

# HILTI

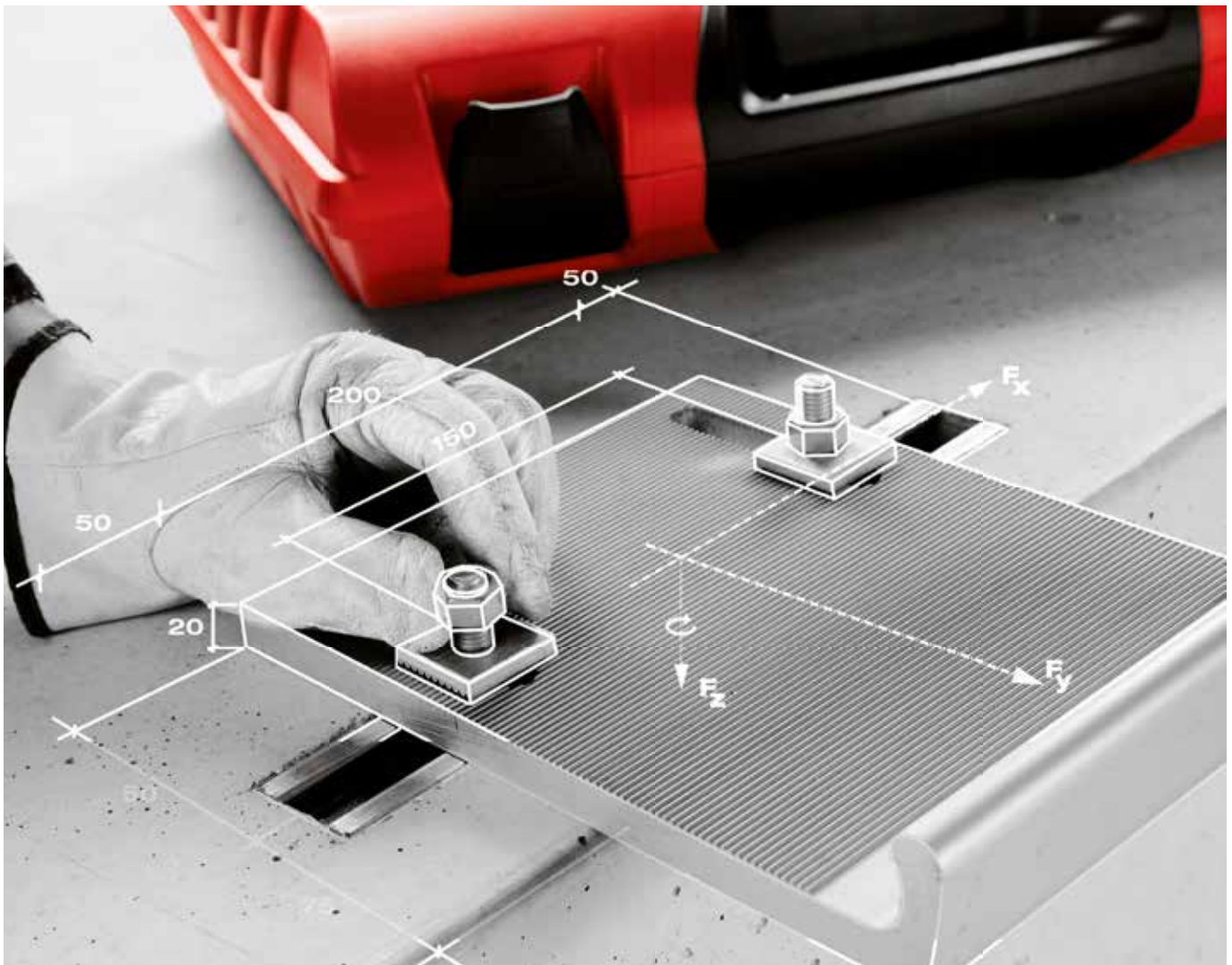
Hilti anchor channels

Method statement



Issue 01/2013

## Recommendations in case of misplacement of the Hilti anchor channel system

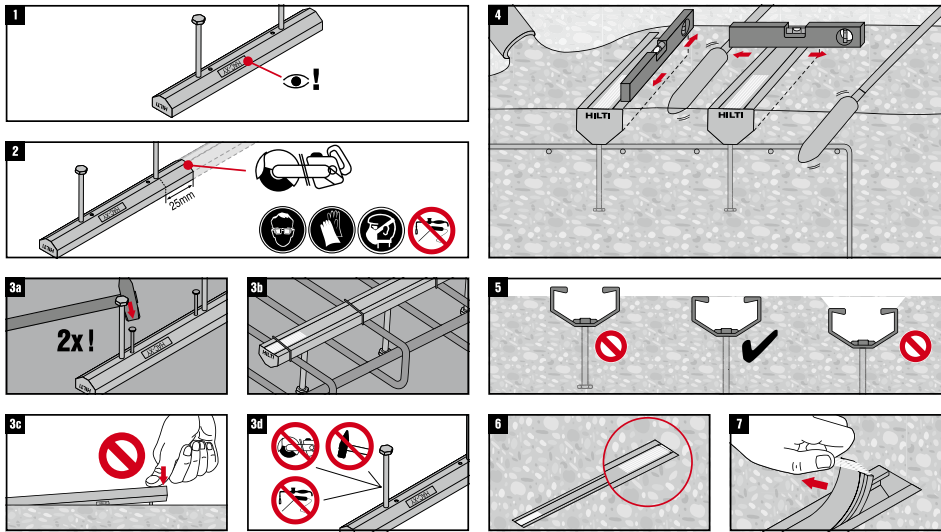


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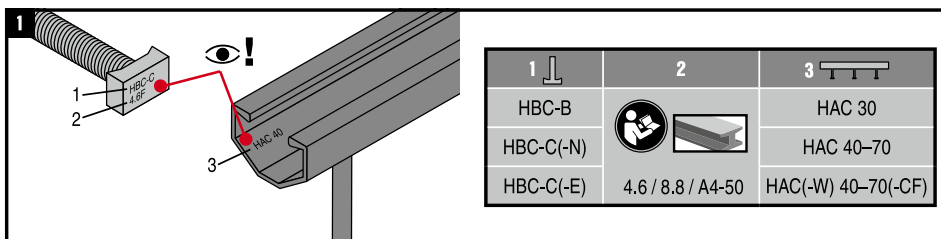
# 1. Correct Installation

## 1.1. Installation of HAC Anchor Channels

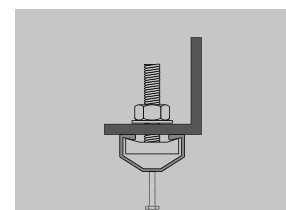
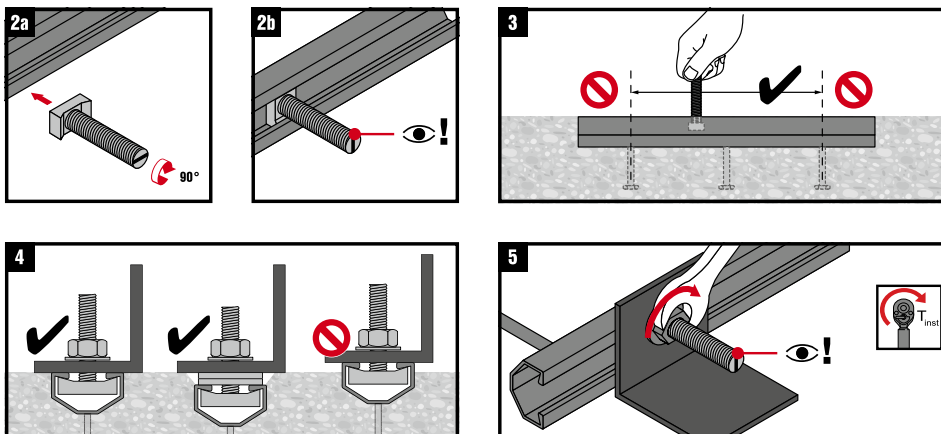


Instructions for use of HAC anchor channels

## 1.1. Installation of HAC Anchor Channels

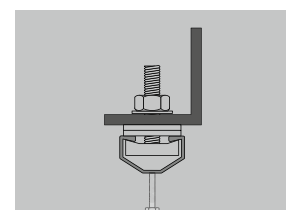


Instructions for use of HBC bolts



General installation situation

Position of fixture			ETA-11/0006				ICC ESR 3520		
			M10	M12	M16	M20	M12	M16	M20
	4.6 8.8 A4-50	HAC-30	15	25	-	-	-	-	-
		HAC-40	15	25	60	120	25	60	70
		HAC-50							105
		HAC-60							120
		HAC-70							120
	4.6 A4-50	HAC-30-70	15	25	60	120	-	-	-
			8.8	48	70 (40) <sup>1)</sup>	200	400	-	-



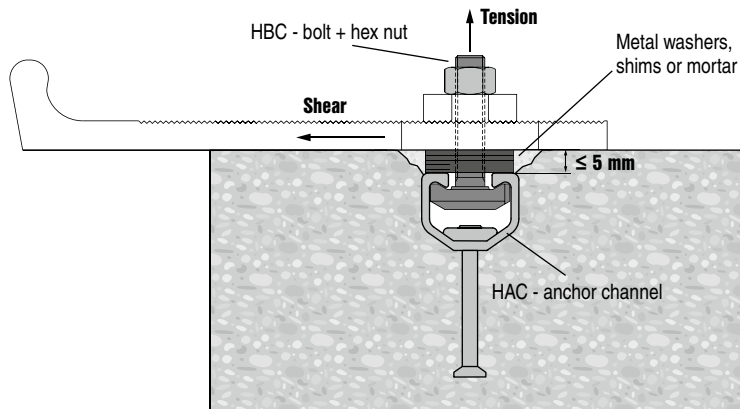
Installation steel-to-steel contact

1) For HBC-B M12

## 2. Misplaced HAC anchor channel

### 2.1 HAC anchor channel embedded too deep into concrete (HAC-40 to HAC-70)

#### 2.1.1 HAC anchor channel embedded $\leq 5\text{mm}$ too deep



#### Description:

A void of  $\leq 5\text{mm}$  between the surface of the anchor channel and the part to be fastened can be observed. The contact between the anchor channel and the fastened part as required in accordance to the European Technical Approval ETA-11/0006 is not met.

#### Possible Consequences:

##### Tension:

- HBC-T-bolt might result too short for installation.
- It might become impossible to apply the required installation torque or forces needed for a proper working of the system – especially for the HBC-C-N bolt.
- The stiffness of the fastening is insufficient.

##### Shear:

- Overstressing of the HBC t-bolt due to increased bending moments.
- Exceeding the resistance and subsequent deformation of the channel lips.

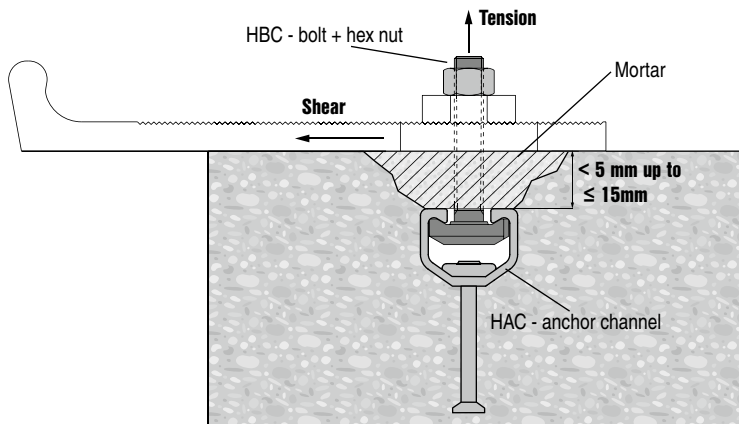
#### Required measures:

- Check of bolt length. If necessary, use longer HBC bolt.
- Check static calculations concerning screw bending. If necessary apply one of the following steps:
  - (1) No filling or leveling of void between anchor channel and part to be fastened.
    - ➔ Check of calculated resistance of t-bolt, especially against bending. If necessary use t-bolt of bigger diameter or higher steel grade acc. ETA-11/0006, Annex 15 in order to meet necessary resistances.
    - Attention:** The general installation torque according to ETA-11/0006, Annex 9 and 10 may not be exceeded.
  - (2) Filling of the void between anchor channel and fastened part by use of mortar (min. compressive strength  $\geq 30\text{N/mm}^2$ ), e.g. Hilti mortar HY 150 MAX, HY 200 or other brands e.g. CB-G PG1 or CB-G EG.

#### Recommended installation procedure:

1. Installation of fastened part
  - Apply sufficient installation torque in order to hold the part in place.
2. Filling of void with mortar
  - Respect required curing time of mortar!
3. Final fastening of fastened part
  - Apply the required installation torque  $T_{inst}$ .
  - ➔ The proof of resistance of the t-bolt against screw bending is not required in case the void is sufficiently filled with a mortar.
- (3) Filling of the void between anchor channel and fastened part by stiff, bending resistant shims (e.g. massive one-part shims)
  - ➔ The proof of resistance of the t-bolt against screw bending is not required in case the void is filled with bending resistant shims!
  - Attention:** The general installation torque according to ETA-11/0006, Annex 9 and 10 may not be exceeded. It is recommended to ensure a steel-to-steel contact according to ETA-11/0006, Annex 10, fig. 16.

### 2.1.2 HAC anchor channel embedded >5mm up to ≤15mm too deep



#### Description:

A void of >5mm up to ≤15mm between the surface of the anchor channel and the part to be fastened can be observed.

#### Possible Consequences:

##### Tension:

- HBC-T-bolt might result too short for installation.
- It might become impossible to apply the required installation torque or forces needed for a proper working of the system – especially for the HBC-C-N bolt.
- The stiffness of the fastening is insufficient.

##### Shear:

- Overstressing of the HBC t-bolt due to increased bending moments.
- Exceeding the resistance and subsequent deformation of the channel lips.

#### Required measures:

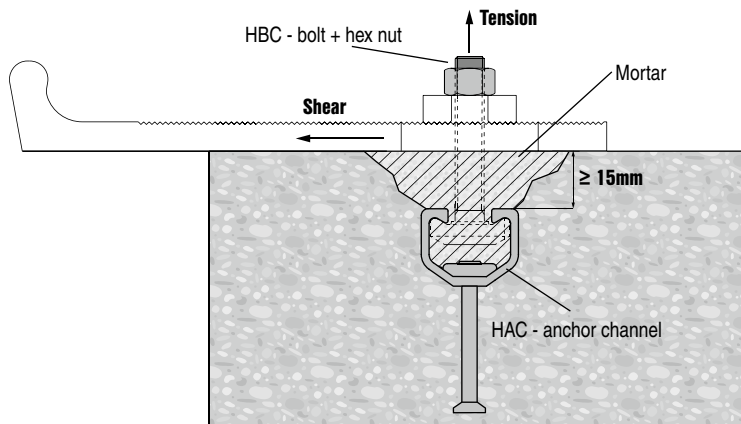
- Check of bolt length. If necessary, use longer HBC bolt.
- Check static calculations concerning screw bending. If necessary apply one of the following steps:  
Filling of the void between anchor channel and fastened part by use of mortar (min. compressive strength  $\geq 30\text{N/mm}^2$ ), e.g. Hilti mortar HY 150 MAX, HY 200 or other brands e.g. CB-G PG1 or CB-G EG.

#### Recommended installation procedure:

1. Installation of fastened part
  - Apply sufficient installation torque in order to hold the part in place.
2. Filling of void with mortar
  - Respect required curing time of mortar!
3. Final fastening of fastened part
  - Apply the required installation torque  $T_{\text{inst}}$ .

→ The proof of resistance of the t-bolt against screw bending is not required in case the void is sufficiently filled with a mortar.

**2.1.3 HAC-anchor channel embedded more than 15mm too deep**



**Description:**

A void of >15mm between the surface of the anchor channel and the part to be fastened can be observed.

**Possible Consequences:**

**Tension:**

- HBC-T-bolt might result too short for installation.
- It might become impossible to apply the required installation torque or forces needed for a proper working of the system – especially for the HBC-C-N bolt.
- The stiffness of the fastening is insufficient.

**Shear:**

- Overstressing of the HBC t-bolt due to increased bending moments.
- Exceeding the resistance and subsequent deformation of the channel lips.

**Required measures:**

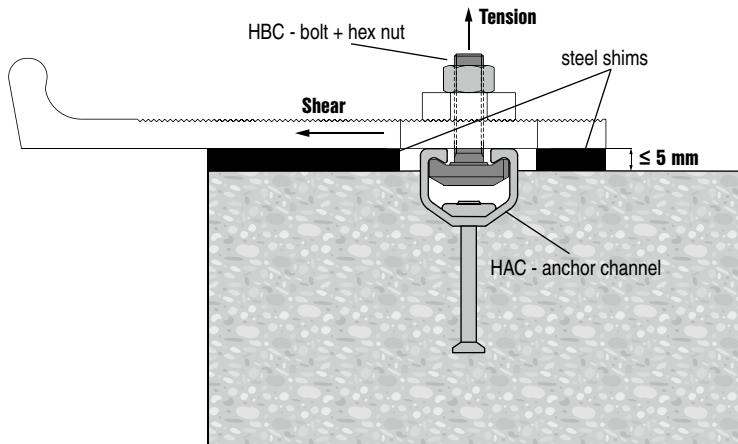
- Check of bolt length. If necessary, use longer HBC bolt.
- Check static calculations concerning screw bending. If necessary apply one of the following steps:  
 Filling of the void between anchor channel and fastened part by use of mortar (min. compressive strength  $\geq 30\text{N/mm}^2$ ), e.g. Hilti mortar HY 150 MAX, HY 200 or other brands e.g. CB-G PG1 or CB-G EG.

**Recommended installation procedure:**

1. Installation of fastened part
    - Apply sufficient installation torque in order to hold the part in place.
  2. Filling of void with mortar
    - Respect required curing time of mortar!
  3. Final fastening of fastened part
    - Apply the required installation torque  $T_{inst}$ .
- The proof of resistance of the t-bolt against screw bending is not required in case the void is sufficiently filled with a mortar.

## 2.2 HAC anchor channel protrudes from concrete surface (HAC-40 to HAC-70)

### 2.2.1 HAC anchor channel protrudes from concrete surface by <math>\leq 5\text{mm}</math>



#### Description:

The surface of the anchor channel protrudes from the concrete surface by  $\leq 5\text{mm}$ .

#### Possible Consequences:

##### Tension:

- The effective embedment depth ( $h_{ef}$ ) of the HAC anchor channel is being reduced by up to 5mm. This leads to a reduction of the pull-out resistance of the anchor channel in tension direction.

##### Shear:

- The fastened part is not flush to the concrete surface. This can result in uncalculated bending moments acting on the anchor channel and can lead to a reduction of the calculated steel resistance of the anchor channel.

#### Required measures:

##### Tension:

- Up to  $\leq 3\text{mm}$  of protrusion there is no significant reduction of the tension resistance of the anchor channel.

→ No measures required!

In case of protrusion of  $> 3\text{mm}$  up to  $\leq 5\text{mm}$  the reduction of effective embedment depth ( $h_{ef}$ ) requires a confirmation of the resistance of the anchor channel to tension.

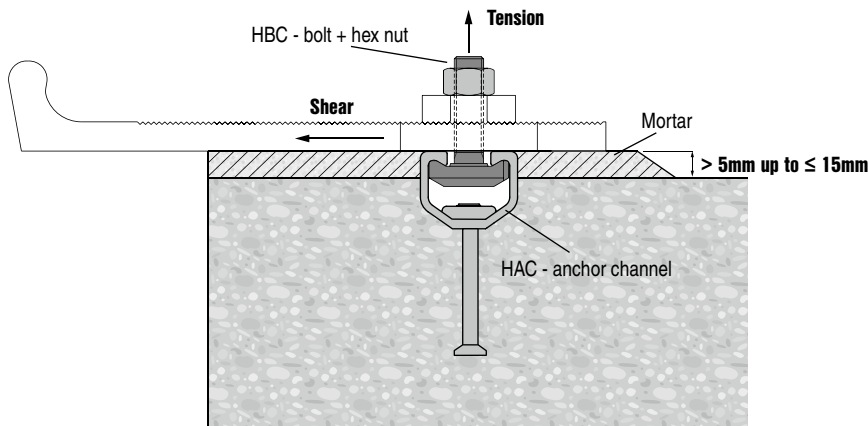
→ Please contact your Hilti representative!

- The void of  $\leq 5\text{mm}$  between the surface of the concrete and the fastened part has to be filled with steel shims in order to avoid the fastened part to overturn.

→ No reduction of steel- or concrete resistance if void is closed with steel shims!



2.2.2 HAC anchor channel protruding from >5mm up to ≤15mm



**Description:**

The surface of the anchor channel (HAC-40 to HAC-70) protrudes from the concrete surface by >5mm up to ≤15mm.

**Possible Consequences:**

**Tension:**

- The effective embedment depth ( $h_{ef}$ ) of the HAC anchor channel is being reduced by up to 15mm. This leads to a reduction of the pull-out resistance of the anchor channel in tension direction.

**Shear:**

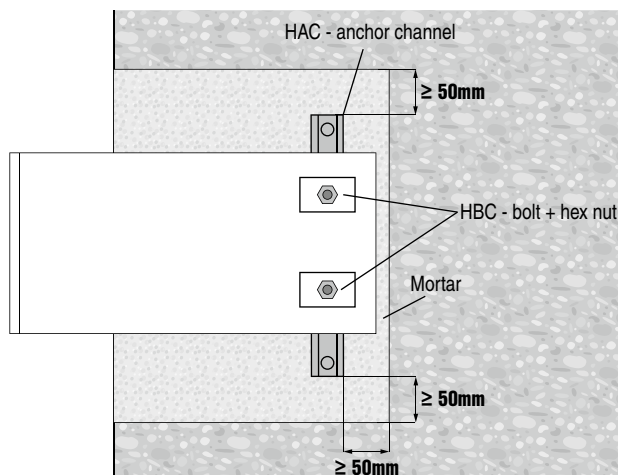
- The fastened part is not flush to the concrete surface. This can result in uncalculated bending moments acting on the anchor channel and can lead to a reduction of the calculated steel resistance of the anchor channel.
- The shear resistance of the HAC anchor channel will be reduced.

**Required measures:**

- In case of protrusion of >5mm up to ≤15mm the reduction of effective embedment depth ( $h_{ef}$ ) requires a confirmation of the resistance of the anchor channel to tension.
  - Please contact your Hilti representative!
- Filling of the void between anchor channel and concrete surface up to the edge of the concrete by use of mortar (min. compressive strength  $\geq 30 \text{ N/mm}^2$ ), e.g. Hilti mortar HY 150 MAX, HY 200 or other brands e.g. CB-G PG1 or CB-G EG.

**Recommended installation procedure:**

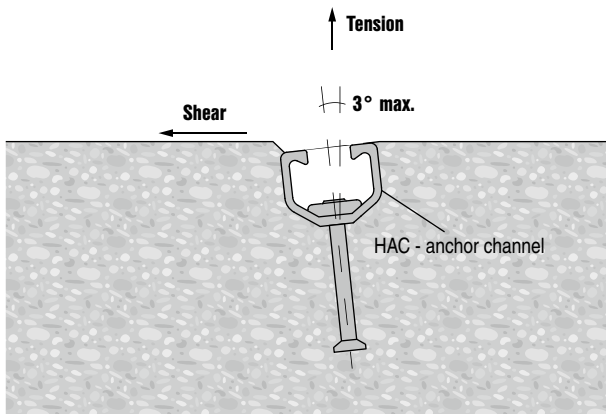
1. Filling of void with mortar → Respect instructions for use and required curing time of mortar!
  2. Installation and fastening of fastened part by applying the required installation torque  $T_{inst}$ .
- No reduction of steel- or concrete resistance if void is bridged with mortar!



Min. required projection length of mortar layer

## 2.3 HAC anchor channel installed with inclination (HAC-40 to HAC-70)

### 2.3.1 HAC anchor channel is inclined by $\leq 3^\circ$ in shear direction



#### Description:

HAC anchor channel is inclined by  $\leq 3^\circ$  with reference to longitudinal axis.

#### Possible Consequences:

##### Tension:

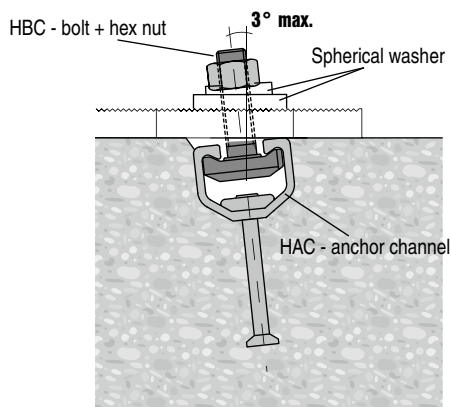
- Inclination of t-bolt leading to one-sided loading of anchor channel. As a consequence, the steel resistance of the HAC anchor channel is reduced.

##### Shear:

- Inclination of t-bolt leading to one-sided loading of anchor channel. As a consequence, the steel resistance of the HAC anchor channel is reduced.

#### Required measures:

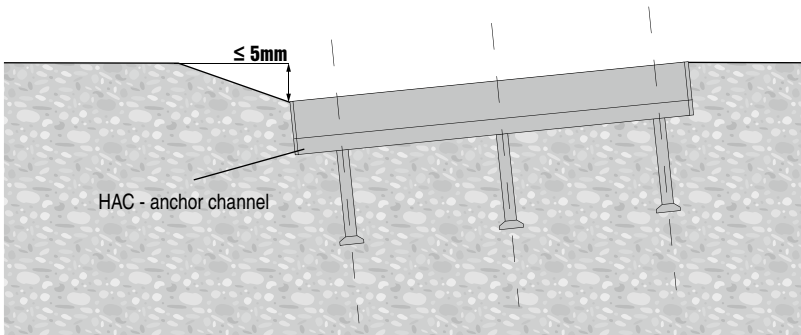
The use of spherical washers according to DIN 6319 or the use of the Hilti Dynamic Set can avoid a reduction of steel resistance of the HAC anchor channel (see below illustration).



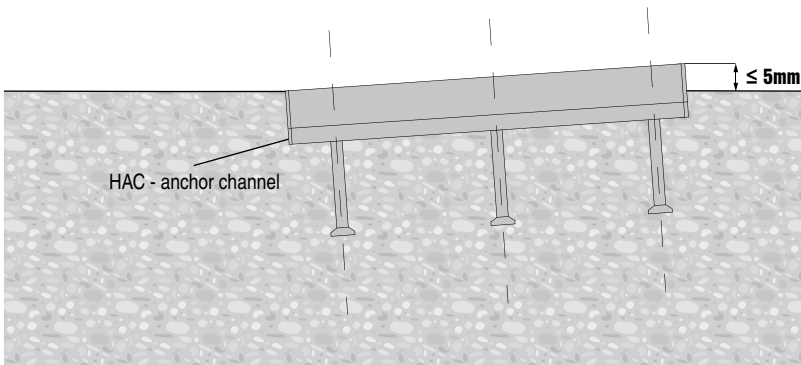
HAC anchor channel with spherical washer

- A reduction of the load resistance of the HAC fastening system can be avoided by utilization of spherical washers according to DIN 6319 or Hilti Dynamic Set.

**2.3.2 Longitudinal inclination of HAC anchor channel by +/- ≤5mm**



HAC anchor channel inclined in longitudinal direction (≤5mm too deep)



HAC anchor channel inclined in longitudinal direction (≤5mm too high)

**Description:**

The HAC anchor channel has been installed with a longitudinal inclination of +/- ≤5.

**Possible problems:**

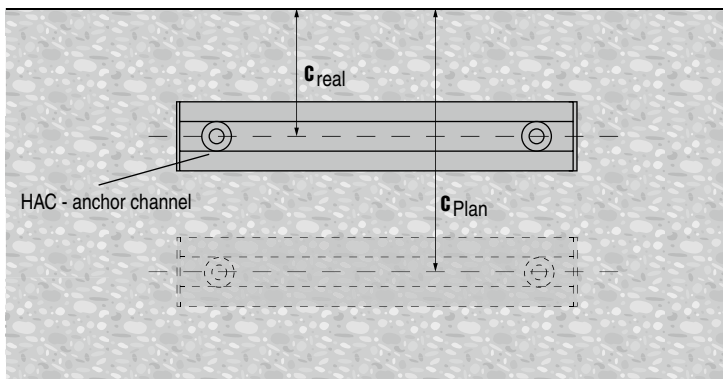
- Channel embedded ≤5mm too deep → see section 2.1.1
- Channel protruding from concrete ≤5mm → see section 2.2.1

**Required measures:**

- Channel embedded ≤5mm too deep → see section 2.1.1
- Channel protruding from concrete ≤5mm → see section 2.2.1

## 2.4 HAC anchor channel installed with incorrect edge distance

### 2.4.1 HAC anchor channel installed closer to edge than planned



Installation of HAC anchor channel closer to edge of the concrete member than planned

#### Description:

The anchor channel has been installed closer than planned to the edge of the concrete member.

#### Possible problems:

##### Tension:

- Reduction of load resistance in tension direction.

##### Shear:

- Reduction of load resistance in shear direction.

#### Required measures:

- Revision and recalculation (e.g. using the Hilti calculation software "PROFIS Anchor Channel) of resistances of anchor channel system according to the actual installation geometry, load situation and other factors having influence on the load resistance of the fastening system (e.g. edge distance, concrete density, distribution of loads, reinforcement, ...) is absolutely necessary.

The edge distance of the installed channel is not allowed to fall short of the minimum allowable edge distances  $c_{min}$  according to ETA-11/0006.

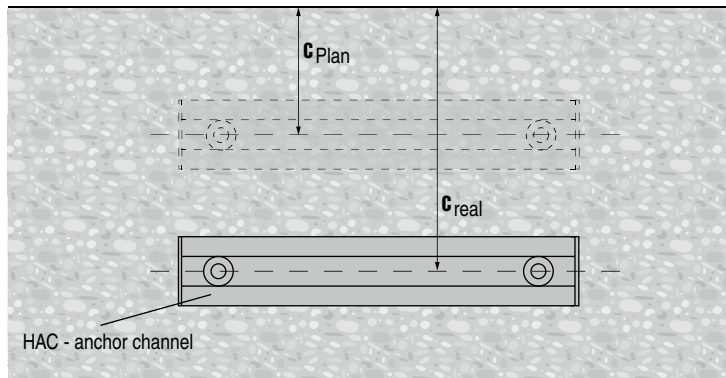
1. In case the design of the fastening point proves to be within allowable limits, the anchor channel can be used without further requirements.
  - No additional measures required!
2. In case the design of the fastening point leads to excess loads on the channel, the design has to be corrected in order to arrive within allowable limits. In order to do so, loads acting on the fastening system have to be reduced.
  - Reduction of required load resistance necessary!

#### Possible solution:

Installation of additional anchors to take up excess loads.

- Contact your Hilti representative for assistance!

## 2.4.2 HAC anchor channels exceeding the designed edge distance



HAC anchor channel exceeding the planned distance to the edge of the concrete member.

### Description:

The anchor channel has been installed with a distance to the edge of the concrete member greater than planned and designed.

### Possible problems:

#### Tension:

- No negative influence on load resistance of fastening system.

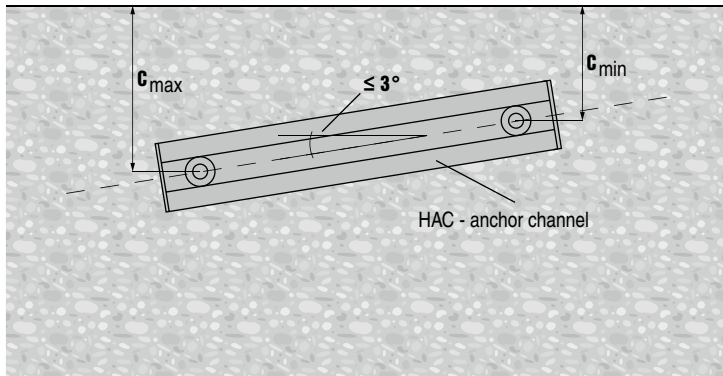
#### Shear:

- No negative influence on load resistance of fastening system.

### Required measures:

- From the perspective of the load capacity of the fastening system no measures are required. An increased edge distance does not lead to a reduction of load resistance.

## 2.5 HAC anchor channel not parallel to edge of member



Installation of HAC anchor channel closer to edge of the concrete member than planned

### Description:

The anchor channel has been installed non-parallel to the edge of the concrete member. One edge of the anchor channel might have been placed closer to the edge than planned and calculated.

### Possible problems:

#### Tension:

- Reduction of concrete resistance in tension direction.

#### Shear:

- Reduction of concrete resistance in shear direction.

### Required measures:

- Revision and recalculation (e.g. using the Hilti calculation software "PROFIS Anchor Channel) of resistances of anchor channel system according to the actual installation geometry, load situation and other factors having influence on the load resistance of the fastening system (e.g. edge distance, concrete density, distribution of loads, reinforcement, ...) is absolutely necessary.

The edge distance of the installed channel is not allowed to fall short of the minimum allowable edge distances  $c_{min}$  according to ETA-11/0006.

1. In case the design of the fastening point proves to be within allowable limits, the anchor channel can be used without further requirements.
  - No additional measures required!
2. In case the design of the fastening point leads to excess loads on the channel, the design has to be corrected in order to arrive within allowable limits. In order to do so, loads acting on the fastening system have to be reduced.
  - Reduction of required load resistance necessary!

### Possible solution:

Installation of additional anchors to take up excess loads.

- Contact your Hilti representative for assistance!

## Disclaimer

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