Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-08/0307 of 29 April 2014

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti screw anchor HUS
Product family to which the construction product belongs	Concrete screw of sizes 6, 8, 10 and 14 for use in concrete
Manufacturer	Hilti Aktiengesellschaft 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	15 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	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 3: "Undercut anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Hilti screw anchor HUS is made of galvanised steel (HUS-A; -H; -I; -P) of sizes 6, 8 and 10 or made of stainless steel (HUS-HR; -CR) of sizes 6, 8, 10 and 14. 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.

The illustration and the description of the product 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 values for resistance to tension and shear load, bending moment, edge distance and spacing, minimum thickness of member and displacements	See Annex C

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

For Basic Works Requirement Safety in use the same criteria are valid as for Basic Works Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not applicable.

3.6 Energy economy and heat retention (BWR 6)

Not applicable.

3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was investigated for this product.

3.8 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

According to Decision of the Commission of 24 June 1996 (96/582/EC) (OJ L 254 of 08.10.96 p. 62-65), the system of assessment and verification of constancy of performance (see Annex V and Article 65 Paragraph 2 to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete (heavy-duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	—	1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Dcoument

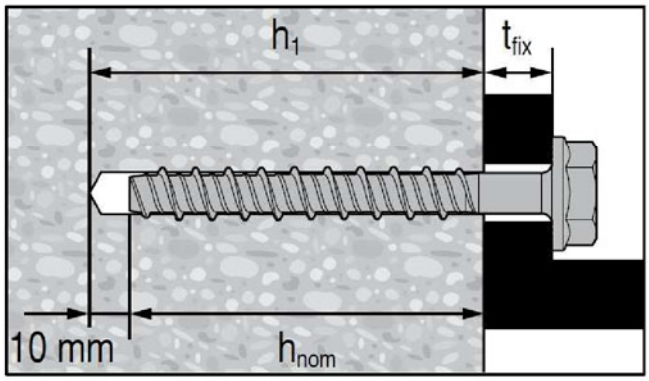
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Gerhard Breitschaft
President

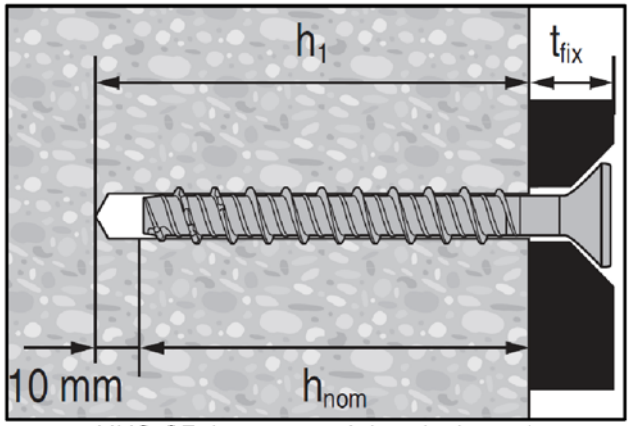
beglaubigt:
Lange

Deutsches Institut für Bautechnik

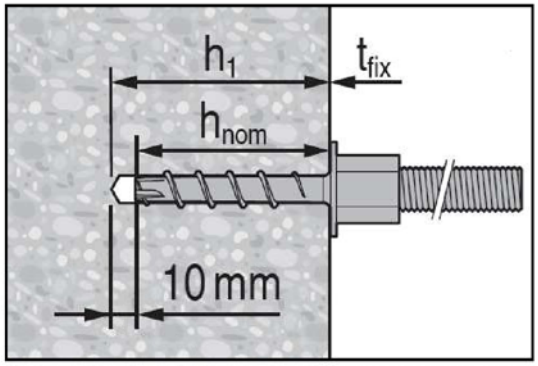
Product and installed condition



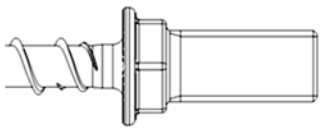
HUS-H (hexagonal head, sizes 8 and 10); HUS-HR (hexagonal head, sizes 6, 8, 10 and 14)



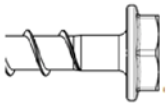
HUS-CR (countersunk head, size 10)



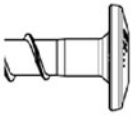
HUS-I (hexagonal head with metric thread, size 6)



HUS-A, external thread, size 6



HUS hexagonal head, size 6



HUS-P pan head, size 6

Hilti screw anchor HUS	
Product description Installed condition Example	**Annex A1**

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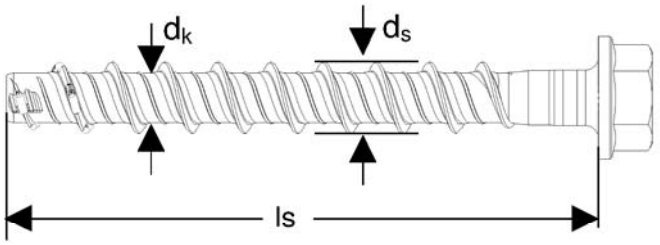
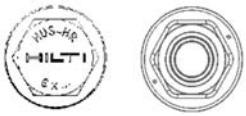
Table A1: Material and screw types

Part	Designation	f_{yk}	f_{uk}	d_s	d_k	A_s	Material
Screw anchor	HUS-A 6	745	930	7,85	5,85	26,9	Carbon Steel, galvanized (≥ 5 µm)
	HUS-H 6						
	HUS-I 6						
	HUS-P 6						
	HUS-H 8	815	950	10,1	7,05	39,0	
	HUS-H 10	860	1000	12,3	8,4	55,4	
	HUS-HR 6	900	1050	7,6	5,4	22,9	Stainless Steel (A4 grade)
	HUS-HR 8	745	870	10,1	7,05	39,0	
	HUS-HR 10	815	950	12,3	8,40	55,4	
	HUS-CR 10	815	950	12,3	8.40	55,4	
	HUS-HR 14	590	690	16,6	12,6	143,1	

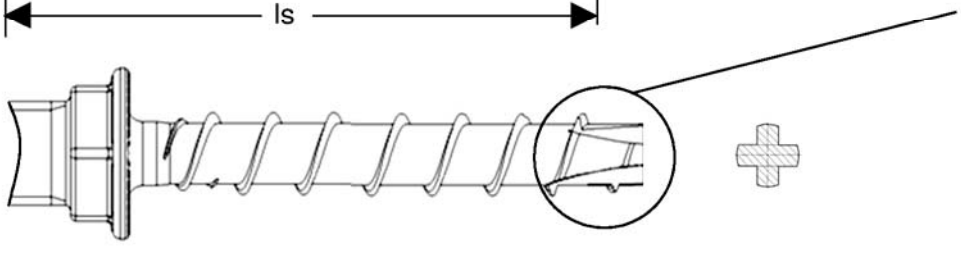


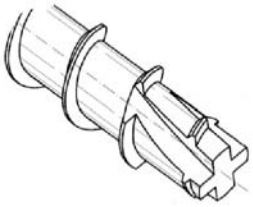


Head stamp:

e.g. Hilti HUS-HR 8 x ... or circle marks

Hilti cutting edges:





HILTI	…Manufacturer
Hilti cutting edges	…**H**ilti **U**niversal **S**crew anchor, anchor diameter/ drill bit diameter 6 mm
HUS	…**H**ilti **U**niversal **S**crew anchor
e.g. „H“ resp. circle marks	…Head configuration (A, H, I, P, C, R)
R	…
8	Corrosion **R**esistance (stainless steel, grade A4)
...	…Nominal anchor diameter/ drill bit diameter (6…14)
	…Nominal anchor length (ls)/ under head length

} Type

Hilti screw anchor HUS

Product description
Material and screw types

Annex A2

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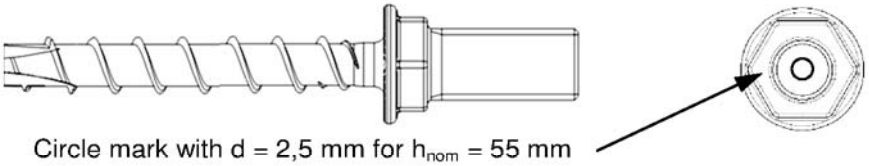
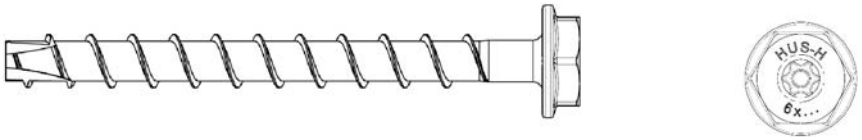
Screw types

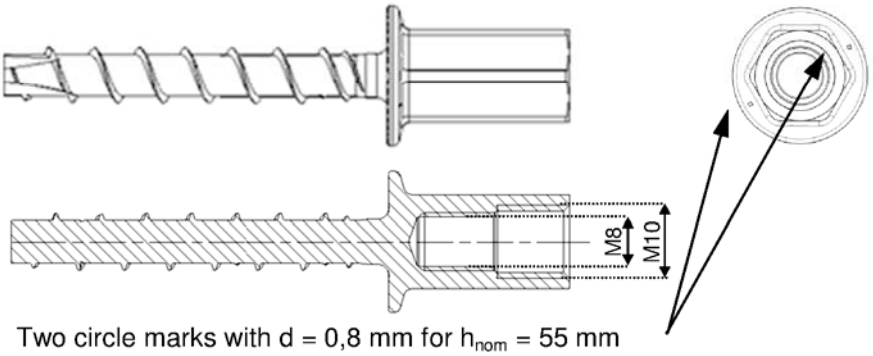
HUS-A 6
External thread
M8 or M10



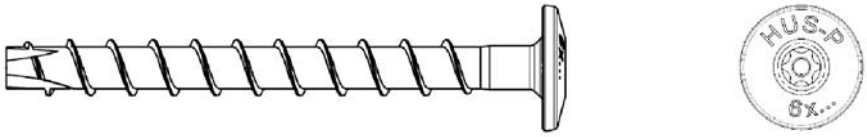
HUS-H 6
Hex head



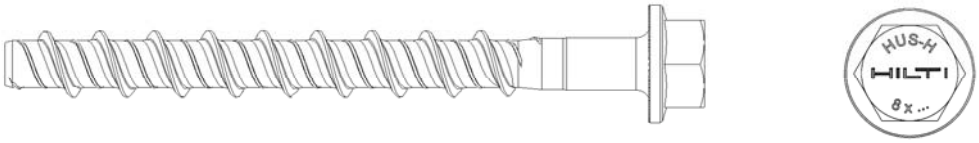
HUS-I 6
Internal threads
M8 and M10



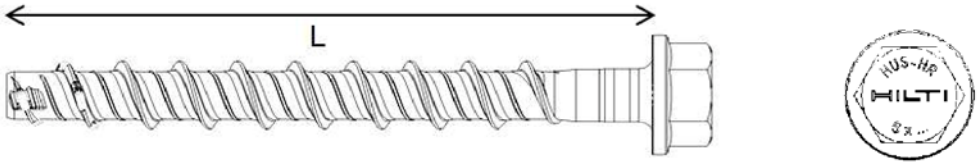
HUS-P 6
Pan head



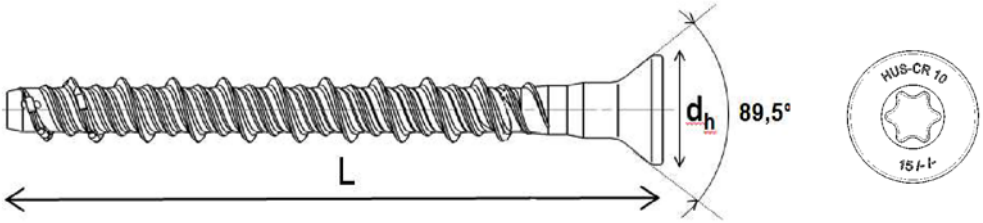
HUS-H 8
HUS-H 10
Hex head



HUS-HR 6
HUS-HR 8
HUS-HR 10
HUS-HR 14
Hex head



HUS-CR 10
Countersunk head



Hilti screw anchor HUS

Product description
Screw types

Annex A3

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Specifications of the intended use

Anchorages subject to:
- Static and quasi-static loads: all sizes and all embedment depths.
- Seismic action for Performance Category C1: sizes 8, 10 and 14 for maximum embedment depth only.
- Fire exposure: sizes 8, 10 and 14 only HUS-H (hex head); Size 6 all head configuration.

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Non-cracked and cracked concrete: all sizes and all embedment depths.

Use conditions (Environmental conditions)
- The anchors may only be used in dry internal conditions: All screw types
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition if no particular aggressive conditions exits: screw types made of stainless steel with marking "R"
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used)

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 anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static actions and under fire exposure are designed for design method A in accordance with:
  - Either ETAG 001, Annex C, Edition August 2010
  - Or CEN/TS 1992-4:2009,
- Anchorages under seismic action are designed in accordance with:
  - EOTA Technical Report TR 045, Edition February 2013 (Seismic performance category C1).
  - Anchorages shall be positions outside of critical regions (e.g. plastic hinges) of the concrete structure.
  - Fastenings in stand-off installation or with a grout layer are not allowed.
- In case of requirements to resistance to fire local spalling of the concrete cover must be avoided.

Installation:
- Hammer drilling only: all sizes and all embedment depths.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the 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 anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.

Hilti screw anchor HUS	**Annex B1**
Intended use Specifications	

Deutsches Institut für Bautechnik DIBt

Table B1: Installation parameters

Nominal anchor diameter			**6**					**8**				**10**				**14**	
Type		**HUS-**	**A**	**H**	**I**	**P**	**HR**	**H**		**HR**		**H**		**HR – CR[1)]**		**HR**	
Nominal anchorage depth	h_{nom}	**[mm]**	**55**					**60**	**75**	**60**	**80**	**70**	**85**	**70**	**90**	**70**	**110**
Nominal diameter of drill bit	d_0	[mm]	6					8				10				14	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,4					8,45				10,45				14,50	
Clearance hole diameter	d_f	[mm]	9					12				14				18	
Wrench size	SW	[mm]	13	13	13	-	13	13				15				21	
TORX (H, P and CR types)			-	T30	-	T30	-	-				-	-	T50		-	
Diameter of countersunk head (CR)	d_h	[mm]	-				-	-	-	-	-	-	-	21		-	-
Installation torque	T_{inst}	[Nm]	25				-[1)]	35	45	-[1)]	-[1)]	45	55	45[3)]		65	35
Setting tool			Impact screw driver,e.g. Hilti SIW 14-A or 22-A[2)]					Impact screw driver, e.g. Hilti SIW 22T-A[2)]									
Depth of drill hole in floor/ wall position	$h_1 \geq$	[mm]	h_{nom}+10 mm					h_{nom}+10 mm				h_{nom}+10 mm				h_{nom}+10 mm	
Depth of drill hole in ceiling position	$h_1 \geq$	[mm]	h_{nom}+3 mm														

[1)] Hand setting in concrete base material not allowed (machine setting only)
[2)] Hilti recommended electrical impact screw drivers are listed in the instruction for use included in the sales box.
[3)] Installation torque refer to HUS-HR only

Table B2: Minimum thickness of concrete member, minimum edge distance and spacing

Nominal anchor diameter				**6**					**8**				**10**				**14**	
Type			**HUS-**	**A**	**H**	**I**	**P**	**HR**	**H**		**HR**		**H**		**HR CR**		**HR**	
Nominal anchorage depth		h_{nom}	**[mm]**	**55**					**60**	**75**	**60**	**80**	**70**	**85**	**70**	**90**	**70**	**110**
Minimum member thickness		h_{min}	[mm]	100					110	120	100	120	110	130	120	140	140	160
Cracked concrete	Minimum edge distance	c_{min}	[mm]	35					50		45	50	50		50		50	60
	Minimum spacing	s_{min}	[mm]						40									
Non-cracked concrete	Minimum edge distance	c_{min}	[mm]	35					55		45	50	65		50		50	60
	Minimum spacing	s_{min}	[mm]															

Hilti screw anchor HUS

Intended use
Installation parameters

Annex B2

Table B3: Screw length and maximum thickness of fixture for HUS size 6

Anchor size	6				
	A	H	I	P	HR
embedment depth [mm] / Length of screw [mm]	h_{nom} 55				
	Thickness of fixture [mm]				
55	0		0		
60		5		5	5
70					15
80		25		25	
100		45			
120		65			

Table B4: Screw length and maximum thickness of fixture for HUS sizes 8, 10, 14

Anchor size	8				10						14	
type	H		HR		H		HR		CR		HR	
embedment depth [mm]	h_{nom1} 60	h_{nom2} 75	h_{nom1} 60	h_{nom2} 80	h_{nom1} 70	h_{nom2} 85	h_{nom1} 70	h_{nom2} 90	h_{nom1} 70	h_{nom2} 90	h_{nom1} 70	h_{nom2} 110
Length of screw [mm]	Thickness of fixture [mm]											
	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}
65	5		5									
75			15		5		5				10	
80	20	5										
85			25	5			15		15			
90	30	15			20	5						
95			35	15			25	5				
100					30	15						
105			45	25			35	15	35	15		
110	50	35										
115							45	25				
120					50	35					50	10
130	70	55										
135											65	25
140					70	55	60	40				
150	90	75										
160					90	75						
200					130	115						
240					170	155						
280					210	195						

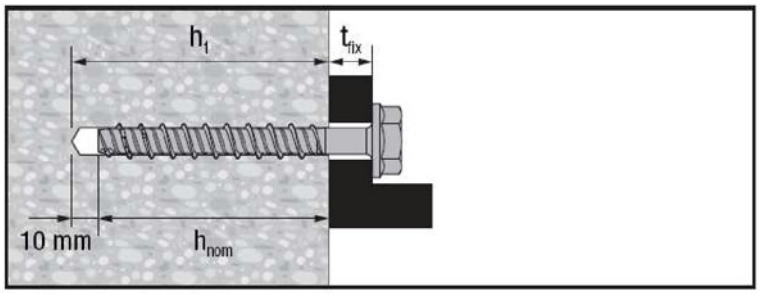
Hilti screw anchor HUS

Intended use
Installation parameters

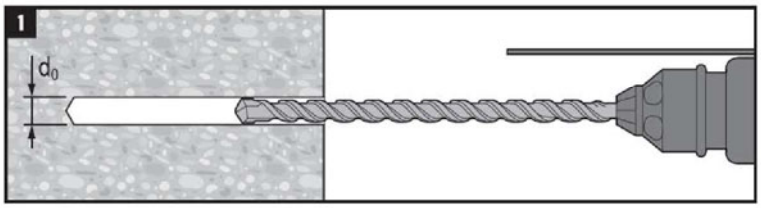
Annex B3

Deutsches Institut für Bautechnik

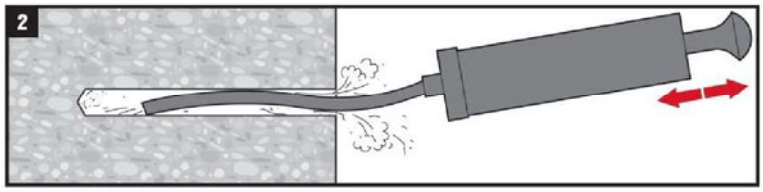
Installation instruction



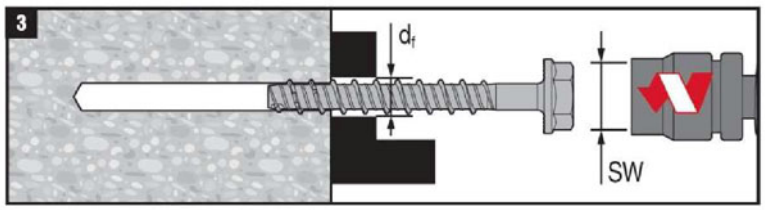
Anchor after installation



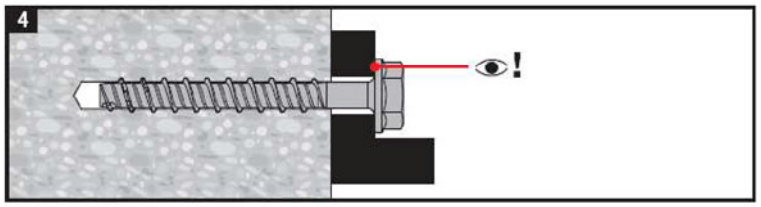
Make a cylindrical hole



Clean the hole



Install the screw anchor by torque wrench or impact screw driver according to Annex B2, Table B1



Ensure that the fixture is caught

Hilti screw anchor HUS	**Annex B4**
Intended use Installation instruction	

Deutsches Institut für Bautechnik DIBt

Table C1: Product performance for static and quasi-static action

Nominal anchor diameter				**6**			**8**				**10**				**14**	
Type			**HUS-**	**AHI**	**P**	**HR**	**H**		**HR**		**H**		**HR CR**		**HR**	
Nominal anchorage depth		h_{nom}	[mm]	**55**			**60**	**75**	**60**	**80**	**70**	**85**	**70**	**90**	**70**	**110**
Steel failure for tension and shear load																
Characteristic resistance		$N_{Rk,s}$	[kN]	25		24	37,1		34,0		55,4		52,6		102,2	
		$V_{Rk,s}$	[kN]	12,5		17	15,9		26		23,8		33		55	77
		$M^0_{Rk,s}$	[Nm]	21		19	39		36		70		66		193	
Pull-out failure																
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	6		5	6	9	6	12	7,5	16	9	16	12	25
Characteristic resistance in non-cracked concrete C20/25		$N_{Rk,p}$	[kN]	9	7,5	9	12	16	12	16	12	20	16	25	- [1]	- [1]
Increasing factors for $N_{Rk,p}$ in cracked and non-cracked concrete		ψ_c	C30/37	1,22			1,22				1,17	1,22			1,22	
			C40/50	1,41			1,41				1,32	1,41			1,41	
			C50/60	1,55			1,55				1,42	1,55			1,55	
Concrete cone and splitting failure																
Effective anchorage depth		h_{ef}	[mm]	42		45	47	60	47	64	54	67	54	71	52	86
Factor for	Cracked	k_{cr} [2]	[-]	7,2												
	Non-cracked	k_{ucr} [2]	[-]	10,1												
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}			1,5 h_{ef}				1,5 h_{ef}				1,5 h_{ef}	
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}			3 h_{ef}				3 h_{ef}				3 h_{ef}	
Splitting failure	Edge distance	$c_{cr,sp}$	[mm]	1,5 h_{ef}			1,5 h_{ef}				1,5 h_{ef}		1,8 h_{ef}		1,8 h_{ef}	
	Spacing	$s_{cr,sp}$	[mm]	3 h_{ef}			3 h_{ef}				3 h_{ef}		3,6 h_{ef}		3,6 h_{ef}	
Installation safety factor		γ_2 [3] = γ_{inst} [2]		1,2		1,4	1,2				1,2	1,4	1,2		1,2	
Concrete pry-out failure																
k factor		$k^{3)} = k_3$ [2]	[mm]	1,5			2				2				2	
Concrete edge failure																
Effective length of anchor		l_f	[mm]	42		45	47	60	47	64	54	67	54	71	52	86
Effective diameter of anchor		d	[mm]	6			8				10				14	

[1] Pull-out is not decisive
[2] Parameter relevant only for design according to CEN/TS 1992-4: 2009.
[3] Parameter relevant only for design according to ETAG 001 Annex C.

Hilti screw anchor HUS

Product performance
For static and quasi-static action

Annex C1

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Table C2: Product performance for seismic category C1

Nominal anchor diameter				**8**		**10**		**14**
Type			**HUS-**	**H**	**HR**	**H**	**HR CR**	**HR**
Nominal anchorage depth		h_{nom}	**[mm]**	**75**	**80**	**85**	**90**	**110**
Steel failure								
Characteristic resistance		$N_{Rk,s,seis}$	[kN]	37,1	34,0	55,4	52,6	102,2
		$V_{Rk,s,seis}$	[kN]	11,1		17,9		53,9
Pull-out failure								
Characteristic resistance in cracked concrete		$N_{Rk,p,seis}$	[kN]	7,7		12,5		17,5
Concrete cone failure								
Effective embedment depth				60	64	67	71	86
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}				
	Spacing	$s_{cr,N}$	[mm]	3,0 h_{ef}				
Installation safety factor		γ_2	[-]	1,2		1,4	1,2	1,2
Concrete pry-out failure								
k factor		k	[-]	2,0				
Concrete edge failure								
Effective length of anchor		l_f	[mm]	60	64	67	71	86
Effective diameter of anchor		d	[mm]	8		10		14

Hilti screw anchor HUS

Product performance
For seismic category C1

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3: Product performance for resistance to fire

Nominal anchor diameter				6		8				10				14	
Type			HUS-	A H I P	HR	H		HR		H		HR		HR	
Nominal anchorage depth		h_{nom}	[mm]	55		60	75	60	80	70	85	70	90	70	110
Steel Failure for tension and shear load ($F_{R,k,s,fi} = N_{R,k,s,fi} = V_{R,k,s,fi}$)															
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	1,6	4,9	3,1		9,3		5,0		18,5		41,7	
	R60	$F_{Rk,s,fi}$	[kN]	1,2	3,3	2,2		6,3		3,6		12,0		26,9	
	R90	$F_{Rk,s,fi}$	[kN]	0,8	1,8	1,3		3,2		2,2		5,4		12,2	
	R120	$F_{Rk,s,fi}$	[kN]	0,7	1,0	0,8		1,7		1,5		2,4		5,4	
	R30	$M^0_{Rk,s,fi}$	[Nm]	1,4	4,0	3,3		8,2		6,3		19,4		65,6	
	R60	$M^0_{Rk,s,fi}$	[Nm]	1,1	2,7	2,3		5,5		4,6		12,6		42,4	
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,7	1,4	1,4		2,8		2,8		5,7		19,2	
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,6	0,8	0,9		1,5		1,9		2,5		8,5	
Concrete pull-out failure															
Characteristic resistance	R30 R60 R90	$N_{Rk,p,fi}$	[kN]	1,5	1,3	1,5	2,3	1,5	3,0	1,9	4,0	2,3	4,0	3,0	6,3
	R120	$N_{Rk,p,fi}$	[kN]	1,2	1,0	1,2	1,8	1,2	2,4	1,5	3,2	1,8	3,2	2,4	5,0
Edge distance															
	R30 to R120	$c_{cr,N}$	[mm]	$2\ h_{ef}$											
Anchor spacing															
	R30 to R120	$s_{cr,N}$	[mm]	$4\ h_{ef}$											
Concrete pry-out failure															
	R30 to R120	k	[-]	1,5		2				2				2	

Hilti screw anchor HUS

Product performance
For resistance to fire

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C4: Displacement under tension load

Nominal anchor diameter				6			8				10				14	
Type			HUS-	AHI	P	HR	H		HR		H		HR CR		HR	
Nominal anchorage depth		h_{nom}	[mm]	55			60	75	60	80	70	85	70	90	70	110
Cracked concrete C20/25 to C50/60	Tension load	N	[kN]	2,4		1,7	2,4	3,6	2,4	4,8	3,0	4,1	3,6	6,3	4,8	9,9
	Displacement	δ_{N0}	[mm]	0,1		0,4	0,1	0,1	0,5	0,7	0,2	0,3	0,3	0,6	0,9	1,4
		$\delta_{N\infty}$	[mm]	0,6		0,5	0,5	0,4	0,7	1,1	0,3	0,7	0,6	1,1	1,1	1,4
		$\delta_{N,seis}$	[mm]	-		-	-	1,2	-	1,2	-	1,2	-	1,2	-	0,4
Non-cracked concrete C20/25 to C50/60	Tension load	N	[kN]	3,6	3,0	3,1	3,6	4,8	4,8	6,3	4,8	6,8	6,3	9,9	7,5	16,0
	Displacement	δ_{N0}	[mm]	0,2		0,8	0,1	0,2	0,7	1,6	0,2	0,3	0,3	1,3	0,7	1,0
		$\delta_{N\infty}$	[mm]	0,3		0,8	0,5	0,4	0,7	1,6	0,3	0,7	0,3	1,3	0,7	1,0

Table C5: Displacement under shear load

Nominal anchor diameter				6			8				10				14	
Type			HUS-	AHI	P	HR	H		HR		H		HR CR		HR	
Nominal anchorage depth		h_{nom}	[mm]	55			60	75	60	80	70	85	70	90	70	110
Cracked and Non-cracked concrete C20/25 to C50/60	Shear load	V	[kN]	6,0		7,8	6,9	6,9	11,0	12,4	10,3	10,3	13,6	15,7	12,9	27,3
	Displacement	δ_{V0}	[mm]	1,9		0,4	1,5	1,5	2,0	2,3	1,5	1,5	1,1	1,7	3,5	3,9
		$\delta_{V\infty}$	[mm]	2,8		0,5	2,3	2,3	2,4	2,9	2,3	2,3	1,5	2,4	3,9	4,3
		$\delta_{V,seis}$	[mm]	-		-	-	4,8	-	4,8	-	5,3	-	5,3	-	7,6

Hilti screw anchor HUS

Performances
Displacements

Annex C4