

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-18/0208
of 29 March 2019

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

Connector Hilti HUS3-H

Product family
to which the construction product belongs

Connector for strengthening of existing concrete
structures by concrete overlay

Manufacturer

Hilti Aktiengesellschaft
Feldkircherstrasse 100
9494 SCHAAN
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment
contains

11 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 332347-00-0601

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Specific Part

1 Technical description of the product

The Connector Hilti HUS3-H is a concrete screw made of galvanised steel anchored into a predrilled cylindrical drill hole in existing concrete. The special thread of the concrete screw cuts an internal thread into the member while setting. The Hilti HUS3-H is connecting two layers of concrete cast at different times (existing concrete and concrete overlay). The side with head of concrete screw is finally embedded in the concrete overlay.

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 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 resistances in existing concrete; edge distance and spacing (static and quasi-static loading)	See Annex C 1
Characteristic resistances in concrete overlay; edge distance and spacing (static and quasi-static loading)	See Annex C 2
Shear interface parameters under static and quasi-static loading	See Annex C 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

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. 332347-00-0601 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 with Deutsches Institut für Bautechnik.

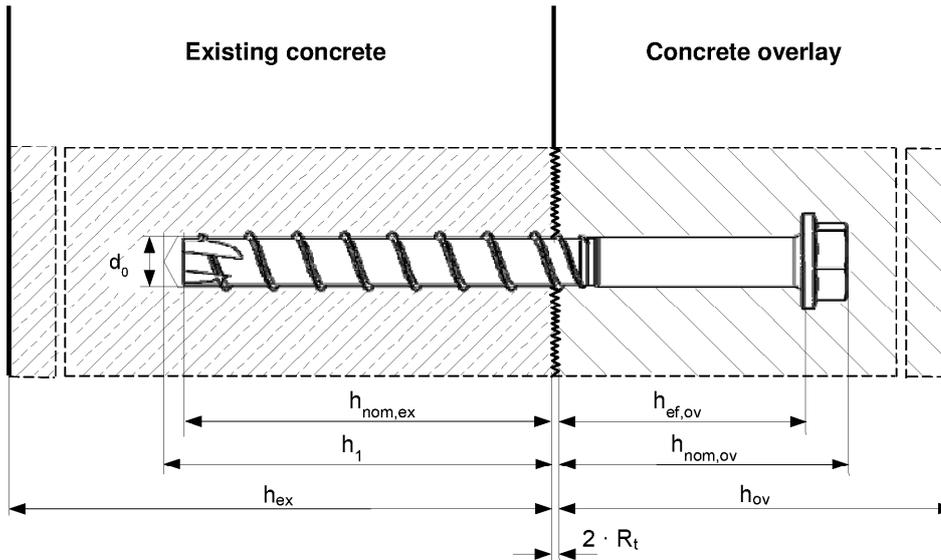
Issued in Berlin on 29 March 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

Installed condition

Figure A1:
Connector Hilti HUS3-H



$h_{nom,ex}$ Overall embedment depth in existing concrete
 h_1 Drill hole depth
 h_{ex} Thickness of existing concrete
 R_t Roughness according to EOTA Technical Report TR 066:2018-11

$h_{ef,ov}$ Effective embedment depth in concrete overlay
 $h_{nom,ov}$ Overall embedment depth in concrete overlay
 h_{ov} Thickness of concrete overlay

Connector Hilti HUS3-H

Product description
Installed condition

Annex A1

Product description: Connector

Concrete screw Hilti HUS3-H

Marking:
Product name: "HUS3-H", size
maximum fixture thickness related to embedment depth

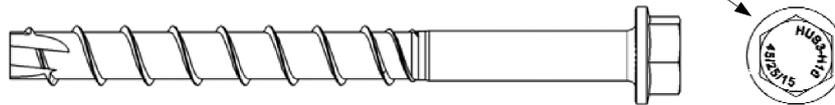
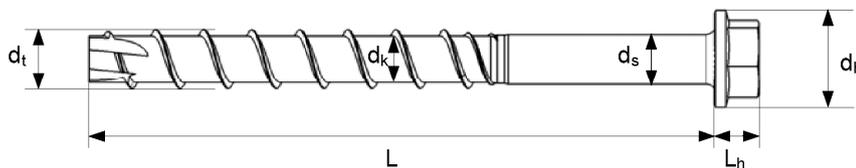


Table A1: Materials

Designation	Material
HUS3-H	carbon steel, galvanized, rupture elongation $A_5 \leq 8\%$ Size 8: strength $f_{uk} \geq 810 \text{ N/mm}^2$, $f_{yk} \geq 695 \text{ N/mm}^2$ Size10: strength $f_{uk} \geq 805 \text{ N/mm}^2$, $f_{yk} \geq 690 \text{ N/mm}^2$ Size14: strength $f_{uk} \geq 730 \text{ N/mm}^2$, $f_{yk} \geq 630 \text{ N/mm}^2$

Table A2: Specification

Connector Hilti HUS3-H			8	10	14
Threaded outer diameter	d_t	[mm]	10,30	12,40	16,85
Core diameter	d_k	[mm]	7,85	9,90	12,95
Shaft diameter	d_s	[mm]	8,45	10,55	13,80
Stressed section	A_s	[mm ²]	48,4	77,0	131,7
Overall length of the connector under the head	L	[mm]	101,5	101,5	131,5
			121,5	131,5	151,5
			151,5	151,5	
Diameter of the head	d_h	[mm]	17,5	20,5	29,0
Hight of the head	$L_h = t_h$	[mm]	7,8	9,3	12,0



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Connector Hilti HUS3-H

Product description
Concrete screw / Materials / Specification

Annex A2

Specifications of intended use

Anchorage subject to:

- static or quasi static actions
 - surface roughness “very smooth” to “very rough” of the shear interface acc. to EOTA Technical Report TR 066:2018-11

Base materials:

Connector for use to strengthen existing concrete by concrete overlay. Both concrete is compacted reinforced or unreinforced normal weight concrete without fibres with strength classes in the range C20/25 to C50/60 all in accordance with EN 206:2013; cracked and uncracked concrete.

Design:

- The design of an anchorage and the specification of the fastener is under the control of an engineer experienced in anchorages and concrete work
- Post-installed shear connections are designed in accordance with EOTA Technical Report TR 066:2018-11
- For the concrete overlay following requirements on the mixture apply:
 - Concrete compressive strength of the new concrete shall be higher than the concrete compressive strength of the existing concrete.
 - Use of concrete with low shrinkage is recommended.
 - Slump of fresh concrete $f \geq 380$ mm, a slump value $f \geq 450$ mm is recommended, if applicable.

Installation:

- The fastener installation is executed by trained personnel, ensuring that the Installation instruction and the specifications by the engineer are observed
- Hammer drilling only
- The requirements for construction works given in EOTA Technical Report TR 066:2018-11 have to be considered.

Connector Hilti HUS3-H	Annex B1
Intended Use Specifications	

Table B1: Installation parameters of connector Hilti HUS3-H in existing concrete

Connector Hilti HUS3-H			8			10			14		
			$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$	$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$	$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$
Nominal embedment depth	$h_{nom,ex}$	[mm]	50	60	70	55	75	85	65	85	110
Nominal diameter of drill bit	d_0	[mm]	8			10			14		
Cutting diameter of the drill bit	d_{cut}	[mm]	8,45			10,45			14,50		
Drill hole depth	h_1	[mm]	60	70	80	65	85	95	75	95	120
Min. thickness of existing concrete	$h_{min,ex}$	[mm]	100	100	120	100	130	140	120	160	200
Minimum spacing	$s_{min,ex}$	[mm]	50	50	50	50	50	50	60	60	60
			40								
Minimum edge distance	$c_{min,ex}$	[mm]	40	40	40	50	50	50	60	60	60
			50								
Width across flats	SW	[mm]	13			15			21		
Setting tool for concrete strength			C20/25			Hilti SIW 14 A or Hilti SIW 22 A or Hilti SIW 22 T-A			Hilti SIW 22 A or Hilti SIW 22 T-A		
			> C20/25			Hilti SIW 22 T-A					

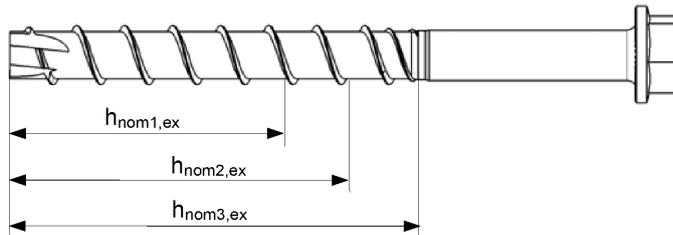
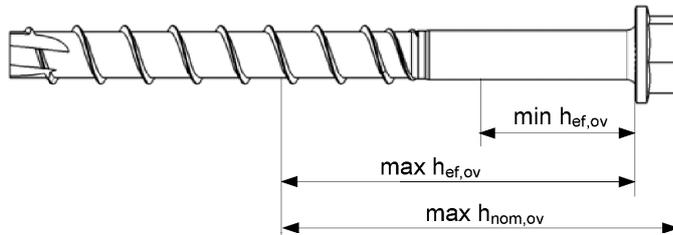


Table B2: Installation parameters of connector Hilti HUS3-H in concrete overlay

Connector Hilti HUS3-H			8	10	14
Effective embedment depth	min	$h_{ef,ov}$	40		
	max		$L - h_{nom,ex} - 2 \cdot R_t$ ¹⁾		
Overall embedment depth	$h_{nom,ov}$	[mm]	$h_{ef,ov} + L_h$		
Min. thickness of concrete overlay	$h_{min,ov}$	[mm]	$h_{nom,ov} + c_{nom}$ ²⁾		
Minimum spacing	$s_{min,ov}$	[mm]	$10 + c_{nom}$ ²⁾	$15 + c_{nom}$ ²⁾	$15 + c_{nom}$ ²⁾
Minimum edge distance	$c_{min,ov}$	[mm]	40	45	60



¹⁾ "R_t" Roughness according to EOTA Technical Report TR 066:2018-11

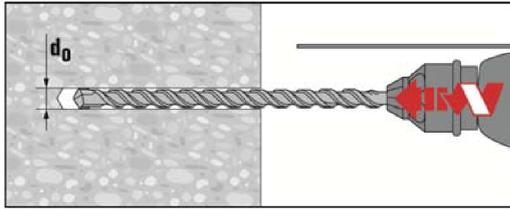
²⁾ "c_{nom}" Nominal concrete cover according to EN 1992-1-1:2004 + AC:2010

Connector Hilti HUS3-H

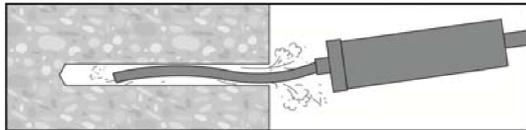
Intended Use
Installation parameters

Annex B2

Installation instruction

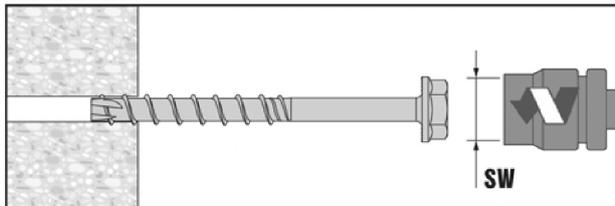


Make a cylindrical hole. If Hilti hollow drill bit TE-CD 14 is used, proceed without additional cleaning of the drill hole.

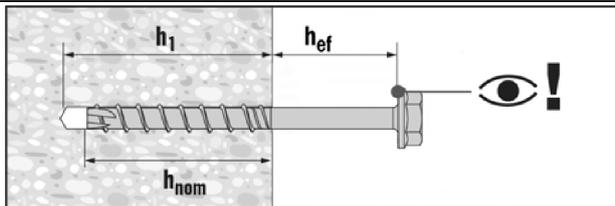


Clean the drill hole. For size 14 only, hole cleaning is not required under one of the following conditions:

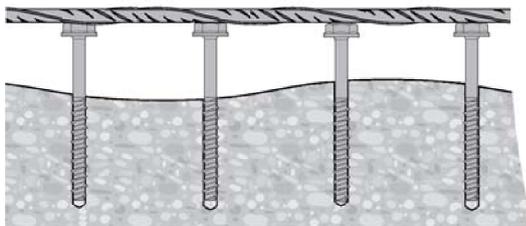
- Drilling in the vertical upwards orientation; or
- Drilling in the vertical downwards or horizontal directions and the drilling depth is increased by additional $3 \cdot d_0$; or
- Hilti hollow drill bit TE-CD 14 is used for drilling



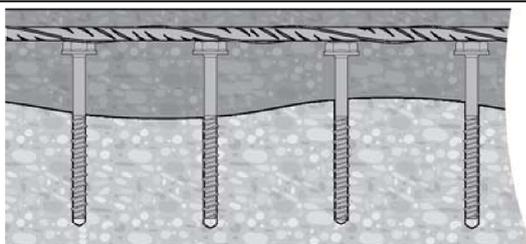
Install the screw anchor by impact screw driver.



Set the HUS3-H to the desired anchoring embedment depth $h_{nom,ex}$ in existing concrete and ensure the desired embedment depth $h_{ef,ov}$ for concrete overlay.



After connector installation, the rebar connections can be done to the connectors.



Observe the required condition of the surface before casting and the use of the correct concrete composition.

For requirements on concrete composition see EOTA TR 066:2018-11.

Connector Hilti HUS3-H

Intended Use
Installation instructions

Annex B3

Table C1: Essential characteristics of connector Hilti HUS3-H in existing concrete under static and quasi-static tension load

Connector Hilti HUS3-H			8			10			14		
			$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$	$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$	$h_{nom1,ex}$	$h_{nom2,ex}$	$h_{nom3,ex}$
Nominal embedment depth	$h_{nom,ov}$	[mm]	50	60	70	55	75	85	65	85	110
Installation factor	γ_{inst}	[-]	1,0								
Steel failure											
Characteristic resistance	$N_{RK,s,ex}$	[kN]	39,2			62,2			96,6		
Partial safety factor	$\gamma_{Ms,N,ex}$	[-]	1,4								
Pull-out failure											
Characteristic resistance in uncracked concrete C20/25	$N_{RK,p,ex}$	[kN]	9	12	16	12	20	$\geq N_{RK,c}^0$			
Characteristic resistance in cracked concrete C20/25	$N_{RK,p,ex}$	[kN]	6	9	12	$\geq N_{RK,c}^0$					
Increasing factors for $N_{RK,p}$ in concrete	$\psi_{c,ex}$	C30/37	1,22								
		C40/50	1,41								
		C50/60	1,58								
Concrete cone failure											
Effective embedment depth	$h_{ef,ex}$	[mm]	40,0	46,4	54,9	41,6	58,6	67,1	49,3	66,3	86,8
Factor for cracked concrete	$k_{cr,N,ex}$	[-]	7,7								
Factor for uncracked concrete	$k_{ucr,N,ex}$	[-]	11,0								
Edge distance	$c_{cr,N,ex}$	[mm]	$1,5 \cdot h_{ef,ex}$								
Spacing	$s_{cr,N,ex}$	[mm]	$3,0 \cdot h_{ef,ex}$								
Splitting failure											
Edge distance	$c_{cr,sp,ex}$	[mm]	$1,5 \cdot h_{ef,ex}$								
Spacing	$s_{cr,sp,ex}$	[mm]	$3,0 \cdot h_{ef,ex}$								

Connector Hilti HUS3-H

Performances
Essential characteristics under tension load in existing concrete

Annex C1

Table C2: Essential characteristics of connector Hilti HUS3-H in concrete overlay under static and quasi-static tension load

Connector Hilti HUS3-H		8	10	14
Steel failure				
Characteristic resistance	$N_{Rk,s,ov}$ [kN]	39,2	62,2	96,6
Partial safety factor	$\gamma_{Ms,N,ov}$ [-]	1,4		
Pull-out failure				
Projected area of the head	A_h [mm ²]	184,4	242,6	510,9
Factor for cracked concrete	k_2 [-]	7,5		
Factor for uncracked concrete	k_2 [-]	10,5		
Concrete cone failure				
Effective embedment depth	$\frac{\min}{\max} h_{ef,ov}$ [mm]	40 $L - h_{nom,ex} - 2 \cdot R_t^{1)}$		
Factor for cracked concrete	$k_{cr,N,ov}$ [-]	8,9		
Factor for uncracked concrete	$k_{ucr,N,ov}$ [-]	12,7		
Edge distance	$c_{cr,N,ov}$ [mm]	$1,5 \cdot h_{ef,ov}$		
Spacing	$s_{cr,N,ov}$ [mm]	$3,0 \cdot h_{ef,ov}$		
Splitting failure				
Edge distance	$c_{cr,sp,ov}$ [mm]	$3,0 \cdot h_{ef,ov}$		
Spacing	$s_{cr,sp,ov}$ [mm]	$6,0 \cdot h_{ef,ov}$		
Blow-out failure				
Projected area of the head	A_h [mm ²]	184,4	242,6	510,9
Factor for cracked concrete	k_5 [-]	8,7		
Factor for uncracked concrete	k_5 [-]	12,2		

¹⁾ "R_t" Roughness according to EOTA Technical Report TR 066:2018-11

Table C3: Essential characteristics of connector Hilti HUS3-H for the shear interface under static and quasi-static loading

Connector Hilti HUS3-H		8	10	14
Characteristic yield strength	f_{yk} [N/mm ²]	695	690	630
Product specific factor for ductility	α_{k1} [-]	0,8	0,8	0,8
Stressed cross section	A_s [mm ²]	48,4	77,0	131,7
Product specific factor for geometry	α_{k2} [-]	1,0	1,0	1,0

Connector Hilti HUS3-H

Performances

Essential characteristics under tension load in concrete overlay
Essential characteristics for the shear interface

Annex C2