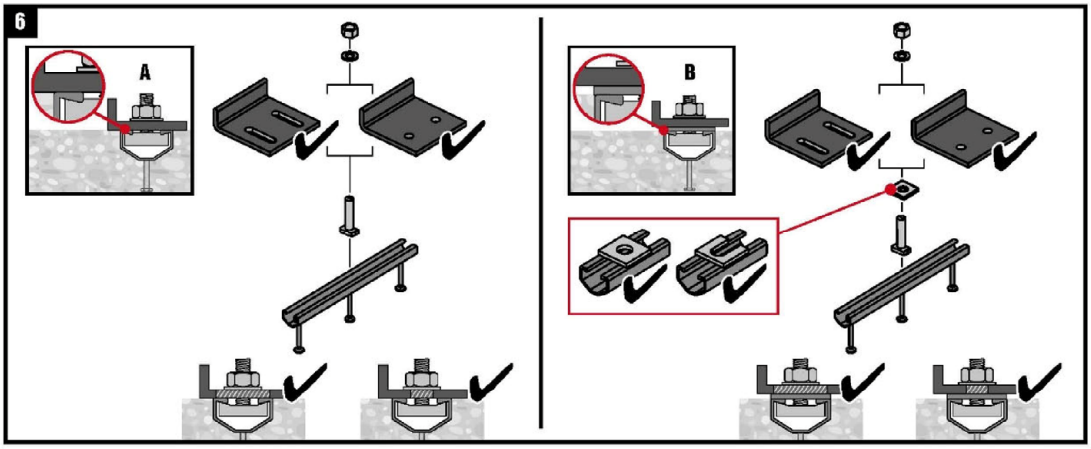

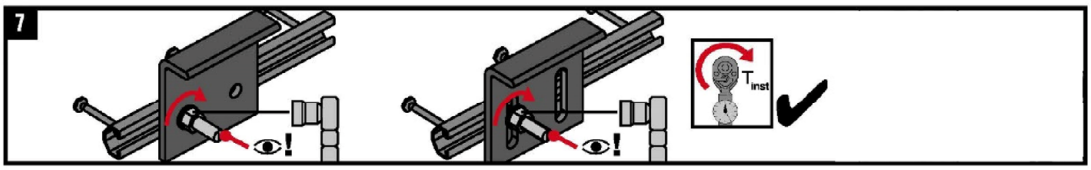

		T_{inst}									
		A					B				
		HAC(-V)-35	HAC(-V)-40	HAC(-V)-50	HAC(-V)-60	HAC(-V)-70	HAC(-V)-35	HAC(-V)-40	HAC(-V)-50	HAC(-V)-60	HAC(-V)-70
M10	4.6, A4-50	15 Nm / 11 ft-lb					15 Nm / 11 ft-lb				
	8.8	15 Nm / 11 ft-lb					48 Nm / 35 ft-lb				
M12	4.6, A4-50	25 Nm / 19 ft-lb					25 Nm / 19 ft-lb				
	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

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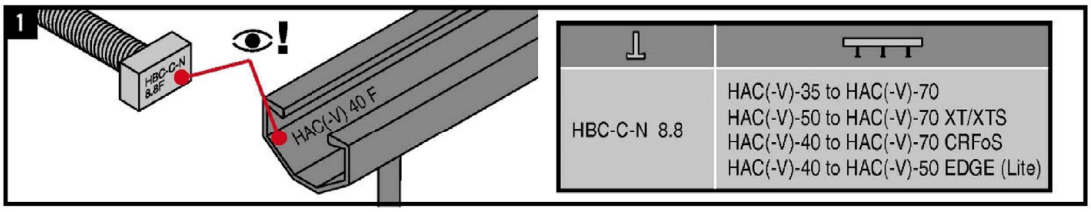
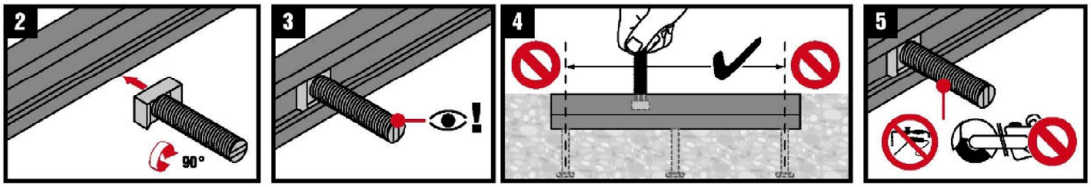
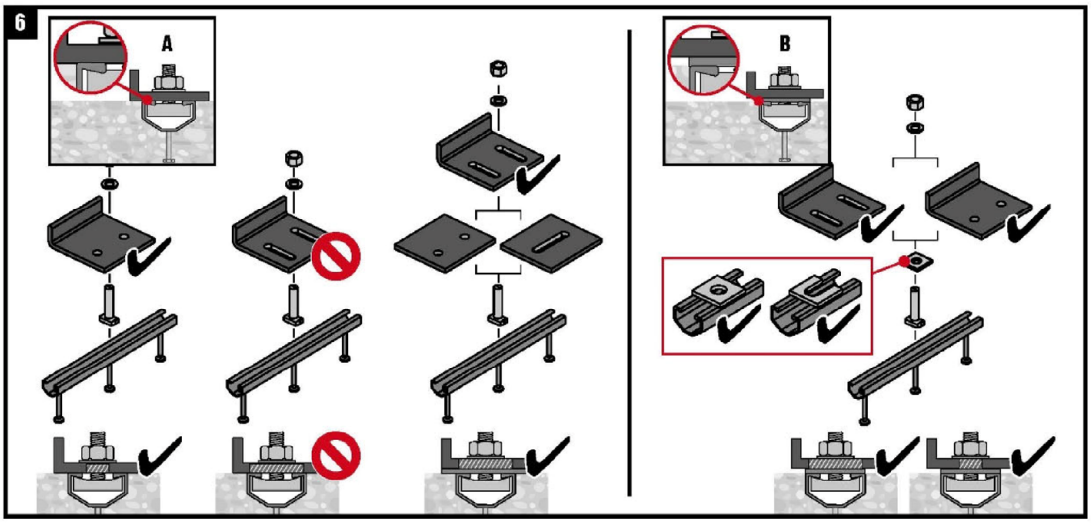
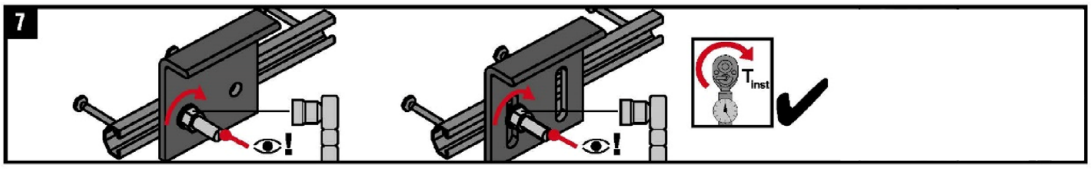
HILTI / HBC-C-N









		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

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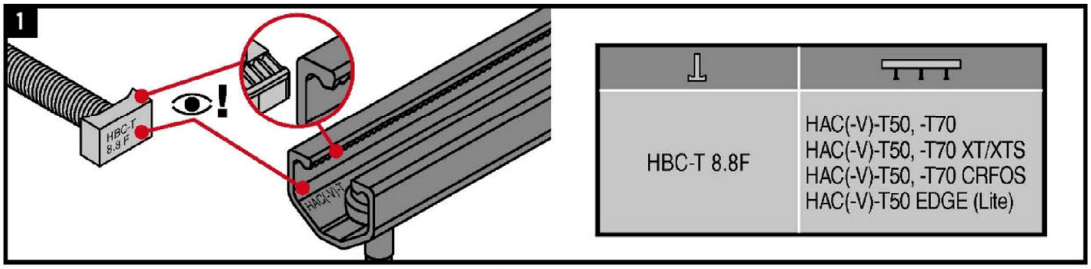
HILTI

HBC-T



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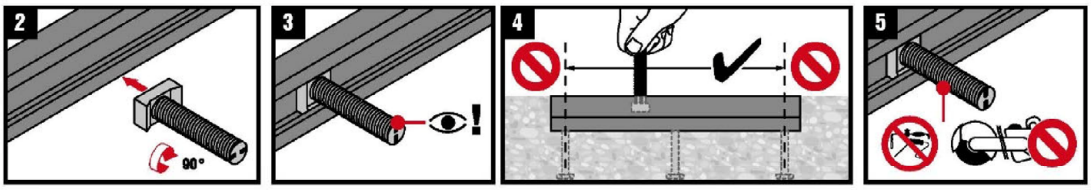

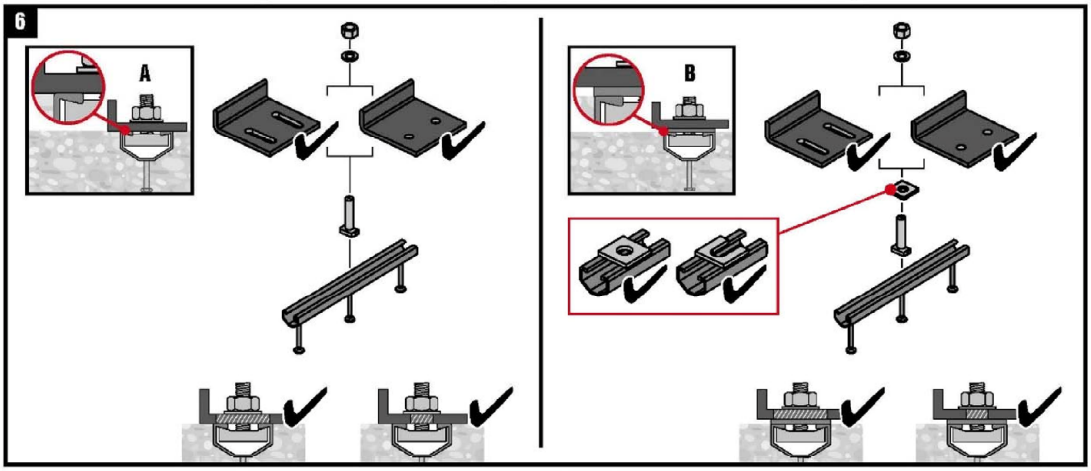

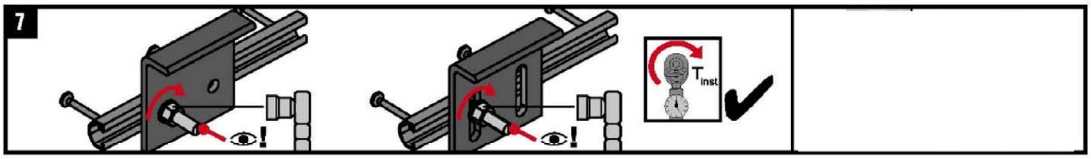

		T_{inst}			
		A		B	
		HAC(-V)-T50	HAC(-V)-T70	HAC(-V)-T50	HAC(-V)-T70
M12	8.8	75 Nm / 55 ft-lb		75 Nm / 55 ft-lb	
M16	8.8	100 Nm / 74 ft-lb		185 Nm / 136 ft-lb	
M20	8.8	120 Nm / 89 ft-lb		320 Nm / 236 ft-lb	

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

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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	γ_{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

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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	γ_{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

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

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

Annex C2

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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	Ψ_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		γ_{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

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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	Ψ_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		γ_{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

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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]	δ_{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	γ_{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.

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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

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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	γ_{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.

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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		γ_{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		γ_{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		γ_{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

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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							

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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		γ_{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		γ_{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

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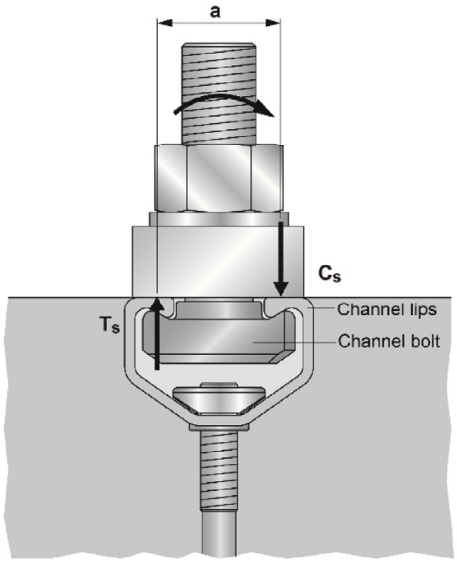
Table 30: Characteristic resistances under shear load with lever arm – steel failure of Hilti channel bolts HBC-B, HBC-C, HBC-C-E, HBC-C-N and HBC-T

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		γ_{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:

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

and

$M^0_{Rk,s} \le 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ 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

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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 HAC-V-T 30	HBC-B	M10	4.6	G [1] F [2]
		M12		
HAC-V 35 HAC-40 HAC-V 40	HBC-C	M12	4.6	
		M16	8.8	
		M20		
HAC-50 HAC-V 50		M16	4.6	
		M20	8.8	
HAC-60 HAC-V 60		M16	4.6	
		M20	8.8	
HAC-70 HAC-V 70		M20	4.6 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 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	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
	$\leq 10^7$						
	$\leq 3 \cdot 10^7$						
	$\leq 6 \cdot 10^7$						
	$> 6 \cdot 10^7$						

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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 γ_M and $\gamma_{M,fat}$ are recommended for design method I according to EOTA TR 050, October 2018:

γ_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

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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 HAC-V 40	HBC-C-N	M12	4.6 8.8	
		M16		
HAC-V 50 HAC-V 60 HAC-V-T 70		M12		
		M16		
		M20		
HAC-V-T 50 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.

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Hilti anchor channels (HAC) with channel bolts (HBC)	Annex C13
Performance Characteristic resistances of anchor channel under seismic tension load (performance category C1)	

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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.

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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

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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.

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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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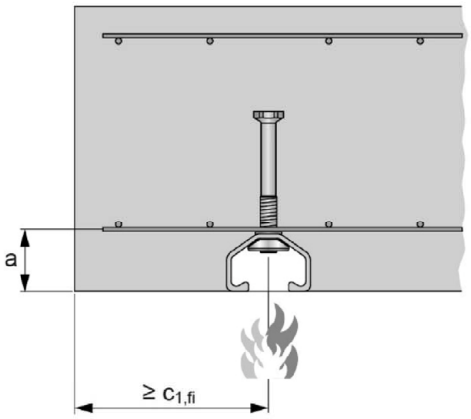
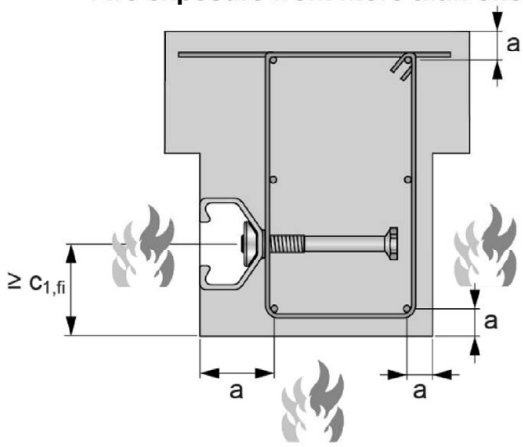
Table 42: Minimum axis distance

Anchor channel				HAC- 30 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
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



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