

European Technical Approval ETA-08/0307

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung
Trade name

Hilti Betonschraube HUS
Hilti screw anchor HUS

Zulassungsinhaber
Holder of approval

Hilti Aktiengesellschaft
Business Unit Anchors
9494 Schaan
FÜRSTENTUM LIECHTENSTEIN

Zulassungsgegenstand
und Verwendungszweck
*Generic type and use
of construction product*

Betonschraube in den Größen 6, 8, 10 und 14 zur Verankerung
im Beton
Concrete screw of sizes 6, 8, 10 and 14 for use in concrete

Geltungsdauer:
Validity: vom
from
bis
to

21 January 2011
12 December 2013

Herstellwerk
Manufacturing plant

Hilti Werke

Diese Zulassung umfasst
This Approval contains

19 Seiten einschließlich 11 Anhänge
19 pages including 11 annexes

Diese Zulassung ersetzt
This Approval replaces

ETA-08/0307 mit Geltungsdauer vom 30.03.2009 bis 12.12.2013
ETA-08/0307 with validity from 30.03.2009 to 12.12.2013

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998⁴, as amended by law of 31 October 2006⁵;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁶;
 - Guideline for European technical approval of "Metal anchors for use in concrete - Part 3: Undercut anchors", ETAG 001-03.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities L 40, 11 February 1989, p. 12
² Official Journal of the European Communities L 220, 30 August 1993, p. 1
³ Official Journal of the European Union L 284, 31 October 2003, p. 25
⁴ Bundesgesetzblatt Teil I 1998, p. 812
⁵ Bundesgesetzblatt Teil I 2006, p. 2407, 2416
⁶ Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the construction 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) 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.

An illustration of the product and intended use is given in Annexes 1 and 2.

1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences.

The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206:2000-12. It may be anchored in cracked and non-cracked concrete.

The Hilti screw anchor HUS-A, -H, -I, -P made of galvanised carbon steel and HUS-HR made of stainless steel may be used for anchorages with requirements related to resistance to fire.

Hilti screw anchor HUS-A, -H, -I, -P made of galvanised steel:

The anchor made of galvanised steel may only be used in structures subject to dry internal conditions.

Hilti screw anchor HUS-HR made of stainless steel A4:

The anchor made of stainless steel A4 may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such 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).

The provisions made in this European technical approval are based on an assumed working life of the anchor of 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.

2 Characteristics of the product and methods of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and information given in Annexes 2 and 3. The characteristic values, dimensions and tolerances of the anchor not indicated in Annex 2 and 3 shall correspond to the respective values laid down in the technical documentation⁷ of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 200/605/EC.

The characteristic values for the design of the anchorages are given in Annexes 4 to 7.

The characteristic values for the design of anchorages regarding resistance to fire are given in Annexes 8 and 9. They are valid for use in a system that is required to provide a specific fire resistance class.

Each anchor shall be marked with the identifying mark of the producer, the anchor type, the diameter and the length of the anchor according to Annex 1 and 2. Each anchor HUS-A 6 for $h_{nom} = 55$ mm is marked with a circle mark according to Annex 1. Each anchor HUS-I 6 for $h_{nom} = 55$ mm is marked with two circle marks according to Annex 1.

2.2 Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Part 1 "Anchors in general" and Part 3 "Undercut anchors", on the basis of Option 1.

The assessment of the anchor for the intended use in relation to the requirements for resistance to fire has been made in accordance with the Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 96/582/EG of the European Commission⁸ the system 2(i) (referred to as system 1) of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

⁷ The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

⁸ Official Journal of the European Communities L 254 of 08.10.1996.

- (a) Tasks for the manufacturer:
 - (1) factory production control;
 - (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed control plan;
- (b) Tasks for the approved body:
 - (3) initial type-testing of the product;
 - (4) initial inspection of factory and of factory production control;
 - (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.⁹

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

⁹

The control plan is a confidential part of the documentation of the European technical approval, but not published together with the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity.
See section 3.2.2.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the factory production control of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-1 Option 1),
- size.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with the Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to the Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Design of anchorages

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A 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, in cracked or non-cracked concrete, etc.).

The design of anchorages under fire exposure has to consider the conditions given in the Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". The relevant characteristic values are given in Annexes 8 and 9. The design method covers anchors with a fire attack from one side only. If the fire attack is from more than one side, the design method may be taken only, if the edge distance of the anchor is $c \geq 300$ mm.

Local spalling is possible at fire attack. To avoid any influence of the spalling on the anchorage, the concrete member must be designed according to prEN 1992-1-2. The members shall be made of concrete with quartzite additives and have to be protected from direct moisture; and the moisture content of the concrete has to be like in dry internal conditions respectively. The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value in the approval.

4.3 Installation of anchors

The fitness for use of the anchor can only be assumed if the following conditions of installation are met:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site,
- Use of the anchor only as supplied by the manufacturer,
- Anchor installation in accordance with the manufacturer's specifications and drawings,
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply,
- Check of the concrete being well compacted, e.g. without significant voids,
- Edge distances and spacing not less than the specified values without minus tolerances,
- Placing drill holes without damaging the reinforcement,
- 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,
- Cleaning of the hole of drilling dust,
- Anchor installation such that the embedment depth of the anchor in the concrete is not smaller than the value h_{nom} given in Annex 4, Table 3,
- The fixture is fully pressed on the concrete surface without intermediate layers,
- Further turning of the anchor is not possible,
- The head of the anchor is fully supported on the fixture and is not damaged.

5 Indications to the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition, all installation data shall be shown clearly on the packaging and/or on an enclosed instruction sheet, preferably using illustrations.

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The minimum data required are:

- Drill bit diameter,
- Size of the anchor,
- Maximum thickness of the fixture,
- Minimum embedment depth,
- Minimum hole depth,
- Information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- Reference to any special installation equipment needed,
- Identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

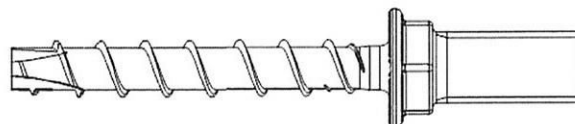
Georg Feistel
Head of Department

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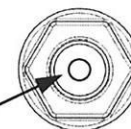
Hilti screw anchor HUS

HUS-A 6

External thread
M8 or M10

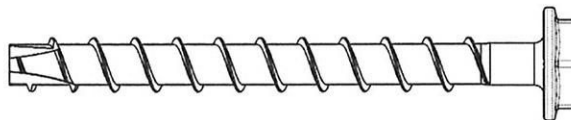


Circle mark with $d = 2,5 \text{ mm}$ for $h_{\text{nom}} = 55 \text{ mm}$



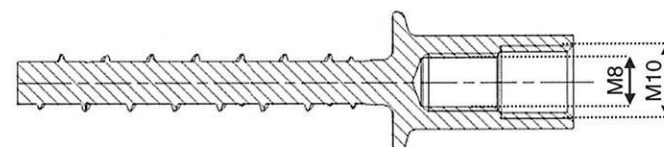
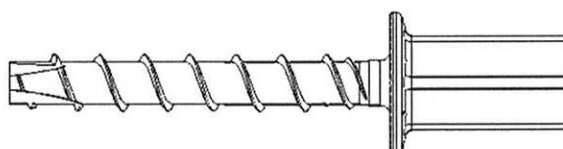
HUS-H 6

Hex head

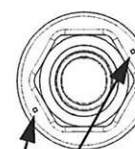


HUS-I 6

Internal threads
M8 and M10

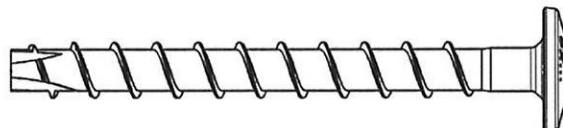


Two circle marks with $d = 0,8 \text{ mm}$ for $h_{\text{nom}} = 55 \text{ mm}$



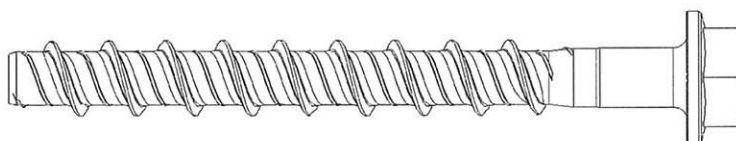
HUS-P 6

Pan head



HUS-H 8

Hex head



HUS-HR 6

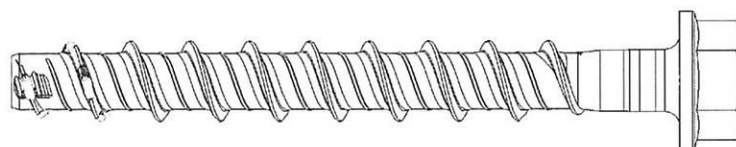
Hex head

HUS-HR 8

HUS-HR 10

HUS-HR 14

Hex head



Hilti screw anchor HUS

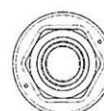
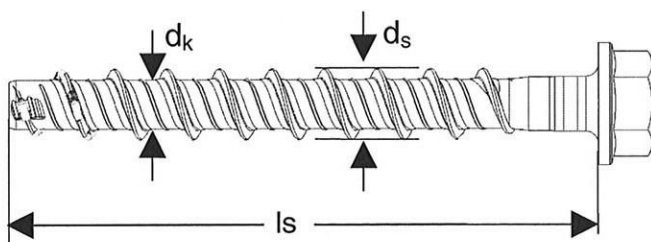
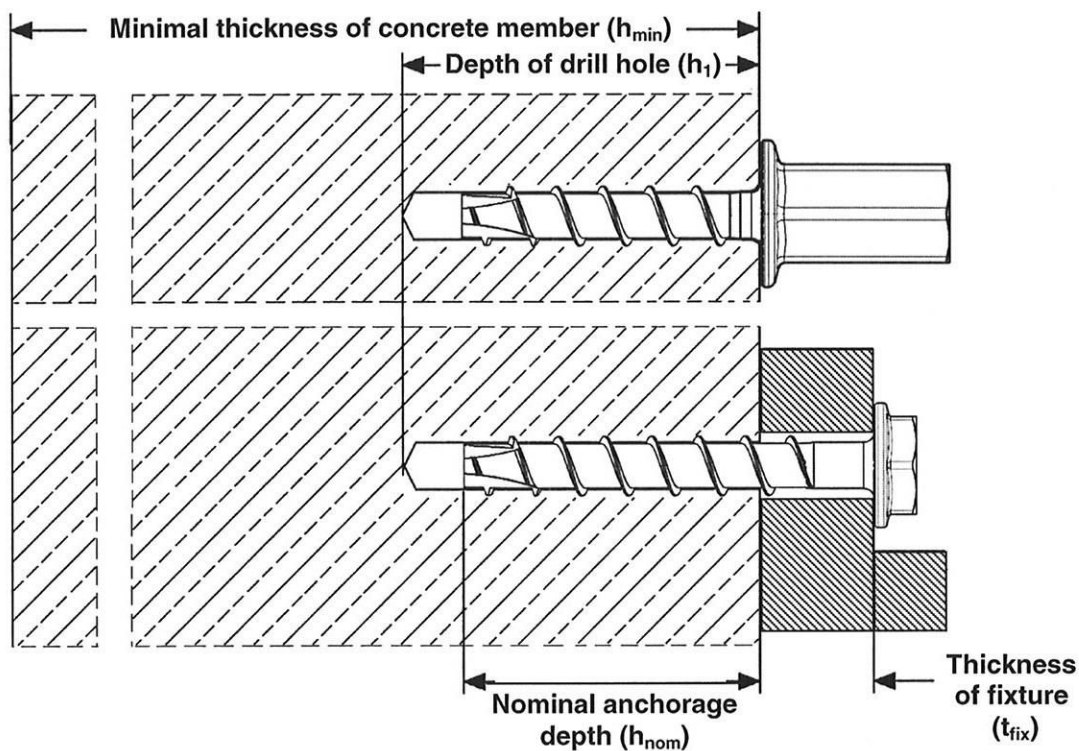
Product

Annex 1

of European
technical approval

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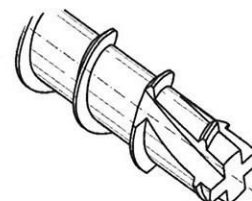
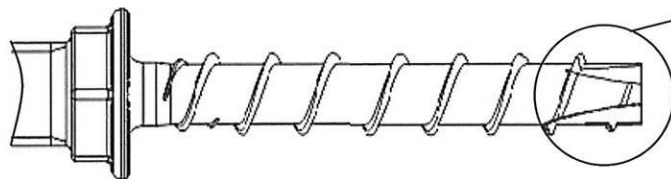
Intended use in concrete



Head stamp:

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

Hilti cutting edges:



HILTI

Hilti cutting edges

HUS

e.g. „H“ resp. circle marks

R

8

...

...Manufacturer

...Hilti Universal Screw anchor, anchor diameter/ drill bit diameter 6 mm

...Hilti Universal Screw anchor

...Head configuration (A, H, I, P)

...Corrosion Resistance (stainless steel, grade A4)

...Nominal anchor diameter/ drill bit diameter (6...14)

...Nominal anchor length (l_s)/ under head length

Type

Hilti screw anchor HUS

Annex 2

Intended use in concrete

of European
technical approval
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Table 1: Materials

Part	Designation	Material
Screw anchor	HUS-A 6 HUS-H 6 HUS-I 6 HUS-P 6 HUS-H 8 HUS-H 10	Carbon Steel, galvanized ($\geq 5 \mu\text{m}$)
	HUS-HR 6 HUS-HR 8 HUS-HR 10 HUS-HR 14	Stainless Steel (A4 grade)

Table 2: Dimensions

Nominal anchor diameter		6					8		10		14
Type	HUS-	A	H	I	P	HR	H	HR	H	HR	HR
Nominal length	l_s [mm]	55	60..120	55	60..80	60..70	65..150	65..105	75..280	75..130	80..135
Outer diameter of thread	d_s [mm]	7,85				7,6	10,1		12,3		16,6
Core diameter	d_k [mm]	5,85				5,4	7,1		8,4		12,6

Hilti screw anchor HUS

Materials and Dimensions

Annex 3

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Table 3: General installation data

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
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			-	T30	-	T30	-	-				-				-	
Installation torque	T_{inst}	[Nm]	25					- ¹⁾	35	45	- ¹⁾	- ¹⁾	45	55	45	65	35
Setting tool			Impact screw driver, e.g. Hilti SIW 144-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														
Thickness of fixture	$t_{fix} \leq$	[mm]	-	65	-	25	15	90	75	45	25	210	195	60	40	65	25

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.

Table 4: Design method A - Minimum thickness of concrete member, minimum spacing and minimum edge distances

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	
Cracked concrete	Minimum member thickness	h_{min}	[mm]	100					110	120	100	120	110	130	120	140	140	160	
	Minimum edge distance	c_{min}	[mm]	35					50		45	50	50		50		50	60	
	Minimum spacing	s_{min}	[mm]	35					40										
Non-cracked concrete	Minimum member thickness	h_{min}	[mm]	100					110	120	100	120	130	130	120	140	140	160	
	Minimum edge distance	c_{min}	[mm]	35					55		45	50	65		50		50	60	
	Minimum spacing	s_{min}	[mm]																

Hilti screw anchor HUS

Installation data
and
Minimum thickness of concrete, minimum
spacing and edge distances of anchors

Annex 4

of European
technical approval
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Table 5: Design method A
Characteristic resistance for tension loads

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															
Characteristic resistance	$N_{Rk,s}$	[kN]	25		24	37,1		34,0		55,4		52,6		102,2	
Partial safety factor	$\gamma_{Ms}^{1)}$	[kN]	1,5		1,4	1,4				1,4				1,4	
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	- ⁴⁾	- ⁴⁾
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 failure and splitting failure															
Effective anchorage depth	h_{ef}	[mm]	42		45	47	60	47	64	54	67	54	71	52	86
Characteristic spacing	$s_{cr,N}$	[mm]	3 h_{ef}			3 h_{ef}				3 h_{ef}				3 h_{ef}	
	$s_{cr,sp}$	[mm]	3 h_{ef}			3 h_{ef}				3 h_{ef}		3,6 h_{ef}		3,6 h_{ef}	
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}			1,5 h_{ef}				1,5 h_{ef}				1,5 h_{ef}	
	$c_{cr,sp}$	[mm]	1,5 $h_{ef}^{5)}$		1,5 h_{ef}	1,5 h_{ef}				1,5 h_{ef}		1,8 h_{ef}		1,8 h_{ef}	
Partial safety factor	$\gamma_{Mc} = \gamma_{Mp}^{1)}$		1,8 ²⁾		2,1 ³⁾	1,8 ²⁾				1,8 ²⁾	2,1 ³⁾	1,8 ²⁾		1,8 ²⁾	

¹⁾ In absence of other national regulations.

²⁾ The installation factor $\gamma_2 = 1,2$ is included.

³⁾ The installation factor $\gamma_2 = 1,4$ is included.

⁴⁾ Pull out is not decisive

⁵⁾ To give proof of splitting failure due to loading according to ETAG 001, Annex C, replace $N_{Rk,c}^0$ in equation 5.3 by $N_{Rk,p}$

Hilti screw anchor HUS

Design method A
Characteristic resistance for tension loads

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Table 6: Design method A
Characteristic resistance for shear loads

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 without lever arm																				
Characteristic resistance	$V_{Rk,s}$	[kN]					12,5		17		15,9		26		23,8		33		55	77
Steel failure with lever arm																				
Characteristic resistance	$M^0_{Rk,s}$	[Nm]					21		19		39		36		70		66		193	
Partial safety factor	γ_{Ms}	¹⁾					1,5		1,5				1,5				1,5			
Concrete pry-out failure																				
Factor in Eq. (5.6) of ETAG 001, Annex C, section 5.2.3.3	k	1,5					2				2				2					
Concrete edge failure																				
Effective length of anchor in shear loading	l_f	[mm]					42		45		47	60	47	64	54	67	54	71	52	86
Effective diameter of anchor	d_{nom}	[mm]					6		8				10				14			
Partial safety factor	$\gamma_{Mc} = \gamma_{Mcp}$	¹⁾					1,5 ²⁾		1,5 ²⁾				1,5 ²⁾				1,5 ²⁾			

¹⁾ In absence of other national regulations.

²⁾ The installation factor $\gamma_2 = 1,0$ is included.

Remark for design in shear

In general, the conditions given in ETAG 001, Annex C, section 4.2.2.1 a) and 4.2.2.2 b) are not fulfilled because the diameter of the clearance hole in the fixture acc. to Annex 3, Table 3 is greater than the values given in Annex C, Table 4.1 for the corresponding diameter of the anchor. For anchor groups with $n = 2 \dots 8$, the characteristic resistance $V_{Rk,s}$ should be limited to max. $2 V_{Rk,s}$.

Hilti screw anchor HUS

Design method A
Characteristic resistance for shear loads

Annex 6

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Table 7: Displacements under tension loads

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
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	
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 8: Displacements under shear loads

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	
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

Hilti screw anchor HUS

**Displacement under tension
and shear loads**

Annex 7

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Table 9: Characteristic tension resistance in cracked and non-cracked concrete C20/25 to C50/60 under fire exposure

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																		
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,6	4,9	3,1		9,3		5,0		18,5		41,7				
	R60	$N_{Rk,s,fi}$	[kN]	1,2	3,3	2,2		6,3		3,6		12,0		26,9				
	R90	$N_{Rk,s,fi}$	[kN]	0,8	1,8	1,3		3,2		2,2		5,4		12,2				
	R120	$N_{Rk,s,fi}$	[kN]	0,7	1,0	0,8		1,7		1,5		2,4		5,4				
Concrete Pullout 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	$c_{cr,N}$	[mm]	2 h_{ef}														
	R60 R90 R120	c_{min}	[mm]	Fire attack from one side : $c_{min} = 2 h_{ef}$ Fire attack from more then one side: $c_{min} \geq 300$ mm														
Anchor spacing	R30	$s_{cr,N}$	[mm]	4 h_{ef}														
	R60 R90 R120	s_{min}	[mm]	35		55		45	50	50				50		60		

In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

Hilti screw anchor HUS

Annex 8

**Characteristic values of tension load resistance
under fire exposure**

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Table 10: Characteristic shear resistance in cracked and non-cracked concrete C20/25 to C50/60 under fire exposure

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 without leaver arm																
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	4,9	3,1		9,3		5,0		18,5		41,7		
	R60	$V_{Rk,s,fi}$	[kN]	1,2	3,3	2,2		6,3		3,6		12,0		26,9		
	R90	$V_{Rk,s,fi}$	[kN]	0,8	1,8	1,3		3,2		2,2		5,4		12,2		
	R120	$V_{Rk,s,fi}$	[kN]	0,7	1,0	0,8		1,7		1,5		2,4		5,4		
Steel failure with leaver arm																
Characteristic resistance	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 pry-out failure																
factor in eq. (5.6) of ETAG 001 Annex C, 5.2.3.3	R30 R60 R90 R120	k		1,5		2										
Concrete edge failure																
Characteristic resistance in C20/25 to C50/60 under fire exposure	R30 R60 R90	$V^0_{Rk,c,fi}$	[kN]	0,25 x $V^0_{Rk,c}$												
	R120	$V^0_{Rk,c,fi}$	[kN]	0,20 x $V^0_{Rk,c}$												
With $V^0_{Rk,c}$ as initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.																

In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1,0$ is recommended.

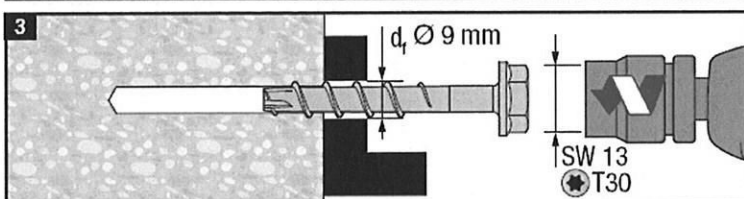
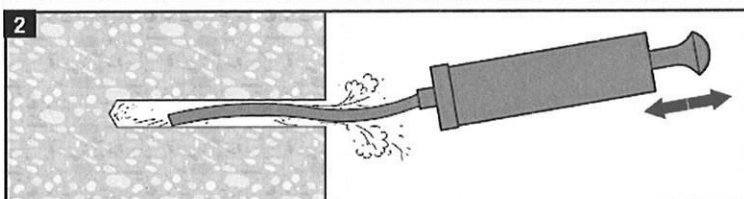
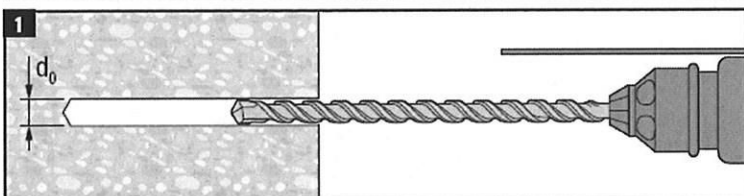
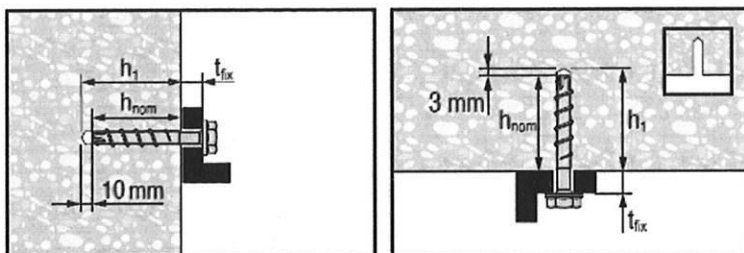
Hilti screw anchor HUS

Characteristic values of shear load resistance under fire exposure

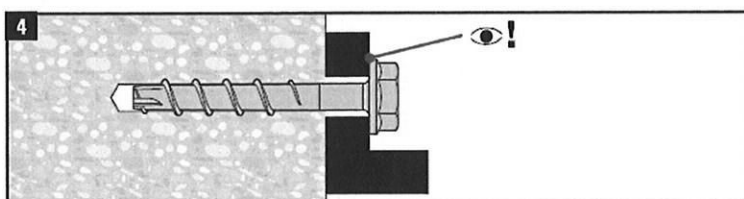
Annex 9

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Setting instruction for HUS-H 6, HUS-P 6, HUS-A 6, HUS-I 6 and HUS-HR 6



Nominal anchor diameter	6				
Type	A	H	I	P	HR
h _{nom} [mm]	55				
T _{inst} [Nm]	25				- ¹⁾
Setting tool	Electrical impact screw driver, e.g. Hilti SIW 144-A.				
d ₀ [mm]	6				
d ₁ [mm]	9				
Wrench size [mm]	13	13	13	-	13
Torx	-	T30	-	T30	-



Installation with other electrical impact screw drivers of equivalent force and performance is possible.

¹⁾ Hand setting of HUS-HR in concrete base material not allowed (machine setting only)

Hilti recommended electrical impact screw drivers are listed in the instruction for use included in the sales box.

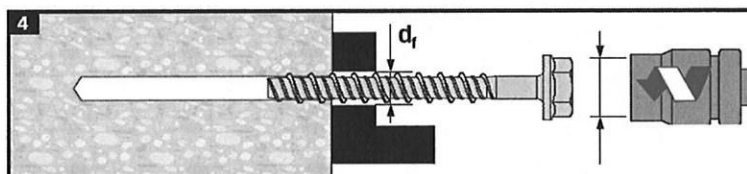
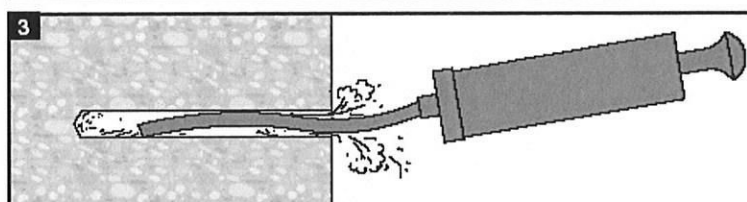
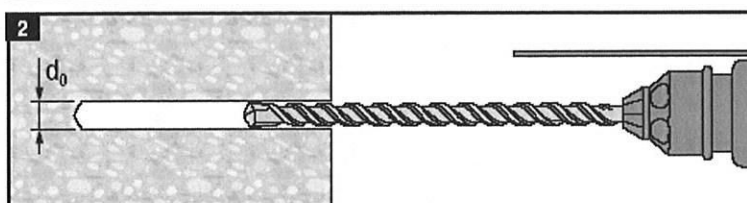
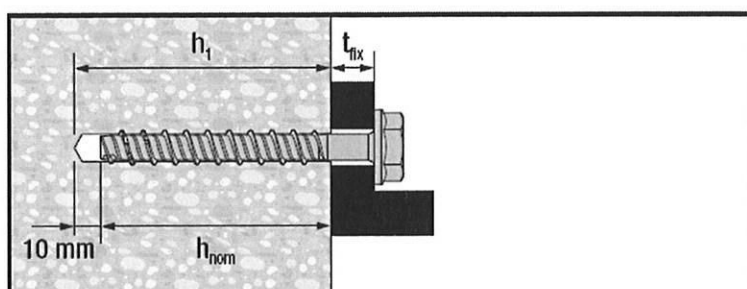
Hilti screw anchor HUS

Setting instruction for
HUS-H 6, HUS-P 6, HUS-A 6, HUS-I 6
and HUS-HR 6

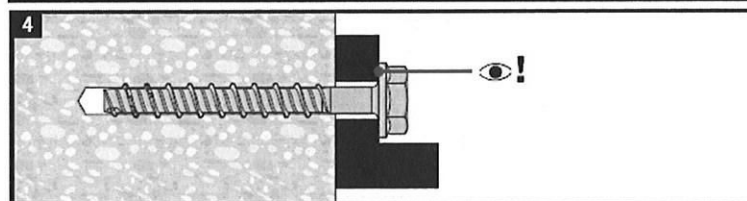
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Setting instruction for HUS-H 8 - 10 and HUS-HR 8 - 14



Nominal anchor diameter	8				10				14	
	H		HR		H		HR		HR	
h_{nom} [mm]	60	75	60	80	70	85	70	90	70	110
T_{inst} [Nm]	35	45	-1)	-1)	45	55	45		65	
Setting tool	Electrical impact screw driver, e.g. Hilti SIW 22T-A.									
d_0 [mm]	8				10				14	
d_1 [mm]	12				14				18	
Wrench size [mm]	13				15				21	



Installation with other electrical impact screw drivers of equivalent force and performance is possible.

1) Hand setting of HUS-HR in concrete base material not allowed (machine setting only)

Hilti recommended electrical impact screw drivers are listed in the instruction for use included in the sales box.

Hilti screw anchor HUS

**Setting instruction for
HUS-H 8 - 10 and HUS-HR 8 - 14**

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