

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-20/0867  
of 14 July 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 screw anchor HUS4

Product family  
to which the construction product belongs

Mechanical fastener for use in concrete

Manufacturer

Hilti Aktiengesellschaft  
Feldkircherstrasse 100  
9494 SCHAAN  
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment  
contains

38 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 330232-01-0601, Edition 05/2021

This version replaces

ETA-20/0867 issued on 14 April 2022

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## Specific Part

### 1 Technical description of the product

The Hilti screw anchor HUS4 is an anchor in size 8, 10, 12, 14 and 16 mm made of galvanized or stainless steel. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

Product and product description are 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 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 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 to tension load (static and quasi-static loading)	See Annex B4 to B9, Annex C1, C3 and C5
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C2, C4 and C5
Displacements (static and quasi-static loading)	See Annex C15 and C16
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C5 to C9 and C17

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

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C10 to C14

#### 3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

English translation prepared by DIBt

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

In accordance with European Assessment Document EAD No. 330232-01-0601 the applicable European legal act is: [96/582/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 European Assessment Document**

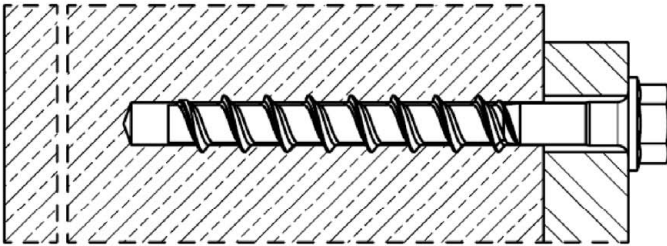
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 14 July 2022 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Tempel

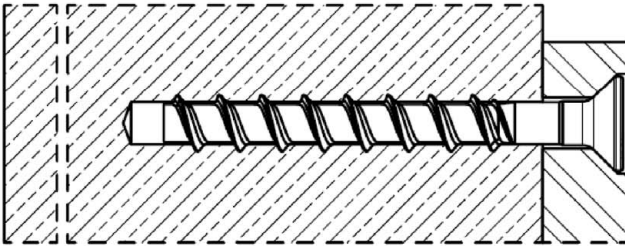
### Installed condition without adjustment



HUS4-H (hexagon head configuration sizes 8, 10, 12, 14 and 16)

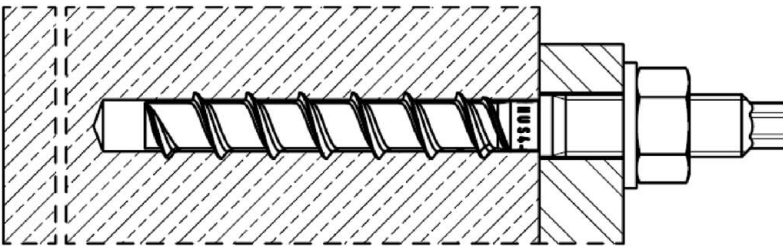
HUS4-HF (hexagon head configuration sizes 8, 10, 14 and 16)

HUS4-HR (hexagon head configuration sizes 6, 8, 10 and 14)



HUS4-C (countersunk head configuration sizes 8 and 10)

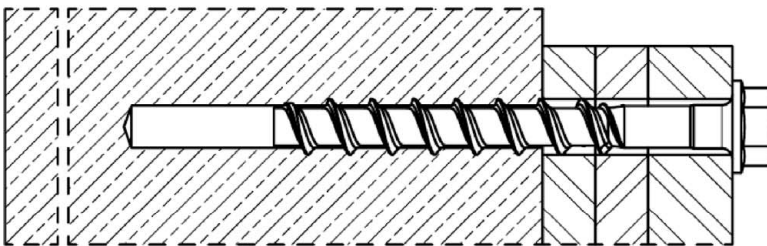
HUS4-CR (countersunk head configuration size 6, 8 and 10)



HUS4-A  
(threaded rod connection sizes 10 with M12 and 14 with M16)

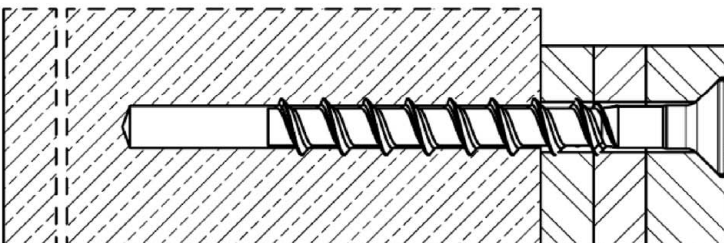
HUS4-AF  
(threaded rod connection sizes 10 with M12 and 14 with M16)

### Installed condition with adjustment - $h_{nom2}$ , $h_{nom3}$



HUS4-H (hexagon head configuration sizes 8, 10, 12, and 14)

HUS4-HF (hexagon head configuration sizes 8, 10, and 14)



HUS4-C (countersunk head configuration sizes 8 and 10)

#### Hilti screw anchor HUS4

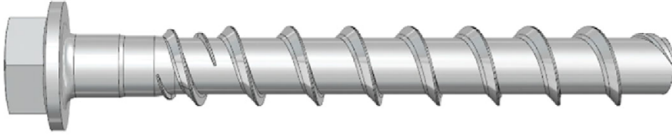
#### Product description

Installed condition with and without adjustment

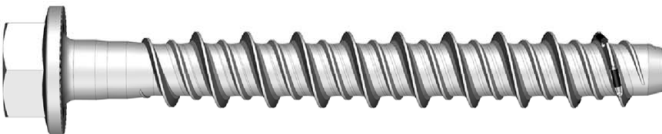
#### Annex A1

**Table A1: Screw types**

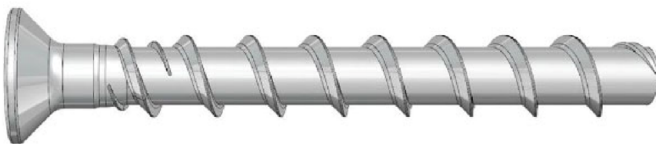
**Hilti HUS4-H**, sizes 8,10, 12, 14 and 16, hexagonal head configuration, carbon steel galvanized  
**Hilti HUS4-HF**, sizes 8,10, 14 and 16, hexagonal head configuration, carbon steel multilayer coating



**Hilti HUS4-HR**, sizes 6, 8, 10 and 14 hexagonal head configuration, stainless steel



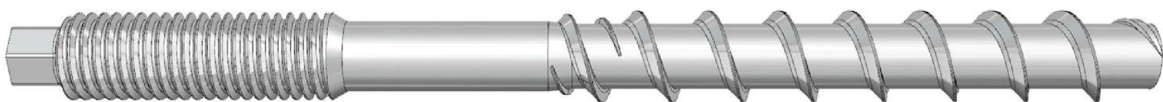
**Hilti HUS4-C**, sizes 8 and 10, countersunk head configuration, carbon steel galvanized



**Hilti HUS4-CR**, sizes 6, 8 and 10 countersunk head configuration, stainless steel



**Hilti HUS4-A**, size 10 with external thread M12 and size 14 with external thread M16, carbon steel galvanized  
**Hilti HUS4-AF**, size 10 with external thread M12 and size 14 with external thread M16, carbon steel multilayer coating

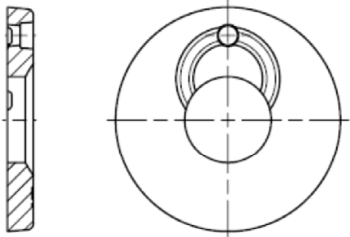
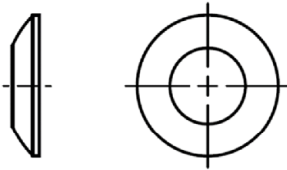



**Hilti screw anchor HUS4**

**Product description**  
HUS4 screw types

**Annex A2**

**Table A2: Hilti filling set (for HUS4-H (F, R) and HUS4-A (F)) and Hilti injection mortar**

Filling washer	Spherical washer	Injection mortar
		 <p>Hilti HIT-HY ... with ETA Hilti HIT-RE ... with ETA</p>

**Table A3: Materials**

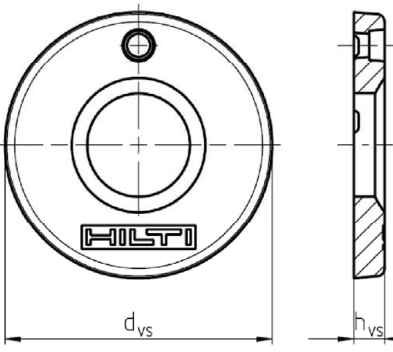


Part	Material
HUS4-H(F), HUS4-C and HUS4-A(F) screw anchor	Carbon steel Rupture elongation $A_5 \leq 8\%$
HUS4-HR and HUS-CR	Stainless steel (A4 grade) Rupture elongation $A_5 > 8\%$ Stainless steel of corrosion resistance class CRC III according to EN 1993-1-4:2006+A1:2015 1.4401 or 1.4404 according to EN 10088-1:2014
Hilti Filling set (carbon steel)	Filling washer: Carbon steel Spherical washer: Carbon steel
Hilti Filling set (stainless steel)	Corrosion resistance class CRC III according to EN 1993-1-4:2006+A1:2015 Filling washer: Stainless steel A4 according to ASTM A240/A 240M:2019 Spherical washer: Stainless steel A4 according to EN 10088-1:2014

**Hilti screw anchor HUS4**

**Product description**  
HUS4 screw types, Filling set and Hilti injection mortar  
Materials

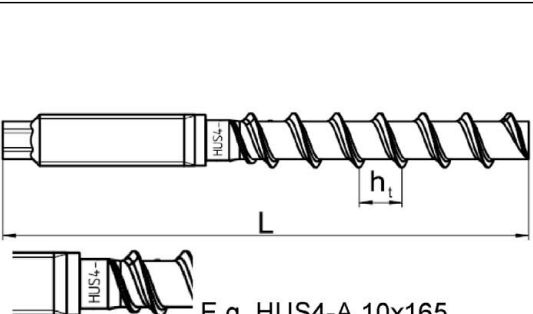

**Annex A3**

**Table A4: Filling set dimensions**

Filling set size			M10	M12	M16	M20	
Diameter	d <sub>vs</sub>	[mm]	42	44	52	60	
Thickness	h <sub>vs</sub>	[mm]	5	5	6	6	
HUS4-H (F, R)			8	10	12 + 14	16	
HUS4-A (F)			-	10	14	-	

**Table A5: Fastener dimensions and marking HUS4-A(F)**

Fastener size HUS4-			A(F) 10			A(F) 14		
Nominal fastener diameter	d	[mm]	10			14		
Metric thread connection			M12			M16		
Pitch of the thread	h <sub>t</sub>	[mm]	10			14		
Nominal embedment depth	h <sub>nom</sub>	[mm]	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>
			55	75	85	65	80	115
Effective embedment depth	h <sub>ef</sub>	[mm]	$h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t) \leq h_{ef,max}$					
Limits of effective embedment depth	h <sub>ef,max</sub>	[mm]	68,0			91,8		
Length of screw min / max	L	[mm]	120 / 165			155 / 205		

 <p>E.g. HUS4-A 10x165</p>		<b>HUS4:</b> Hilti Universal Screw 4 <sup>th</sup> generation												
		<b>A:</b> Thread connection, galvanized												
		<b>AF:</b> Thread connection, multilayer coating												
		<b>10:</b> Nominal screw diameter d [mm]												
		<b>165:</b> Length of screw L [mm]												
		<b>8:</b> Carbon steel												
		<b>K:</b> Length identification HUS4-A 10x165												
		<table border="1"> <thead> <tr> <th>G</th> <th>I</th> <th>K</th> <th>J</th> <th>L</th> <th>N</th> </tr> </thead> <tbody> <tr> <td>10x120</td> <td>10x140</td> <td>10x165</td> <td>14x155</td> <td>14x185</td> <td>14x205</td> </tr> </tbody> </table>	G	I	K	J	L	N	10x120	10x140	10x165	14x155	14x185	14x205
G	I	K	J	L	N									
10x120	10x140	10x165	14x155	14x185	14x205									

**Hilti screw anchor HUS4**

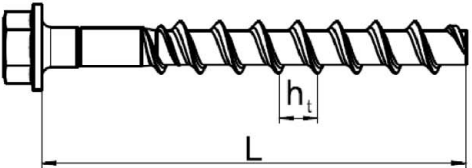

**Production description**  
Fastener dimensions and head marking

**Annex A4**

**Table A6: Fastener dimensions and marking HUS4-H...**

Fastener size HUS4-	H(F) 8			H(F) 10			H 12			H(F) 14			H(F) 16	
Nominal fastener diameter d [mm]	8			10			12			14			16	
Pitch of the thread h <sub>t</sub> [mm]	8			10			12			14			13,2	
Nominal embedment depth h <sub>nom</sub> [mm]	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom3</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>
	40	60	70	55	75	85	60	80	100	65	85	115	85	130
Effective embedment depth h <sub>ef</sub> [mm]	$h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t) \leq h_{ef,max}$													
Limits of effective embedment depth h <sub>ef,max</sub> [mm]	56,1			68,0			79,9			91,8			104,9	
Length of screw min / max L [mm]	45 / 150			60 / 305			70 / 150			75 / 150			100 / 205	

Fastener size HUS4-	HR 6		HR 8		HR 10		HR 14	
Nominal fastener diameter d [mm]	6		8		10		14	
Pitch of the thread h <sub>t</sub> [mm]	4,75		7,6		8,0		9,8	
Non-load bearing tip h <sub>s</sub> [mm]	-		1,03		2,43		4,1	
Nominal embedment depth h <sub>nom</sub> [mm]	h <sub>nom1</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	h <sub>nom1</sub>	h <sub>nom2</sub>	
	55	60	80	70	90	70	110	
Effective embedment depth h <sub>ef</sub> [mm]	$h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t - h_s) \leq h_{ef,max}$							
Limits of effective embedment depth h <sub>ef,max</sub> [mm]	45		64		71		86	
Length of screw min / max L [mm]	60 / 70		65 / 105		75 / 130		80 / 135	

		<b>HUS4:</b> Hilti Universal Screw 4 <sup>th</sup> generation
		<b>H:</b> Hexagonal head, galvanized
		<b>HF:</b> Hexagonal head, multilayer coating
		<b>HR:</b> Hexagonal head, stainless steel
		<b>10:</b> Nominal screw diameter d [mm]
		<b>100:</b> Length of screw [mm]

**Hilti screw anchor HUS4**

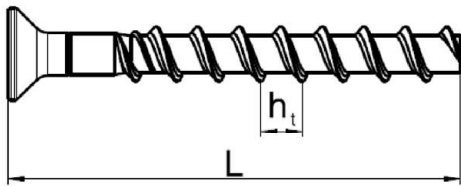

**Production description**  
Fastener dimensions and head marking

**Annex A5**

**Table A7: Fastener dimensions and marking HUS4-C...**

Fastener size HUS4-			C 8			C 10		
Nominal fastener diameter	d	[mm]	8			10		
Pitch of the thread	$h_t$	[mm]	8			10		
Nominal embedment depth	$h_{nom}$	[mm]	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
			40	60	70	55	75	85
Effective embedment depth	$h_{ef}$	[mm]	$h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t) \leq h_{ef,max}$					
Limits of effective embedment depth	$h_{ef,max}$	[mm]	56,1			68,0		
Length of screw min / max	L	[mm]	55 / 85			70 / 120		

Fastener size HUS4-			CR 6	CR 8	CR 10		
Nominal fastener diameter	d	[mm]	6	8	10		
Pitch of the thread	$h_t$	[mm]	-	7,6	8,0		
Non-load bearing tip	$h_s$	[mm]	-	1,03	2,43		
Nominal embedment depth	$h_{nom}$	[mm]	$h_{nom2}$	$h_{nom2}$	$h_{nom3}$	$h_{nom2}$	$h_{nom3}$
			55	60	80	70	90
Effective embedment depth	$h_{ef}$	[mm]	$h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t - h_s) \leq h_{ef,max}$				
Limits of effective embedment depth	$h_{ef,max}$	[mm]	45	64	71		
Length of screw min / max	L	[mm]	60 / 70	65 / 95	75 / 105		

		<b>HUS4:</b> Hilti Universal Screw 4 <sup>th</sup> generation
		<b>C:</b> Countersunk head, galvanized
		<b>CR:</b> Countersunk head, stainless steel
		<b>10:</b> Nominal screw diameter d [mm]
		<b>100:</b> Length of screw L [mm]

**Hilti screw anchor HUS4**

**Production description**  
Fastener dimensions and head marking

**Annex A6**

## Specifications of intended use

### Anchorage subject to:

- Static and quasi-static loadings
- Seismic action for performance category C1 and C2 for HUS4-H(F)/-C/-A(F) (carbon steel screw)
- Seismic action for performance category C1: HUS4-HR/-CR (stainless steel screw)
- Fire exposure

### Base materials:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 +A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206-1:2010+A1:2016.
- Cracked and uncracked concrete.

### Use conditions (Environmental conditions):

- Anchorages subject to dry internal conditions: all screw types
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006+A1:2015
  - Stainless steel according to Annex A3, Table A3, screw types HUS4-HR/-CR: CRC III

### Design:

- Anchorages 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 fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with:  
EN 1992-4:2018 and EOTA Technical Report TR 055 edition February 2018.
- In case of requirements to resistance to fire local spalling of the concrete cover must be avoided.

### Installation:

- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the fastener must not be possible.
- The head of the fastener (HUS4-H (F, R) and HUS4-C/-CR) must be supported on the fixture and is not damaged.
- Hilti filling set is suitable for HUS4-H (F, R) and HUS4-A (F)




Hilti screw anchor HUS4

Intended use  
Specifications

Annex B1



### Specifications of intended use: Drilling and cleaning for HUS4 carbon steel

**Table B1: Static and quasi static loading for HUS4-H(F)/-C/-A(F)**

HUS4-H(F)/-C/-A(F) carbon steel		Fastener size and embedment depth $h_{nom}$
<b>Cracked and uncracked concrete</b>		
Hammer drilling (HD) <sup>1)</sup>	cleaned 	sizes 8 to 16 at all $h_{nom}$
	not cleaned	sizes 8 to 14 at all $h_{nom}$
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) <sup>1)</sup>		sizes 12 and 14 at all $h_{nom}$
<b>Uncracked concrete</b>		
Diamond coring (DD) DD30-W handheld and with stand DD-EC1 handheld		sizes 10 to 14 at $h_{nom3}$


<sup>1)</sup> Adjustment according to Annex B11 is possible for sizes 8 to 14 at  $h_{nom2+3}$

**Table B2: Seismic performance category C1 for HUS4-H(F)/-C/-A(F)**

HUS4-H(F)/-C/-A(F) carbon steel		Fastener size and embedment depth $h_{nom}$
Hammer drilling (HD) <sup>1)</sup>	cleaned 	sizes 8 to 14 at $h_{nom2+3}$ size 16 at $h_{nom1+2}$
	not cleaned	sizes 8 to 14 at $h_{nom2+3}$
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) <sup>1)</sup>		sizes 12 and 14 at $h_{nom2+3}$



<sup>1)</sup> Adjustment according to Annex B11 is possible for sizes 8 to 14 at  $h_{nom2+3}$

**Table B3: Seismic performance category C2 for HUS4-H(F)/-C/-A(F)**

HUS4-H(F)/-C/-A(F) carbon steel		Fastener size and embedment depth $h_{nom}$
Hammer drilling (HD) <sup>1)</sup>	cleaned 	sizes 8 to 14 at $h_{nom3}$
	not cleaned	sizes 8 to 14 at $h_{nom3}$

<sup>1)</sup> Adjustment according to Annex B11 is possible for sizes 8 to 14 at  $h_{nom3}$

**Table B4: Static and quasi static loading under fire exposure for HUS4-H(F)/-C/-A(F)**


HUS4-H(F)/-C/-A(F) carbon steel		Fastener size and embedment depth $h_{nom}$
Hammer drilling (HD) <sup>1)</sup>	cleaned 	sizes 8 to 16 at all $h_{nom}$
	not cleaned	sizes 8 to 14 at all $h_{nom}$
Hammer drilling with Hilti hollow drill bit TE-CD (HDB) <sup>1)</sup>		sizes 12 and 14 at all $h_{nom}$

<sup>1)</sup> Adjustment according to Annex B11 is possible for sizes 8 to 14 at  $h_{nom2+3}$


<b>Hilti screw anchor HUS4</b>	<b>Annex B2</b>
<b>Intended use</b> Specifications	

**Specifications of intended use: Drilling and cleaning for HUS4 stainless steel**


**Table B5: Static and quasi static loading for HUS4-HR/-CR**

HUS4-HR/-CR stainless steel		Fastener size and embedment depth $h_{nom}$
Cracked and uncracked concrete		
Hammer drilling (HD)	cleaned 	sizes 6 to 14 at all $h_{nom}$
	not cleaned	

**Table B6: Seismic performance category C1 for HUS4-HR/-CR**

HUS4-HR/-CR stainless steel		Fastener size and embedment depth $h_{nom}$
Hammer drilling (HD)	cleaned 	sizes 8 to 14 at $h_{nom2}$
	not cleaned	sizes 8 to 14 at $h_{nom2}$

**Table B7: Static and quasi static loading under fire exposure for HUS4-HR/-CR**

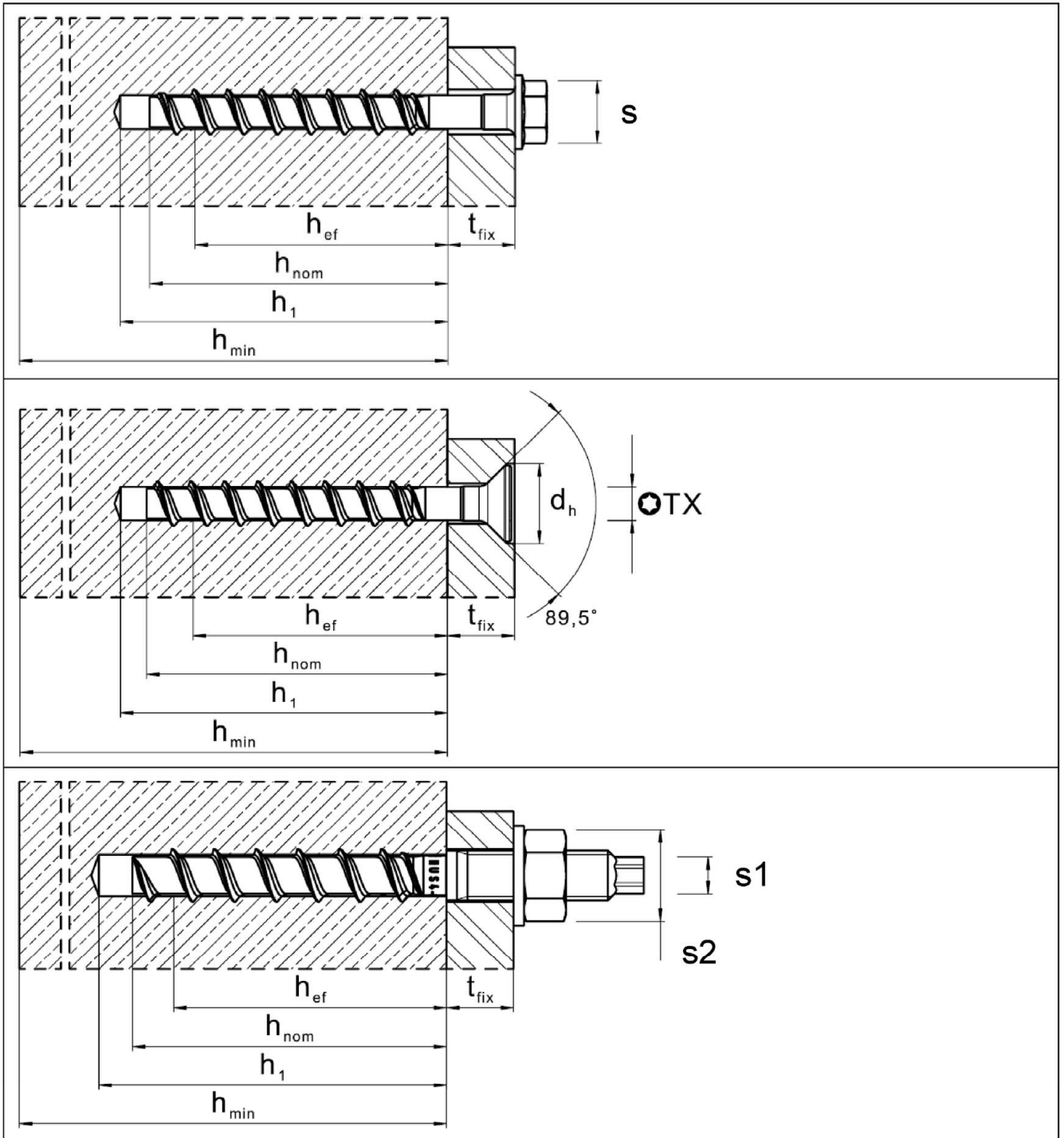
HUS4-HR/-CR stainless steel		Fastener size and embedment depth $h_{nom}$
Hammer drilling (HD)	cleaned 	sizes 6 to 14 at all $h_{nom}$
	not cleaned	sizes 6 to 14 at all $h_{nom}$

**Hilti screw anchor HUS4**

**Intended use  
Specifications**

**Annex B3**

### Installation parameters



**Hilti screw anchor HUS4**

**Intended use**  
Installation parameters

**Annex B4**

**Table B8: Installation parameters HUS4-8 and 10**

Fastener size HUS4 Type			8			10		
			H(F), C			H(F), C, A(F)		
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	40	60	70	55	75	85
Nominal drill hole diameter	$d_0$	[mm]	8			10		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45			10,45		
Cutting diameter of diamond core bit	$d_{cut} \leq$	[mm]	-			9,9		
Clearance hole diameter through setting	$d_f \frac{\min}{\max}$	[mm]	11			13		
			12			14		
Clearance hole diameter pre setting (A-type)	$d_f \leq$	[mm]	-			14		
Wrench size (H, HF-type)	s	[mm]	13			15		
Wrench size for hex head (A-type)	s1	[mm]	-			8		
Wrench size for nut (A-type)	s2	[mm]	-			19		
Maximum installation torque (A-type)	$\max T_{inst}$	[Nm]	-			40		
Torx size (C-type)	TX	-	45			50		
Diameter of countersunk head	$d_h$	[mm]	18			21		
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 10 \text{ mm})$					
			50	70	80	65	85	95
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 10 \text{ mm}) + 2 * d_0$					
			66	86	96	85	105	115
Depth of drill hole (with adjustability) for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 20 \text{ mm})$					
			-	80	90	-	95	105
Depth of drill hole (with adjustability) for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 20 \text{ mm}) + 2 * d_0$					
			-	96	106	-	115	125
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	$(h_1 + 30 \text{ mm})$					
			80	100	120	100	130	140
Minimum spacing	$s_{min} \geq$	[mm]	35			40		
Minimum edge distance	$c_{min} \geq$	[mm]	35			40		
Hilti Setting tool <sup>1)</sup>			SIW 6AT-A22 1/2" SIW 6-22 1/2" gear 1			SIW 6AT-A22 1/2" SIW 22T-A 1/2" SIW 6-22 1/2" SIW 8-22 1/2" gear 1 SIW 9-A22 3/4"		

<sup>1)</sup> Installation with other impact screw driver of equivalent power is possible.

**Hilti screw anchor HUS4**

**Intended use**  
Installation parameters

**Annex B5**

**Table B9: Installation parameters HUS4-12 and 14**

Fastener size HUS4 Type			12			14		
			H			H(F), A(F)		
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	60	80	100	65	85	115
Nominal drill hole diameter	$d_0$	[mm]	12			14		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12,50			14,50		
Cutting diameter of diamond core bit	$d_{cut} \leq$	[mm]	12,2			-		
Clearance hole diameter through setting	$d_f \frac{\min}{\max}$	[mm]	16			18		
Clearance hole diameter pre setting (A-type)	$d_f \leq$	[mm]	-			18		
Wrench size (H, HF-type)	s	[mm]	17			21		
Wrench size for hex head (A-type)	s1	[mm]	-			12		
Wrench size for nut (A-type)	s2	[mm]	-			24		
Maximum installation torque (A-type)	$\max T_{inst}$	[Nm]	-			80		
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 10 \text{ mm})$					
			70	90	110	75	95	125
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 10 \text{ mm}) + 2 * d_0$					
			94	114	134	103	123	153
Depth of drill hole (with adjustability) for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 20 \text{ mm})$					
			-	100	120	-	105	135
Depth of drill hole (with adjustability) for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 20 \text{ mm}) + 2 * d_0$					
			-	124	144	-	133	163
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	$(h_1 + 30 \text{ mm})$					
			110	130	150	120	160	200
Minimum spacing	$s_{min} \geq$	[mm]	50			60		
Minimum edge distance	$c_{min} \geq$	[mm]	50			60		
Hilti Setting tool <sup>1)</sup>			SIW 22T-A 1/2" SIW 6-22 1/2" SIW 8-22 1/2" SIW 9-A22 3/4"			SIW 22T-A 1/2" SIW 6-22 1/2" SIW 8-22 1/2" SIW 9-A22 3/4"		

<sup>1)</sup> Installation with other impact screw driver of equivalent power is possible.

**Hilti screw anchor HUS4**

**Intended use**  
Installation parameters

**Annex B6**

**Table B10: Installation parameters HUS4-16**

Fastener size HUS4			16	
Type			H(F)	
			$h_{nom1}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$	[mm]	85	130
Nominal drill hole diameter	$d_0$	[mm]	16	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	16,50	
Clearance hole diameter through setting	$d_f \leq$	[mm]	20	
Wrench size	s	[mm]	24	
Depth of drill hole for cleaned hole hammer drilling or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	(h <sub>nom</sub> + 10 mm)	
			95	140
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	130	195
Minimum spacing	$s_{min} \geq$	[mm]	90	
Minimum edge distance	$c_{min} \geq$	[mm]	65	
Hilti Setting tool <sup>1)</sup>			SIW 22T-A 1/2" SIW 6-22 1/2" SIW 8-22 1/2" SIW 9-A22 3/4"	

<sup>1)</sup> Installation with other impact screw driver of equivalent power is possible.

**Hilti screw anchor HUS4**

**Intended use**  
Installation parameters

**Annex B7**

**Table B11: Installation parameters HUS4-HR/-CR 6 and 8**

Fastener size HUS4			6		8	
Type			HR, CR		HR, CR	
			$h_{nom1}$	$h_{nom1}$	$h_{nom2}$	
Nominal embedment depth	$h_{nom}$	[mm]	55	60	80	
Nominal drill hole diameter	$d_0$	[mm]	6	8		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45		
Clearance hole diameter	$d_f \leq$	[mm]	9	12		
Wrench size (H-type)	s	[mm]	13	13		
Torx size (C-type)	TX	[-]	30	45		
Diameter of countersunk head	$d_h$	[mm]	11	18		
Depth of drill hole for cleaned hole hammer drilling or for uncleanded hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 10mm)$			
			65	70	90	
Depth of drill hole for uncleanded hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 10 mm) + 2 * d_0$			
			77	86	106	
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	$(h_1 + 30 mm)$			
			100	100	120	
Minimum spacing	$s_{min} \geq$	[mm]	35	45	60	
Minimum edge distance	$c_{min} \geq$	[mm]	35	45	60	
Hilti Setting tool <sup>1)</sup>			SIW 6AT-A22 1/2" gear 3		SIW 22T-A 1/2" SIW 6AT-A22 1/2" gear 3 SIW 6-22 1/2" gear 2	

<sup>1)</sup> Installation with other impact screw driver of equivalent power is possible.

**Hilti screw anchor HUS4**

**Intended use**  
Installation parameters

**Annex B8**

**Table B12: Installation parameters HUS4-HR/-CR 10 and 14**

Fastener size HUS4 Type			10		14	
			HR, CR		HR	
			$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$	[mm]	70	90	70	110
Nominal drill hole diameter	$d_0$	[mm]	10		14	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	10,45		14,50	
Clearance hole diameter	$d_f \leq$	[mm]	14		18	
Wrench size (H-type)	s	[mm]	15		21	
Torx size (C-type)	TX	[-]	50		-	
Diameter of countersunk head	$d_h$	[mm]	21		-	
Depth of drill hole for cleaned hole hammer drilling, diamond coring or for uncleaned hole when drilling upwards	$h_1 \geq$	[mm]	$(h_{nom} + 10\text{mm})$			
			80	100	80	120
Depth of drill hole for uncleaned hole hammer drilling in wall and floor position	$h_1 \geq$	[mm]	$(h_{nom} + 10\text{mm}) + 2 * d_0$			
			100	120	108	148
Installation Torque	$T_{inst}$	[Nm]	45		65	
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	120	140	140	160
Minimum spacing	$s_{min} \geq$	[mm]	50		60	
Minimum edge distance	$c_{min} \geq$	[mm]	50		60	
Hilti Setting tool <sup>1)</sup>			SIW 22T-A 1/2" SIW 6AT-A22 1/2" gear 3 SIW 6-22 1/2" gear 2		SIW 22T-A 1/2" SIW 6-22 1/2" gear 2 SIW 8-22 1/2" gear 1 SIW 9-A22 3/4"	

<sup>1)</sup> Installation with other impact screw driver of equivalent power is possible.

**Hilti screw anchor HUS4**

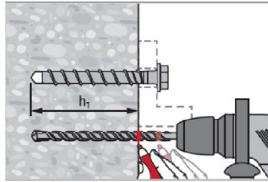
**Intended use**  
Installation parameters

**Annex B9**

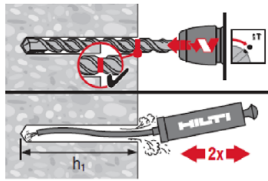
## Installation instructions

### Hole drilling and cleaning

Hammer drilling (HD) all sizes for carbon and stainless steel screw types (size 16 with cleaning only)

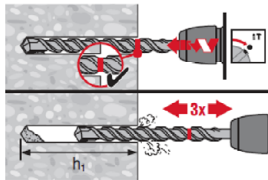


Mark drilling depth  $h_1$  for pre or through installation.  
Details for drilling depth  $h_1$  see table B5 to B9.



Cleaning needed in downward and horizontal installation direction with drill hole depth.

$$h_1 = h_{nom} + 10 \text{ mm}$$



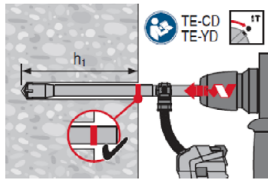
No cleaning is allowed in upward installation direction.

No cleaning is allowed in downward and horizontal installation direction when 3x ventilation<sup>1)</sup> after drilling is executed.

$$\text{Drill hole depth } h_1 = h_{nom} + 10 \text{ mm} + 2 * d_0$$

<sup>1)</sup> moving the drill bit in and out of the drill hole 3 times after the recommended drilling depth  $h_1$  is achieved. This procedure shall be done with both revolution and hammer functions activated in the drilling machine. For more details read the relevant installation instruction (MPII).

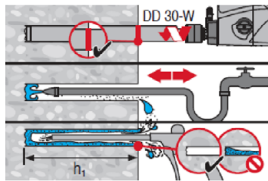
Hammer drilling with Hilti hollow drill bit (HDB) TE-CD size 12 and 14 for carbon steel screw types



No cleaning needed.

$$h_1 = h_{nom} + 10 \text{ mm}$$

Diamond coring with DD-EC1 or DD-30W size 10 to 14 for carbon steel screw types



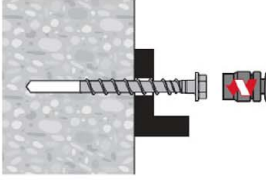
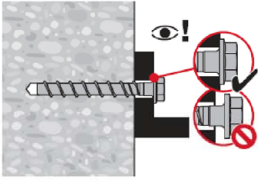
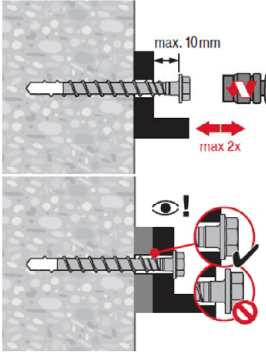
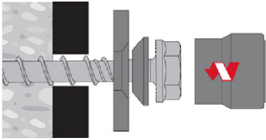
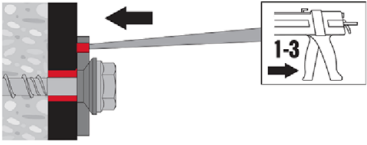
Cleaning needed in all installation directions.

$$h_1 = h_{nom} + 10 \text{ mm}$$

Hilti screw anchor HUS4

Intended use  
Installation instructions

Annex B10

<b>Fastener setting without adjustment</b>	
Setting by impact screw driver	
	Setting parameters listed in Table B5 to B7.
<b>Setting check</b>	
	
<b>Fastener setting with adjustment for carbon steel screw types</b>	
<b>Adjusting process</b>	
	A screw can be adjusted maximum two times. The total allowed thickness of shims added during the adjustment process is 10 mm. The final embedment depth after adjustment process must be larger or equal than $h_{nom2}$ or $h_{nom3}$ .
<b>Fastener setting with Hilti filling set</b>	
	
<b>Injection of Hilti HIT mortar and curing time</b>	
	Fill the annular gap between screw and fixture with 1-3 strokes of a Hilti injection mortar HIT-HY ... or HIT-RE ... . Follow the installation instructions supplied with the respective Hilti injection mortar. After required curing time $t_{cure}$ the fastening can be loaded.
<b>Hilti screw anchor HUS4</b>	<b>Annex B11</b>
<b>Intended use</b> Installation instructions	

**Table C1: Essential characteristics under static and quasi-static load in concrete for HUS4 carbon steel size 8 and 10**

Fastener size HUS4			8			10		
Type			H(F), C			H(F), C, A(F)		
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	40	60	70	55	75	85
<b>Adjustment</b>								
Total max. thickness of adjustment layers	$t_{adj}$	[mm]	-	10	10	-	10	10
Max. number of adjustments	$n_a$	[-]	-	2	2	-	2	2
<b>Steel failure for tension load</b>								
Characteristic resistance	$N_{Rk,s}$	[kN]	36,0			55,0		
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,5					
<b>Pull-out failure</b>								
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	$\geq N_{Rk,c}^{0,3)}$			13	22	$\geq N_{Rk,c}^{0,3)}$
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5,5	$\geq N_{Rk,c}^{0,3)}$				
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	$\psi_c$	[-]	$(f_{ck}/20)^{0,5}$					
<b>Concrete cone and splitting failure</b>								
Effective embedment depth	$h_{ef}^{2)}$	[mm]	30,6	47,6	56,1	42,5	59,5	68,0
Factor for	Uncracked	$k_{ucr,N}$	11,0					
	Cracked	$k_{cr,N}$	7,7					
Concrete cone failure	Edge distance	$c_{cr,N}$	$1,5 h_{ef}$					
	Spacing	$s_{cr,N}$	$3 h_{ef}$					
Characteristic resistance	$N_{Rk,sp}^0$	[kN]	$N_{Rk,p}$					
Splitting failure	Edge distance	$c_{cr,sp}$	$1,5 h_{ef}$			$1,65 h_{ef}$		
	Spacing	$s_{cr,sp}$	$3 h_{ef}$			$3,3 h_{ef}$		
Installation factor	$\gamma_{inst}$	[-]	1,0			1,2	1,0	

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> In case  $h_{nom} > h_{nom1}$  and  $< h_{nom3}$  the actual  $h_{ef}$  for concrete failure can be calculated according to:  $h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t)$

<sup>3)</sup>  $N_{Rk,c}^0$  according to EN 1992-4:2018

**Hilti screw anchor HUS4**

**Performances**  
Essential characteristics under static and quasi-static load in concrete

**Annex C1**

**Table C1 continued**

Fastener size HUS4 Type			8			10		
			H(F), C			H(F), C, A(F)		
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	40	60	70	55	75	85
<b>Steel failure for shear load</b>								
Characteristic resistance	$V_{RK,S}^0$	[kN]	18,8		21,9	28,8		32,0
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,25					
Ductility factor	$k_7$	[-]	0,8					
Characteristic resistance	$M_{RK,S}^0$	[Nm]	32			64		
<b>Concrete pry-out failure</b>								
Pry-out factor	$k_8$	[-]	1,0	2,0		1,0	2,0	
<b>Concrete edge failure</b>								
Effective length of fastener	$l_f$	[mm]	40	60	70	55	75	85
Outside diameter of fastener	$d_{nom}$	[mm]	8			10		

<sup>1)</sup> In absence of other national regulations.

**Hilti screw anchor HUS4**

**Performances**

Essential characteristics under static and quasi-static load in concrete

**Annex C2**

**Table C2: Essential characteristics under static and quasi-static load in concrete for HUS4 carbon steel size 12 to 16**

Fastener size HUS4 Type			12			14			16		
			H			H(F), A(F)			H(F)		
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	
Nominal embedment depth	$h_{nom}$	[mm]	60	80	100	65	85	115	85	130	
<b>Adjustment</b>											
Total max. thickness of adjustment layers	$t_{adj}$	[mm]	-	10	10	-	10	10	-	-	
Max. number of adjustments	$n_a$	[-]	-	2	2	-	2	2	-	-	
<b>Steel failure for tension load</b>											
Characteristic resistance	$N_{Rk,s}$	[kN]	79,0			101,5			107,7		
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,5								
<b>Pull-out failure</b>											
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	$\geq N_{Rk,c}^{0,3)}$						22	46	
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	10	$\geq N_{Rk,c}^{0,3)}$						16	32
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	$\psi_c$	[-]	$(f_{ck}/20)^{0,5}$								
<b>Concrete cone and splitting failure</b>											
Effective embedment depth	$h_{ef}^{2)}$	[mm]	45,9	62,9	79,9	49,3	66,3	91,8	66,6	104,9	
Factor for	Uncracked	$k_{ucr,N}$	11,0								
	Cracked	$k_{cr,N}$	7,7								
Concrete cone failure	Edge distance	$c_{cr,N}$	1,5 $h_{ef}$								
	Spacing	$s_{cr,N}$	3 $h_{ef}$								
Characteristic resistance	$N_{Rk,sp}^0$	[kN]	$N_{Rk,p}$								
Splitting failure	Edge distance	$c_{cr,sp}$	1,65 $h_{ef}$				1,60 $h_{ef}$				
	Spacing	$s_{cr,sp}$	3,30 $h_{ef}$				3,20 $h_{ef}$				
Installation factor	$\gamma_{inst}$	[-]	1,0								

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> In case  $h_{nom} > h_{nom1}$  and  $< h_{nom3}$  the actual  $h_{ef}$  for concrete failure can be calculated according to:  $h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t)$

<sup>3)</sup>  $N_{Rk,c}^0$  according to EN 1992-4:2018

**Hilti screw anchor HUS4**

**Performances**  
Essential characteristics under static and quasi-static load in concrete

**Annex C3**

**Table C2 continued**

Fastener size HUS4 Type			12			14			16	
			H			H(F), A(F)			H(F)	
			$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$	[mm]	60	80	100	65	85	115	85	130
<b>Steel failure for shear load</b>										
Characteristic resistance	$V_{Rk,s}^0$	[kN]	38,9	44,9	55	62		65,1	73,1	
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,25							
Ductility factor	$k_7$	[-]	0,8							
Characteristic resistance	$M_{Rk,s}^0$	[Nm]	120			186			240	
<b>Concrete pry-out failure</b>										
Pry-out factor	$k_8$	[-]	2,0							
<b>Concrete edge failure</b>										
Effective length of fastener	$l_f$	[mm]	60	80	100	65	85	115	85	130
Outside diameter of fastener	$d_{nom}$	[mm]	12			14			16	

<sup>1)</sup> In absence of other national regulations.

**Hilti screw anchor HUS4**

**Performances**  
Essential characteristics under static and quasi-static load in concrete

**Annex C4**

**Table C3: Essential characteristics under static and quasi-static load in concrete for HUS4 stainless steel**

Fastener size HUS4			6		8		10		14	
Type			HR, CR		HR, CR		HR, CR		HR	
			$h_{nom1}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	
Nominal embedment depth	$h_{nom}$	[mm]	55	60	80	70	90	70	110	
<b>Steel failure for tension and shear load</b>										
Characteristic resistance	$N_{Rk,s}$	[kN]	24,0	34,0	52,6	102,2				
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,4							
Characteristic resistance	$V_{Rk,s}$	[kN]	17,0	26,0	33,0	55,0	77,0			
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,5							
Ductility factor	$k_7$	[-]	1,0							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	19	36	66	193				
<b>Pull-out failure</b>										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	8,5	15	12	16	12	25	
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9	12	16	16	25	$\geq N^0_{Rk,c}^{2)}$		
Increasing factor for $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	$\psi_c$	[-]	$(f_{ck}/20)^{0,5}$							
<b>Concrete cone and splitting failure</b>										
Effective anchorage depth	$h_{ef}$	[mm]	45	47	64	54	71	52	86	
Factor for	Cracked	$k_{cr,N}$	7,7							
	Uncracked	$k_{ucr,N}$	11,0							
Concrete cone failure	Edge distance	$c_{cr,N}$	1,5 $h_{ef}$							
	Spacing	$s_{cr,N}$	3 $h_{ef}$							
Splitting failure	Edge distance	$c_{cr,sp}$	1,5 $h_{ef}$	1,5 $h_{ef}$	1,8 $h_{ef}$	1,8 $h_{ef}$				
	Spacing	$s_{cr,sp}$	3 $h_{ef}$	3 $h_{ef}$	3,6 $h_{ef}$	3,6 $h_{ef}$				
Robustness	$\gamma_{inst}$	[-]	1,4	1,0	1,2	1,2	1,0	1,2		
<b>Concrete pry-out failure</b>										
Pry-out factor	$k_8$	[mm]	1,5	2,0						
<b>Concrete edge failure</b>										
Effective length of anchor	$l_f = h_{ef}$	[mm]	45	47	64	54	71	52	86	
Effective diameter of anchor	$d_{nom}$	[mm]	6	8		10		14		

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup>  $N^0_{Rk,c}$  according to EN 1992-4:2018

Hilti screw anchor HUS4

**Performances**  
Essential characteristics under static and quasi-static load in concrete

**Annex C5**

**Table C4: Essential characteristics for seismic performance category C1 in concrete for HUS4 carbon steel**

Fastener size HUS4			8		10		12		14	
			H(F), C		H(F), C, A(F)		H		H(F), A(F)	
Type			$h_{nom2}$	$h_{nom3}$	$h_{nom2}$	$h_{nom3}$	$h_{nom2}$	$h_{nom3}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	60	70	75	85	80	100	85	115
<b>Steel failure for tension and shear load</b>										
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	36,0		55,0		79,0		101,5	
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,5							
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	18,8	26,7	38,9		22,5	34,5		
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,25							
Reduction factor acc. to EN 1992-4:2018 annular gap unfilled	$\alpha_{gap}$	[-]	0,5							
Reduction factor acc. to EN 1992-4:2018 annular gap filled	$\alpha_{gap}$	[-]	1,0							
<b>Pull-out failure</b>										
Characteristic resistance in cracked concrete	$N_{Rk,p,C1}$	[kN]	$\geq N_{Rk,c}^{0,3)}$							
<b>Concrete cone failure</b>										
Effective embedment depth	$h_{ef}^{2)}$	[mm]	47,6	56,1	59,5	68,0	62,9	79,9	66,3	91,8
Concrete cone failure	Edge distance	$c_{cr,N}$	1,5 $h_{ef}$							
	Spacing	$s_{cr,N}$	3 $h_{ef}$							
Installation factor	$\gamma_{inst}$	[-]	1,0							
<b>Concrete pry-out failure</b>										
Pry-out factor	$k_8$	[-]	2,0							
<b>Concrete edge failure</b>										
Effective length of fastener	$l_f$	[mm]	60	70	75	85	80	100	85	115
Outside diameter of fastener	$d_{nom}$	[mm]	8		10		12		14	

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> In case  $h_{nom} > h_{nom2}$  and  $< h_{nom3}$  the actual  $h_{ef}$  for concrete failure can be calculated according to " $h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t)$ "

<sup>3)</sup>  $N_{Rk,c}^0$  according to EN 1992-4:2018

**Hilti screw anchor HUS4**

**Performances**

Essential characteristics for seismic performance category C1 in concrete

**Annex C6**

<b>Table C4 continued</b>			
<b>Fastener size HUS4</b>		<b>16</b>	
<b>Type</b>		<b>H(F)</b>	
		$h_{nom1}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$ [mm]	85	130
<b>Steel failure for tension and shear load</b>			
Characteristic resistance	$N_{Rk,s,C1}$ [kN]	107,7	
Partial factor	$\gamma_{Ms,N}^{1)}$ [-]	1,5	
Characteristic resistance	$V_{Rk,s,C1}$ [kN]	42,9	25,3
Partial factor	$\gamma_{Ms,V}^{1)}$ [-]	1,25	
Partial factor annular gap unfilled	$\alpha_{gap}$ [-]	0,5	
Partial factor annular gap filled	$\alpha_{gap}$ [-]	1,0	
<b>Pull-out failure</b>			
Characteristic resistance in cracked concrete	$N_{Rk,p,C1}$ [kN]	7,5	19,0
<b>Concrete cone failure</b>			
Effective embedment depth	$h_{ef}^{2)}$ [mm]	66,6	104,9
Concrete cone failure	Edge distance $c_{cr,N}$ [mm]	1,5 $h_{ef}$	
	Spacing $s_{cr,N}$ [mm]	3 $h_{ef}$	
Installation factor	$\gamma_{inst}$ [-]	1,0	
<b>Concrete pry-out failure</b>			
Pry-out factor	$k_8$ [-]	2,0	
<b>Concrete edge failure</b>			
Effective length of fastener	$l_f$ [mm]	85	130
Outside diameter of fastener	$d_{nom}$ [mm]	16	
<sup>1)</sup> In absence of other national regulations. <sup>2)</sup> In case $h_{nom} > h_{nom2}$ and $< h_{nom3}$ the actual $h_{ef}$ for concrete failure can be calculated according to " $h_{ef} = 0,85 * (h_{nom} - 0,5 * h_t)$ "			
<b>Hilti screw anchor HUS4</b>			<b>Annex C7</b>
<b>Performances</b> Essential characteristics for seismic performance category C1 in concrete			

**Table C5: Essential characteristics for seismic performance category C1 in concrete for HUS4 stainless steel**

Fastener size HUS4			8	10	14
Type			HR, CR	HR, CR	HR
			$h_{nom2}$	$h_{nom2}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$	[mm]	80	90	110
<b>Steel failure for tension and shear load</b>					
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	34,0	52,6	102,2
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,4		
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	11,1	17,9	53,9
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,5		
<b>Pull-out failure</b>					
Characteristic resistance in cracked concrete	$N_{Rk,p,C1}$	[kN]	7,7	12,5	17,5
<b>Concrete cone failure</b>					
Effective embedment depth	$h_{ef}$	[mm]	64	71	86
Concrete cone failure	Edge distance	$c_{cr,N}$	1,5 $h_{ef}$		
	Spacing	$s_{cr,N}$	3 $h_{ef}$		
Robustness	$\gamma_{Inst}$	[-]	1,2	1,0	1,2
<b>Concrete pry-out failure</b>					
Pry-out factor	$k_8$	[-]	2,0		
<b>Concrete edge failure</b>					
Effective length of fastener	$l_f = h_{ef}$	[mm]	64	71	86
Outside diameter of fastener	$d_{nom}$	[mm]	8	10	14

<sup>1)</sup> In absence of other national regulations.

**Hilti screw anchor HUS4**

**Performances**

Essential characteristics for seismic performance category C1 in concrete

**Annex C8**

**Table C6: Essential characteristics for seismic performance category C2 in concrete for HUS4 carbon steel**

Fastener size HUS4			8	10	12	14
Type			H(F), C	H(F), C, A(F)	H	H(F), A(F)
			$h_{nom3}$	$h_{nom3}$	$h_{nom3}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]	70	85	100	115
<b>Adjustment</b>						
Total max. thickness of adjustment layers	$t_{adj}$	[mm]	10	10	10	10
Max. number of adjustments	$n_a$	[-]	2	2	2	2
<b>Steel failure for tension</b>						
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	36,0	55,0	79,0	101,5
Partial factor	$\gamma_{Ms,N}^{1)}$	[-]	1,5			
<b>Steel failure for shear load</b>						
Partial factor	$\gamma_{Ms,V}^{1)}$	[-]	1,25			
Installation with Hilti filling set (HUS4-H and HUS4-A)						
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	13,9	21,5	27,2	46,5
Partial factor annular gap filled	$\alpha_{gap}$	[-]	1,0			
Installation without Hilti filling set						
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	9,4	13,7	22,5	34,4
Partial factor annular gap not filled	$\alpha_{gap}$	[-]	0,5			
<b>Pull-out failure</b>						
Characteristic resistance in cracked concrete	$N_{Rk,p,C2}$	[kN]	2,7	5,4	11,4	17,7
<b>Concrete cone failure</b>						
Effective embedment depth	$h_{ef}$	[mm]	56,1	68,0	79,9	91,8
Concrete cone failure	Edge distance	$c_{cr,N}$	1,5 $h_{ef}$			
	Spacing	$s_{cr,N}$	3 $h_{ef}$			
Installation factor	$\gamma_{inst}$	[-]	1,0			
<b>Concrete pry-out failure</b>						
Pry-out factor	$k_8$	[-]	2,0			
<b>Concrete edge failure</b>						
Effective length of fastener	$l_f$	[mm]	70	85	100	115
Outside diameter of fastener	$d_{nom}$	[mm]	8	10	12	14

<sup>1)</sup> In absence of other national regulations.

**Hilti screw anchor HUS4**

**Performances**  
Essential characteristics for seismic performance category C2 in concrete

**Annex C9**

**Table C7: Essential characteristics under fire exposure in concrete for HUS4-H carbon steel**

Fastener size HUS4-H(F)		8			10			
		$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
Nominal embedment depth	$h_{nom}$ [mm]	40	60	70	55	75	85	
<b>Steel failure for tension and shear load (<math>F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}</math>)</b>								
Characteristic resistance	R30	$F_{Rk,s,fi}$ [kN]	2,6		4,1	4,2		
	R60	$F_{Rk,s,fi}$ [kN]	1,9		3,1	3,1		
	R90	$F_{Rk,s,fi}$ [kN]	1,2		2,2	2,3		
	R120	$F_{Rk,s,fi}$ [kN]	0,9		1,5	1,7		
	R30	$M^0_{Rk,s,fi}$ [Nm]	2,3		4,8	4,9		
	R60	$M^0_{Rk,s,fi}$ [Nm]	1,7		3,6	3,7		
	R90	$M^0_{Rk,s,fi}$ [Nm]	1,1		2,6	2,7		
	R120	$M^0_{Rk,s,fi}$ [Nm]	0,8		1,8	1,9		
<b>Pull-out failure</b>								
Characteristic resistance	R30	$N^0_{Rk,p,fi}$ [kN]	1,3	2,8	3,6	2,3	3,9	4,7
	R60							
	R90							
	R120							
<b>Concrete cone failure</b>								
Characteristic resistance	R30	$N^0_{Rk,c,fi}$ [kN]	0,8	2,6	4,0	2,0	4,7	6,5
	R60							
	R90							
	R120							
<b>Edge distance</b>								
R30 to R120	$c_{cr,fi}$ [mm]	2 $h_{ef}$						
In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm								
<b>Fastener spacing</b>								
R30 to R120	$s_{cr,fi}$ [mm]	2 $c_{cr,fi}$						
<b>Concrete pry-out failure</b>								
R30 to R120	$k_8$ [-]	1,0	2,0		1,0	2,0		
The anchorage depth shall be increased for wet concrete by at least 30 mm compared to the given value								

Hilti screw anchor HUS4

**Performances**  
Essential characteristics under fire exposure in concrete

**Annex C10**

**Table C7 continued**

Fastener size HUS4-H(F)				12			14			16	
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth		$h_{nom}$	[mm]	60	80	100	65	85	115	85	130
<b>Steel failure for tension and shear load (<math>F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}</math>)</b>											
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	7,5	7,6	7,6	10,3	10,4	10,5	10,6	10,7
	R60	$F_{Rk,s,fi}$	[kN]	5,5	5,7	5,8	7,7	7,9	8,0	8,1	8,2
	R90	$F_{Rk,s,fi}$	[kN]	3,7	3,9	4,1	5,2	5,6	5,8	5,7	5,9
	R120	$F_{Rk,s,fi}$	[kN]	2,8	3,0	3,1	3,9	4,2	4,4	4,3	4,5
	R30	$M^0_{Rk,s,fi}$	[Nm]	11,4	11,6	11,6	18,9	19,2	19,3	23,7	23,9
	R60	$M^0_{Rk,s,fi}$	[Nm]	8,4	8,8	8,9	14,1	14,6	14,8	18,1	18,3
	R90	$M^0_{Rk,s,fi}$	[Nm]	5,7	6,0	6,2	9,5	10,2	10,7	12,7	13,2
	R120	$M^0_{Rk,s,fi}$	[Nm]	4,3	4,6	4,7	7,2	7,7	8,1	9,6	10,0
<b>Pull-out failure</b>											
Characteristic resistance	R30	$N^0_{Rk,p,fi}$	[kN]	2,6	4,2	6,1	2,9	4,5	7,5	4,6	8,7
	R60										
	R90										
	R120	$N^0_{Rk,p,fi}$	[kN]	2,1	3,4	4,9	2,3	3,6	6,0	3,7	7,0
<b>Concrete cone failure</b>											
Characteristic resistance	R30	$N^0_{Rk,c,fi}$	[kN]	2,4	5,4	9,8	2,9	6,1	13,9	6,2	19,4
	R60										
	R90										
	R120	$N^0_{Rk,c,fi}$	[kN]	1,9	4,3	7,8	2,3	4,9	11,1	4,9	15,5
<b>Edge distance</b>											
R30 to R120		$C_{cr,fi}$	[mm]	2 $h_{ef}$							
In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm											
<b>Fastener spacing</b>											
R30 to R120		$S_{cr,fi}$	[mm]	2 $C_{cr,fi}$							
<b>Concrete pry-out failure</b>											
R30 to R120		$k_8$	[-]	2,0							
The anchorage depth shall be increased for wet concrete by at least 30 mm compared to the given value											

**Hilti screw anchor HUS4**

**Performances**  
Essential characteristics under fire exposure in concrete

**Annex C11**

**Table C8: Essential characteristics under fire exposure in concrete for HUS4-C carbon steel**

Fastener size HUS4-C				8			10		
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$	[mm]		40	60	70	55	75	85
<b>Steel failure for tension and shear load (<math>F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}</math>)</b>									
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	0,5			1,0		
	R60	$F_{Rk,s,fi}$	[kN]	0,4			0,9		
	R90	$F_{Rk,s,fi}$	[kN]	0,3			0,7		
	R120	$F_{Rk,s,fi}$	[kN]	0,2			0,6		
	R30	$M^0_{Rk,s,fi}$	[Nm]	0,4			1,2		
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,3			1,0		
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,2			0,8		
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,2			0,6		
<b>Pull-out failure</b>									
Characteristic resistance	R30	$N^0_{Rk,p,fi}$	[kN]	1,3	2,8	3,6	2,3	3,9	4,7
	R60								
	R90								
	R120								
<b>Concrete cone failure</b>									
Characteristic resistance	R30	$N^0_{Rk,c,fi}$	[kN]	0,8	2,6	4,0	2,0	4,7	6,5
	R60								
	R90								
	R120								
<b>Edge distance</b>									
R30 to R120	$c_{cr,fi}$	[mm]	2 $h_{ef}$						
In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm									
<b>Fastener spacing</b>									
R30 to R120	$s_{cr,fi}$	[mm]	2 $c_{cr,fi}$						
<b>Concrete pry-out failure</b>									
R30 to R120	$k_8$	[-]	1,0	2,0	1,0	2,0			
The anchorage depth shall be increased for wet concrete by at least 30 mm compared to the given value									

Hilti screw anchor HUS4

**Performances**  
Essential characteristics under fire exposure in concrete

**Annex C12**

**Table C9: Essential characteristics under fire exposure in concrete for HUS4-A carbon steel**

Fastener size HUS4-A(F)		10			14			
		$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	
Nominal embedment depth	$h_{nom}$ [mm]	55	75	85	65	85	115	
<b>Steel failure for tension and shear load (<math>F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}</math>)</b>								
Characteristic resistance	R30	$F_{Rk,s,fi}$ [kN]	4,2			8,4		
	R60	$F_{Rk,s,fi}$ [kN]	3,3			6,8		
	R90	$F_{Rk,s,fi}$ [kN]	2,5			5,1		
	R120	$F_{Rk,s,fi}$ [kN]	2,1			4,3		
	R30	$M^0_{Rk,s,fi}$ [Nm]	4,8			15,4		
	R60	$M^0_{Rk,s,fi}$ [Nm]	3,8			12,4		
	R90	$M^0_{Rk,s,fi}$ [Nm]	2,9			9,3		
	R120	$M^0_{Rk,s,fi}$ [Nm]	2,4			7,8		
<b>Pull-out failure</b>								
Characteristic resistance	R30	$N^0_{Rk,p,fi}$ [kN]	2,3	3,9	4,7	2,9	4,5	7,5
	R60							
	R90							
	R120							
<b>Concrete cone failure</b>								
Characteristic resistance	R30	$N^0_{Rk,c,fi}$ [kN]	2,0	4,7	6,5	2,9	6,1	13,9
	R60							
	R90							
	R120							
<b>Edge distance</b>								
R30 to R120	$c_{cr,fi}$ [mm]	2 $h_{ef}$						
In case of fire attack from more than one side, the minimum edge distance shall be $\geq 300$ mm								
<b>Fastener spacing</b>								
R30 to R120	$s_{cr,fi}$ [mm]	2 $c_{cr,fi}$						
<b>Concrete pry-out failure</b>								
R30 to R120	$k_8$ [-]	1,0	2,0					
The anchorage depth shall be increased for wet concrete by at least 30 mm compared to the given value								

Hilti screw anchor HUS4

**Performances**  
Essential characteristics under fire exposure in concrete

**Annex C13**

**Table C10: Essential characteristics under fire exposure in concrete for HUS4 stainless steel**

Fastener size HUS4			6		8				10				14	
			HR	CR	HR		CR		HR		CR		HR	
Type			$h_{nom1}$		$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth	$h_{nom}$	[mm]	55		60	80	60	80	70	90	70	90	70	110
<b>Steel failure for tension and shear load (<math>F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}</math>)</b>														
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	4,9	0,2	9,3	0,8	18,5	1,4	41,7				
	R60	$F_{Rk,s,fi}$	[kN]	3,3	0,2	6,3	0,6	12,0	1,1	26,9				
	R90	$F_{Rk,s,fi}$	[kN]	1,8	0,2	3,2	0,5	5,4	0,9	12,2				
	R120	$F_{Rk,s,fi}$	[kN]	1,0	0,1	1,7	0,4	2,4	0,8	5,4				
	R30	$M^0_{Rk,s,fi}$	[Nm]	4,0	0,2	8,2	0,8	19,4	1,5	65,6				
	R60	$M^0_{Rk,s,fi}$	[Nm]	2,7	0,2	5,5	0,7	12,6	1,2	42,4				
	R90	$M^0_{Rk,s,fi}$	[Nm]	1,4	0,1	2,8	0,5	5,7	0,9	19,2				
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,8	0,1	1,5	0,4	2,5	0,8	8,5				
<b>Concrete pull-out failure</b>														
Characteristic resistance	R30	$N_{Rk,p,fi}$	[kN]	1,3	1,5	3,0	1,5	3,0	2,3	4,0	2,3	4,0	3,0	6,3
	R60													
	R90													
	R120	$N_{Rk,p,fi}$	[kN]	1,0	1,2	2,4	1,2	2,4	1,8	3,2	1,8	3,2	2,4	5,0
Edge distance														
R30 to R120	$c_{cr,fi}$	[mm]	2 $h_{ef}$											
Anchor spacing														
R30 to R120	$s_{cr,fi}$	[mm]	2 $c_{cr,fi}$											
<b>Concrete pry-out failure</b>														
R30 to R120	$k_8$	[-]	1,5	2,0										

Hilti screw anchor HUS4

**Performances**  
Essential characteristics under fire exposure in concrete

**Annex C14**

**Table C11: Displacements under tension loads for HUS4 carbon steel**

Fastener size HUS4				8			10		
Type				H(F), C			H(F), C, A(F)		
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth		$h_{nom}$	[mm]	40	60	70	55	75	85
Cracked concrete C20/25 to C50/60	Tension Load	N	[kN]	2,6	5,4	6,9	3,8	7,5	8,6
	Displacement	$\delta_{N0}$	[mm]	0,1	0,3	0,4	0,2	0,4	0,4
$\delta_{N\infty}$		[mm]	0,3	0,4	0,4	0,7	0,7	0,9	
Uncracked concrete C20/25 to C50/60	Tension Load	N	[kN]	3,7	7,1	9,1	5,2	10,5	12,2
	Displacement	$\delta_{N0}$	[mm]	0,1	0,2	0,2	0,1	0,3	0,3
$\delta_{N\infty}$		[mm]	0,3	0,4	0,4	0,7	0,7	0,9	

Fastener size HUS4				12			14			16	
Type				H			H(F), A(F)			H(F)	
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth		$h_{nom}$	[mm]	60	80	100	65	85	115	85	130
Cracked concrete C20/25 to C50/60	Tension Load	N	[kN]	5,1	8,2	11,7	5,7	8,6	14,4	8,7	16,7
	Displacement	$\delta_{N0}$	[mm]	0,3	0,4	0,6	0,3	0,4	0,7	0,1	0,4
$\delta_{N\infty}$		[mm]	0,9	0,9	1,2	1,3	1,3	1,5	1,3	1,4	
Uncracked concrete C20/25 to C50/60	Tension Load	N	[kN]	6,8	10,8	15,5	7,5	11,7	19,1	11,5	22,9
	Displacement	$\delta_{N0}$	[mm]	0,2	0,3	0,4	0,2	0,3	0,5	0,4	0,3
$\delta_{N\infty}$		[mm]	0,9	0,9	1,2	1,3	1,3	1,5	1,3	1,4	

**Table C12: Displacements under tension loads for HUS4 stainless steel**

Fastener size HUS				6		8		10				14	
Type				HR, CR		HR, CR		HR, CR		H		HR	
				$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$
Nominal anchorage depth		$h_{nom}$	[mm]	55	60	80	70	90	70	85	70	110	
Cracked concrete C20/25 to C50/60	Tension load	N	[kN]	1,7	2,4	4,8	3,6	6,3	3,0	4,1	4,8	9,9	
	Displacement	$\delta_{N0}$	[mm]	0,4	0,5	0,7	0,3	0,6	0,2	0,3	0,9	1,4	
		$\delta_{N\infty}$	[mm]	0,5	0,7	1,1	0,6	1,1	0,3	0,7	1,1	1,4	
		$\delta_{N,seis}$	[mm]	1)	1)	1,2	1)	1,2	1)	1,2	1)	0,4	
Uncracked concrete C20/25 to C50/60	Tension load	N	[kN]	3,1	4,8	6,3	6,3	9,9	4,8	6,8	7,5	16,0	
	Displacement	$\delta_{N0}$	[mm]	0,8	0,7	1,6	0,3	1,3	0,2	0,3	0,7	1,0	
		$\delta_{N\infty}$	[mm]	0,8	0,7	1,6	0,3	1,3	0,3	0,7	0,7	1,0	

1) No performance assessed.

<b>Hilti screw anchor HUS4</b>	<b>Annex C15</b>
<b>Performances</b> Displacement values in case of static and quasi-static loading	

**Table C13: Displacements under shear loads for HUS4 carbon steel**

Fastener size HUS4 Type				8			10		
				H(F), C			H(F), C, A(F)		
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$
Nominal embedment depth		$h_{nom}$	[mm]	40	60	70	55	75	85
Concrete C20/25 to C50/60	Shear Load	V	[kN]	10,7	10,7	12,5	16,5	16,5	18,3
	Displacement	$\delta_{V0}$	[mm]	1,3	1,1	0,9	1,4	1,3	1,0
		$\delta_{V\infty}$	[mm]	2,0	1,7	1,4	2,1	2,0	1,5

Fastener size HUS4 Type				12			14			16	
				H			H(F), A(F)			H(F)	
				$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$	$h_{nom3}$	$h_{nom1}$	$h_{nom2}$
Nominal embedment depth		$h_{nom}$	[mm]	60	80	100	65	85	115	85	130
Concrete C20/25 to C50/60	Shear Load	V	[kN]	22,2	22,2	25,7	31,4	35,4	35,4	37,2	41,8
	Displacement	$\delta_{V0}$	[mm]	1,6	1,6	0,9	5,3	5,3	4,0	2,3	1,8
		$\delta_{V\infty}$	[mm]	2,3	2,4	1,4	7,9	7,9	6,0	3,5	2,7

**Table C14: Displacements under shear loads for HUS4 stainless steel**

Fastener size HUS4 Type				6		8		10		14	
				HR, CR		HR, CR		HR, CR		HR	
				$h_{nom1}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	$h_{nom1}$	$h_{nom2}$	
Nominal anchorage depth		$h_{nom}$	[mm]	55	60	80	70	90	70	110	
Concrete C20/25 to C50/60	Shear load	V	[kN]	7,8	11,0	12,4	13,6	15,7	12,9	27,3	
	Displacement	$\delta_{V0}$	[mm]	0,4	2,0	2,3	1,1	1,7	3,5	3,9	
		$\delta_{V\infty}$	[mm]	0,5	2,4	2,9	1,5	2,4	3,9	4,3	
		$\delta_{V,C1}$	[mm]	1)	1)	4,8	1)	5,3	1)	7,6	

1) No performance assessed.

**Hilti screw anchor HUS4**

**Performances**

Displacement values in case of static and quasi-static loading

**Annex C16**

**Table C15: Displacements under tension and shear loads for seismic category 2  
for HUS 4 carbon steel**

Fastener size HUS4		8	10	12	14
Type		H(F), C	H(F), C, A(F)	H	H(F), A(F)
		$h_{nom3}$	$h_{nom3}$	$h_{nom3}$	$h_{nom3}$
Nominal embedment depth	$h_{nom}$ [mm]	70	85	100	115
Tension load					
Displacement DLS	$\bar{\delta}_{N,C2 (DLS)}$ [mm]	0,59	0,80	0,77	1,06
Displacement ULS	$\bar{\delta}_{N,C2 (ULS)}$ [mm]	1,36	3,66	2,78	3,89
Shear load with Hilti filling set (HUS4-H and HUS4-A)					
Displacement DLS	$\bar{\delta}_{V,C2 (DLS)}$ [mm]	1,85	1,72	1,73	2,52
Displacement ULS	$\bar{\delta}_{V,C2 (ULS)}$ [mm]	5,44	6,88	5,62	6,79
Shear load without Hilti filling set					
Displacement DLS	$\bar{\delta}_{V,C2 (DLS)}$ [mm]	4,64	5,02	4,90	4,93
Displacement ULS	$\bar{\delta}_{V,C2 (ULS)}$ [mm]	7,96	8,97	7,00	9,14

**Hilti screw anchor HUS4**

**Performances**  
Displacement values in case of seismic C2 loading

**Annex C17**