工程名稱

HILTI HVU2 化學錨栓
工程品質管理與施工計畫書

材料廠商：喜利得股份有限公司
承攬廠商：

中　華　民　國　110　年　2　月

目　　錄

工程施工說明

一、 說明

本工程之施工要點乃在原有結構之混凝土上鑽孔，注入化學粘著藥劑並旋入螺桿，以達到原有結構混凝土與固定物結合成一體之目的。

二、 材料

I. 化學藥劑：

a. 本工程之化學藥劑採用 HILTI HVU 2之化學藥劑包。該藥劑為速凝型材料，安裝完成後之固化時間詳產品型錄 。

b. 本工程使用之化學藥劑包,其藥劑之主劑及硬化劑安裝於同一包裝內，經螺桿之攪拌而混合。

c. HILTI HVU 2化學藥劑附國際認證報告認證書編號ETA-16/0515與ETA-18/0185，其測試程序及評定標準依照ETAG 001之標準，認證符合應用於開裂混凝土基材。

d. 本化學藥劑按照製造廠商之儲存方式保管,現場放置於陰涼處所以避免陽光直接照射。

三、 施工步驟

II. 鑽孔：

a. 鑽孔按照設定之位置，使用電鎚鑽，連續鑽孔以達到規定。

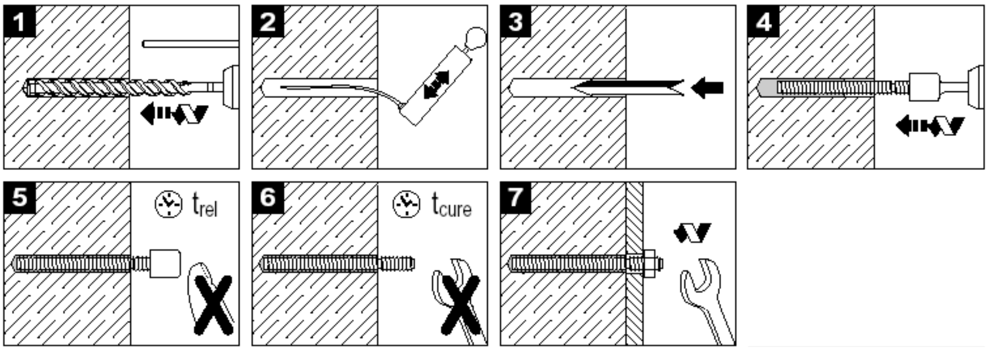
b. 施工時於鑽孔過程中，如遇鋼筋及未達設計孔深而遇到既有鋼筋時，則此鑽孔予以廢棄不用，另行鑽孔，而廢孔以無收縮水泥砂漿填實。

c. 鑽孔完畢後用吹氣筒或其他空壓設備將孔內灰屑吹出。

III. 化錨安裝：

IV. 藥劑包塞入孔內，利用電動螺絲起子或是鎚擊式電鑽以適當之轉速將螺桿旋轉插入孔內至底部，且可目視藥劑外溢，施作過程須注意插入速度不可過快，以確保完全混合。

V. 螺桿施作完成後固化時間以內，避免碰觸或矯正而影響強度。待硬化完成後即可進行負載或施工，安裝示意圖如下所示：



安裝基材溫度℃	固化時間
-10至-6	5小時
-5至-1	3小時
0至4	40分鐘
5至9	20分鐘
10至19	10分鐘
20至40	5分鐘

四、 附件說明

1. HILTI HVU2 國際認證報告
   - EOTA ETA-16/0515
   - EOTA ETA-18/0185
2. HILTI HVU2 原廠型錄及技術資料FTM
3. 材料廠商公司資料

附件一 HILTI HVU 國際認證報告

通過 ETAG 001允收標準報告：
ETA-16/0515（M8~M20）
ETA-18/0185（M24~M27）

Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

European Technical Assessment ETA-16/0515 of 13 November 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	HVU2
Product family to which the construction product belongs	Bonded Fastener for use in concrete
Manufacturer	Hilti AG Liechtenstein Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Corporation
This European Technical Assessment contains	27 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 330499-01-0601
This version replaces	ETA-16/0515 issued on 17 June 2019

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Specific Part

1 Technical description of the product

The HVU2 is a bonded anchor consisting of a mortar capsule Hilti HVU2 and a steel element. The steel element consist of

- an anchor rod Hilti HAS-U or Hilti HAS-(E) with washer and hexagon nut of sizes M8 to M30 or
- an internally threaded sleeve HIS-(R)N of sizes M8 to M20.

The mortar capsule is placed in the hole and the steel element is driven by machine as specified in Annex B9.

The anchor rod is anchored via the bond between steel element, chemical mortar and concrete.

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 resistance for static and quasi-static tension load	See Annex C1 to C5
Characteristic resistance for static and quasi-static shear load	See Annex C6 to C8
Displacements for static and quasi-static loads	See Annex C9
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C10 and C11
Durability	See Annex B2

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	**Performance**
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with EAD 330499-01-0601 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.

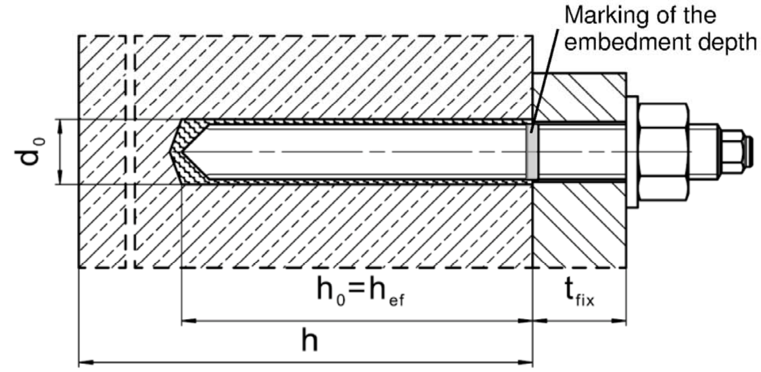
Issued in Berlin on 13 November 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
G. Lange

Installed condition

Figure A1:
HAS-U… and HAS-(E)…



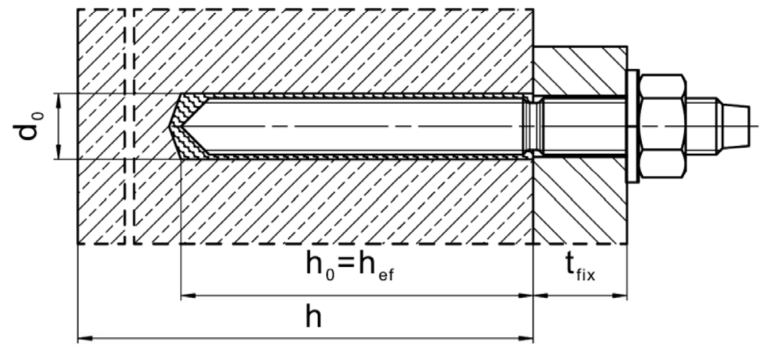
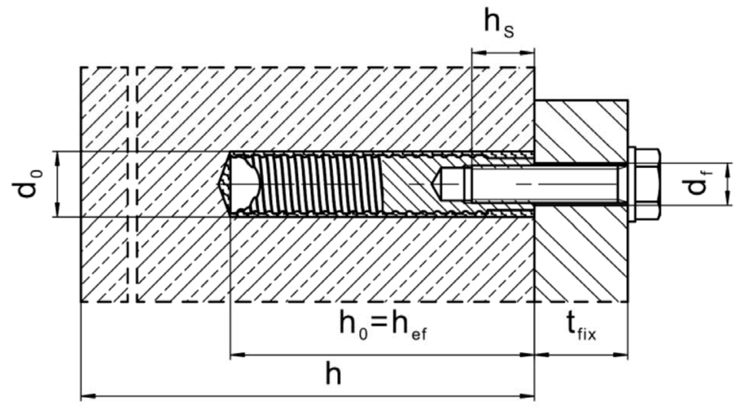


Figure A2:
Internally threaded sleeve HIS-(R)N



HVU2	
Product description Installed condition	**Annex A1**

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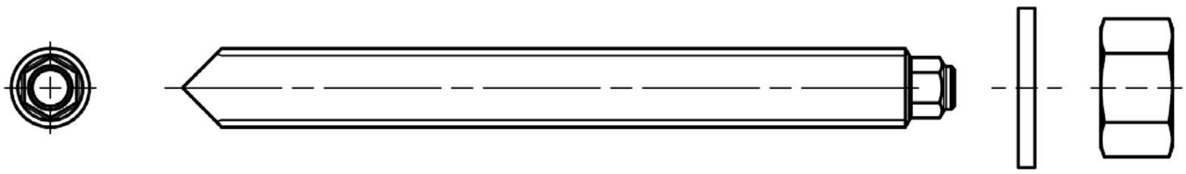
Product description: Mortar capsule and steel elements

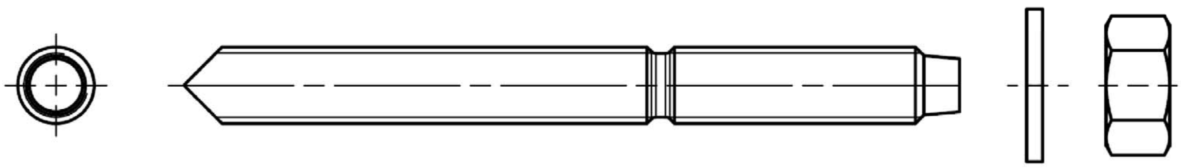
Adhesive anchor capsule HVU2 M8 to M30: resin and hardener with aggregate

Marking:
HVU2 M …
Expiry date mm/yyyy

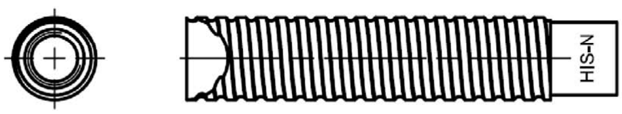
Steel elements



HAS-U…: M8 to M30 washer nut



HAS-(E)…: M8 to M30 washer nut



Internally threaded sleeve HIS-(R)N: M8 to M20
Dimensions according to Annex B4.

HVU2	
Product description Adhesive anchor capsule / Steel elements	**Annex A2**

Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
HAS-(E)-(F)	M8 to M16: Strength class 5.8, f_{uk} = 570 N/mm², f_{yk} = 456 N/mm². M20 and M24: Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm². Elongation at fracture (l_0=5d) > 8% ductile. M8 to M30: Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm². Elongation at fracture (l_0=5d) > 12% ductile . Electroplated zinc coated ≥ 5 μm, (F) hot dip galvanized ≥ 45 μm.
HAS-U (HDG)	M8 to M24: Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm². Elongation at fracture (l_0=5d) > 8% ductile. M8 to M30: Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm². Elongation at fracture (l_0=5d) > 12% ductile. Electroplated zinc coated ≥ 5 μm, (HDG) hot dip galvanized ≥ 45 μm.
Internally threaded sleeve HIS-N	Electroplated zinc coated ≥ 5 μm.
Washer	Electroplated zinc coated ≥ 5 μm, hot dip galvanized ≥ 45 μm.
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5 μm, hot dip galvanized ≥ 45 μm.
Metal parts made of stainless steel corrosion resistance classes III according EN 1993-1-4:2006+A1:2015-06	
HAS-(E)-R	M8 to M16: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 500 N/mm². M20 and M24: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm². M27 and M30: Strength class 50, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm². Elongation at fracture (l_0=5d) > 8% ductile.
HAS-U A4	M8 to M24: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm². M27 and M30: Strength class 50, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm². Elongation at fracture (l_0=5d) > 8% ductile.
Internally threaded sleeve HIS-RN	Stainless steel 1.4401, 1.4571 EN 10088-1:2014.
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Nut	M8 to M24: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm². M27 and M30: Strength class 50, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm². Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Metal parts made of high corrosion resistant steel corrosion resistance classes V according EN 1993-1-4:2006+A1:2015-06	
HAS-(E)-HCR HAS-U HCR	M8 to M20: f_{uk} = 800 N/mm², f_{yk} = 640 N/mm². M24: f_{uk} = 700 N/mm², f_{yk} = 400 N/mm². Elongation at fracture (l_0=5d) > 8% ductile.
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	M8 to M20: f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², M24: f_{uk} = 700 N/mm², f_{yk} = 400 N/mm², High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

HVU2

Product description
Materials

Annex A3

Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.
- Seismic performance category C1: HAS-U… and HAS-(E)… size M10 to M30.
- Seismic performance category C2: HAS-U… and HAS-(E)… size M16 and M20.

Base material:

- 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 206:2013 + A1:2016.
- Cracked and uncracked concrete.

Temperature in the base material:

- **At installation**
  -10 °C to +40 °C
  For the standard variation of temperature and rapid variation of temperature after installation.
- **In-service**
  Temperature range I: -40 °C to +40 °C
  (max. long term temperature +24 °C and max. short term temperature +40 °C)
  Temperature range II: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short term temperature +80 °C)
  Temperature range III: -40 °C to +120 °C
  (max. long term temperature +72 °C and max. short term temperature +120 °C)

Table B1: Specifications of intended use

	Foil capsule HVU2 with …	
Elements	HAS-U…, HAS-(E)…	HIS-(R)N
Hammer drilling with hollow drill bit TE-CD or TE-YD	M10 to M30	M8 to M20
Hammer drilling	M8 to M30	M8 to M20
Diamond coring	M10 to M30	M8 to M20

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according EN 1993-1-4:2006+A1:2015-06 corresponding to corrosion resistance classes Table A1 Annex A4 (stainless steels).

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.).
- The anchorages are designed in accordance with:
  EN 1992-4:2018 and EOTA Technical Report TR 055.

Installation:

- Use category: dry or wet concrete (not in flooded holes) for all drilling techniques.
- Drilling technique:
  - Hammer drilling
  - Hammer drilling with hollow drill bit TE-CD, TE-YD
  - Diamond coring (e.g. Hilti DD 30-W or other Hilti DD machines).
- Installation direction:
  D2: downward and horizontal installation for HVU2 M8 to M30.
  D3: downward and horizontal and upward (e.g. overhead) installation for HVU2 M8 to M24.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

HVU2	Annex B2
Intended Use Specifications	

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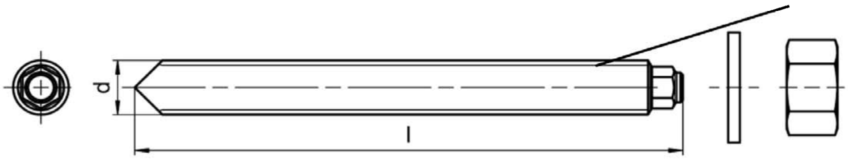
Table B2: Installation parameters of HAS-U… and HAS-(E)…

HAS-U… and HAS-(E)…			M8	M10	M12	M16	M20	M24	M27	M30
Foil capsule HVU2 M…	h_{ef1}	[mm]	**8x80**	**10x90**	**12x110**	**16x125**	**20x170**	**24x210**	**27x240**	**30x270**
	h_{ef2}	[mm]	**-**	**10x135**	**12x165**	**16x190**	**-**	**-**	**-**	**-**
Diameter of fastener	$d = d_{nom}$	[mm]	8	10	12	16	20	24	27	30
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	22	28	30	35
Effective embedment depth and drill hole depth	$h_{ef1} = h_{0,1}$	[mm]	80	90	110	125	170	210	240	270
	$h_{ef2} = h_{0,2}$	[mm]	-	135	165	190	-	-	-	-
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	30	33
Minimum thickness of concrete member	h_{min1}	[mm]	110	120	140	160	220	270	300	340
	h_{min2}	[mm]	-	165	195	230	-	-	-	-
Maximum torque moment	T_{max}	[Nm]	10	20	40	80	150	200	270	300
Minimum spacing	s_{min}	[mm]	40	50	60	75	90	115	120	140
Minimum edge distance	c_{min}	[mm]	40	45	45	50	55	60	75	80

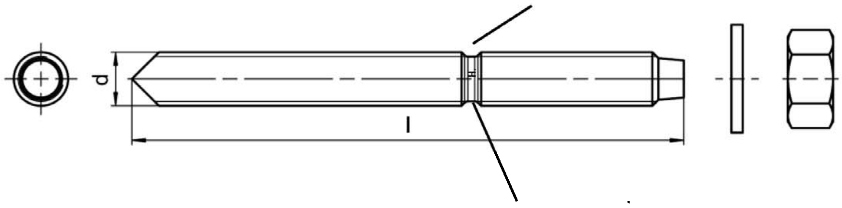
HAS-U…



Marking:
Steel grade number and length identification letter: e.g. 8L

HAS-(E)…

Embedment depth marking



Marking:
identifying mark - H, embossing “1” HAS-(E)
identifying mark - H, embossing “=” HAS-(E)R
identifying mark - H, embossing “CR” HAS-(E)HCR

HVU2	**Annex B3**
Intended Use Installation parameters	

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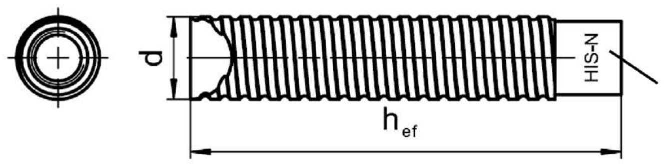
Table B3: Installation parameters of internally threaded sleeve HIS-(R)N

Internally threaded sleeve HIS-(R)N			**M8**	**M10**	**M12**	**M16**	**M20**
Foil capsule HVU2 M…			**10x90**	**12x110**	**16x125**	**20x170**	**24x210**
Outer diameter of sleeve	$d = d_{nom}$	[mm]	12,5	16,5	20,5	25,4	27,8
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	90	110	125	170	205
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22
Minimum thickness of concrete member	h_{min}	[mm]	120	150	170	230	270
Maximum torque moment	T_{max}	[Nm]	10	20	40	80	150
Thread engagement length min-max	h_s	[mm]	8-20	10-25	12-30	16-40	20-50
Minimum spacing	s_{min}	[mm]	60	75	90	115	130
Minimum edge distance	c_{min}	[mm]	40	45	55	65	90

Internally threaded sleeve HIS-(R)N…



Marking:
Identifying mark - HILTI and
embossing “HIS-N” (for zinc coated steel)
embossing “HIS-RN” (for stainless steel)

Table B4: Minimum curing time

Temperature in the base material T	**Minimum curing time t_{cure}**
-10 °C to -6 °C	5 hours
-5 °C to -1 °C	3 hours
0 °C to 4 °C	40 min
5 °C to 9 °C	20 min
10 °C to 19 °C	10 min
20 °C to 40 °C	5 min

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HVU2

Intended Use
Installation parameters
Minimum curing time

Annex B4

Table B5: Parameters of drilling and cleaning tools

Elements		Drill and clean			
HAS-U… HAS-(E)…	HIS-(R)N	Hammer drilling		Diamond coring	Brush
			Hollow drill bit TE-CD, TE-YD		
					
Size	Name	d_0 [mm]	d_0 [mm]	d_0 [mm]	HIT-RB
M8	-	10	-	-	-
M10	-	12	12	12	12
M12	M8	14	14	14	14
M16	M10	18	18	18	18
M20	M12	22	22	22	22
M24	M16	28	28	28	28
M27	-	30	-	30	30
-	M20	32	32	32	32
M30	-	35	35	35	35

Cleaning alternatives

Manual Cleaning (MC):
Hilti hand pump for blowing out drill holes with diameters $d_0 \le 18$ mm and drill hole depths $h_0 \le 10$ d.

Compressed Air Cleaning (CAC):
Air nozzle with an orifice opening of minimum 3,5 mm in diameter.

Automatic Cleaning (AC):
Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.

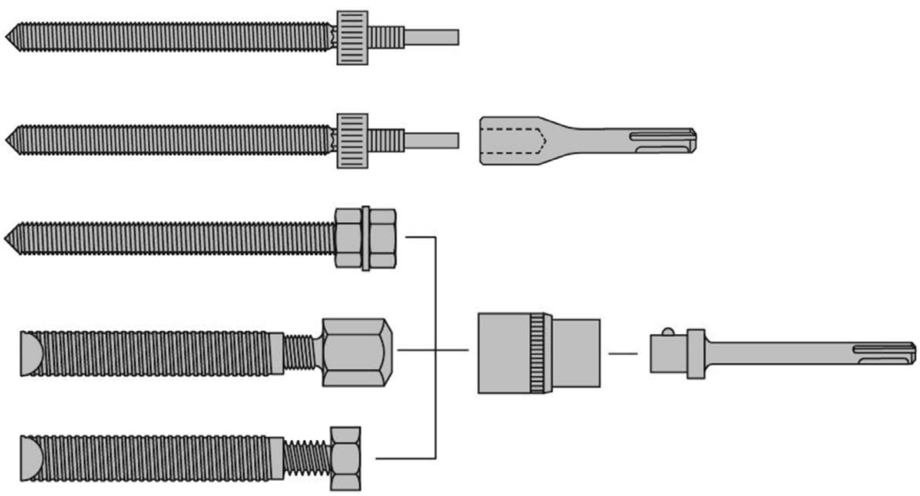
HVU2

Intended Use
Cleaning tools

Annex B5

Table B6: Parameters of setting tools HAS-U…, HAS-(E)… and HIS-(R)N

HAS	HIS-N	HVU2	TE(A)	SID 4-A22	SIW 22T-A	SF(H)	RPM
M8	-	M8x80	1…7	+	+	2, 6, 8, 10, 14, 22	450…1300
M10	M8	M10x90	1…7	+	+	6, 8, 10, 14, 22	450…1300
M10	-	M10x135	1…40	-	-	6, 8, 10, 14, 22	450…1300
M12	M10	M12x110	1…40	+	+	6, 8, 10, 14, 22	450…1300
M12	-	M12x165	1…40	-	-	6, 8, 10, 14, 22	450…1300
M16	M12	M16x125	1…40	+	-	6, 8, 10, 14, 22	450…1300
M16	-	M16x190	50…80	-	-	-	-
M20	-	M20x170	50…60	-	-	-	-
-	M16	M20x170	40…80	-	-	-	-
M24	-	M24x210	50…80	-	-	-	-
-	M20	M24x210	40…80	-	-	-	-
M27	-	M27x240	60…80	-	-	-	-
M30	-	M30x270	60…80	-	-	-	-



Setting tool		Article number	TE (A) 1…40	TE 50…80	SF (H)	SID 4-A22	HIS-S
-		-	-	-	+	-	-
TE-C HVU2		# 2181356	+	-	-	-	-
TE-Y HVU2		# 2230162…5	-	+	-	-	-
TE-C ½“		# 32220	+	-	-	-	+
TE-Y ¾“		# 32221	-	+	-	-	+
SI-SA ¼“- ½“		# 2077174	-	-	+	+	+
SI-SA 7/16“		# 2134075	-	-	+	-	+

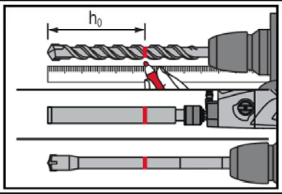
HVU2

Intended Use
Setting tools

Annex B6

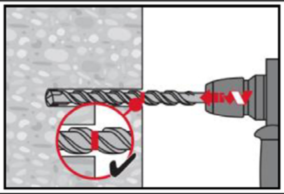
Installation instruction

Hole drilling



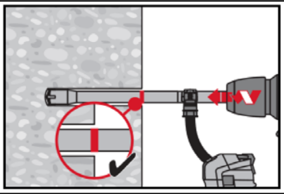
Mark required drilling depth h_0 on drill bit or core bit

a) Hammer drilling: For dry or wet concrete.



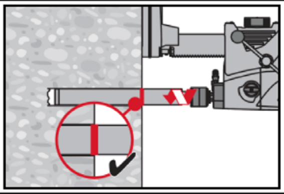
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

b) Hammer drilling with Hilti hollow drill bit: For dry or wet concrete.



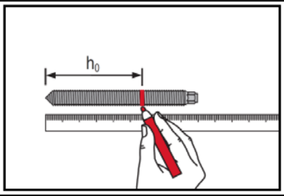
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit attached to Hilti vacuum cleaner. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user's manual. After drilling is completed, proceed to the "setting the element" step in the installation instruction.

c) Diamond coring: For dry or wet concrete.

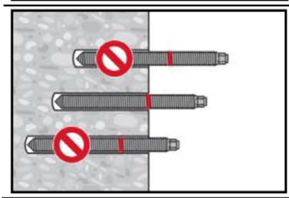


Diamond coring is permissible when suitable diamond core drilling machines and the corresponding core bits are used.

Check setting depth



Mark required setting depth on fastener (see table B2).



Check the setting depth with the marked element.
The element has to fit in the hole until the required embedment depth, not deeper.
If it is not possible to insert the element to the required embedment depth, drill deeper.

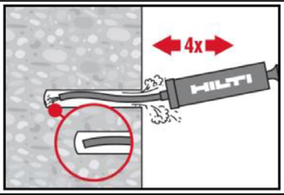
HVU2

Intended Use
Installation instructions

Annex B7

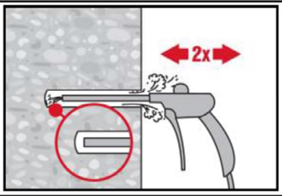
Drill hole cleaning: Just before setting an anchor, the drill hole must be free of dust and debris. Inadequate hole cleaning = poor load values.

Manual Cleaning (MC): For drill hole diameters $d_0 \leq 18$ mm and drill hole depths $h_0 \leq 10$ d.



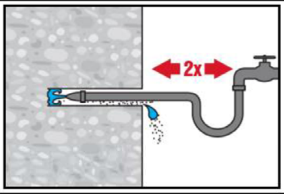
The Hilti hand pump may be used for blowing out drill holes.
Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust.

Compressed Air Cleaning (CAC): For all drill hole diameters d_0 and all drill hole depths h_0.

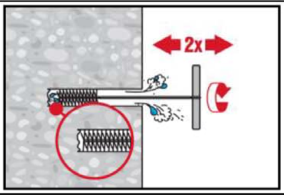


Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.

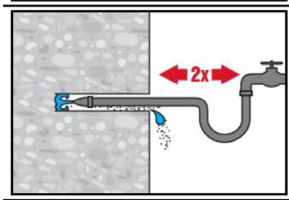
Cleaning of hammer drilled flooded holes and diamond cored holes:
For all drill hole diameters d_0 and all drill hole depths h_0.



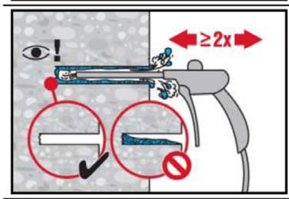
Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



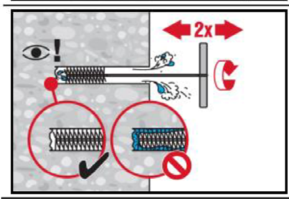
Brush 2 times with the specified brush (see table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not, the brush is too small and must be replaced with the proper brush diameter.



Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust and water.



Brush 2 times with the specified brush (see Table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not, the brush is too small and must be replaced with the proper brush diameter.

HVU2

Intended Use
Installation instructions

Annex B8

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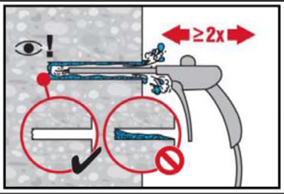
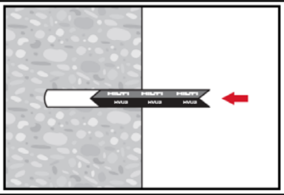
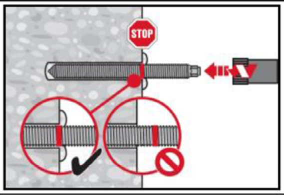
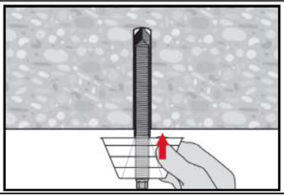
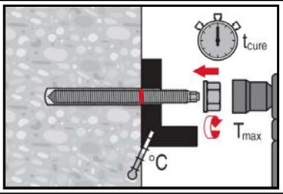
	Blow again with compressed air 2 times until return air stream is free of noticeable dust and water.
Setting the element	
	Insert the foil capsule with the peak ahead to the back of the hole.
	Drive the anchor rod with the plugged tool into the hole, applying moderate pressure. Rotary hammer tool in rotation hammer mode (450 RPM to maximum 1300 RPM). Setting tool see Annexes B6. After reaching the embedment depth switch off setting machine immediately.
	Overhead installation for HVU2 M8 to M24. For overhead installation use the overhead dripping cup HIT-OHC.
	Loading the anchor: After required curing time t_{cure} (see Table B4) the anchor can be loaded. The applied installation torque shall not exceed the values T_{max} given in Table B2 and B3.

HVU2	**Annex B9**
Intended Use Installation instructions	

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Table C1: Essential characteristics for HAS-U… and HAS-(E) under tension load in concrete

HAS-U… and HAS-(E)…			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Installation safety factor										
Hammer drilling and Hilti hollow drill bit TE-CD or TE-YD	γ_{inst}	[-]	1,0							
Diamond coring	γ_{inst}	[-]	-	1,0						
Steel failure HAS-(E)…										
Characteristic resistance HAS-(E) 5.8	$N_{Rk,s}$	[kN]	18,9	30,1	43,4	82,2	112,2	160,2	-	
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,50						-	
Characteristic resistance HAS-(E) 8.8	$N_{Rk,s}$	[kN]	26,5	42,2	61,0	115,4	179,5	256,4	347	421,5
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,50							
Characteristic resistance HAS-R	$N_{Rk,s}$	[kN]	23,2	37,0	53,3	100,9	157,0	224,3	216,9	263,4
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,68				1,87		2,86	
Characteristic resistance HAS-HCR	$N_{Rk,s}$	[kN]	26,5	42,2	61,0	115,4	179,5	224,3	-	
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,50					2,10	-	
Steel failure HAS-U…										
Characteristic resistance HAS-U…	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$							
Partial factor HAS-U 5.8	$\gamma_{Ms,N}$ 1)	[-]	1,50						-	
Partial factor HAS-U 8.8	$\gamma_{Ms,N}$ 1)	[-]	1,50							
Partial factor HAS-U A4	$\gamma_{Ms,N}$ 1)	[-]	1,87						2,86	
Partial factor HAS-U HCR	$\gamma_{Ms,N}$ 1)	[-]	1,50					2,10	-	

HVU2	**Annex C1**
Performances Essential characteristics under tension loads in concrete	

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Table C1: continued

HAS-U… and HAS-(E)...			M8	M10	M12	M16	M20	M24	M27	M30
Combined pullout and concrete cone failure										
Effective embedment depth	h_{ef1}	[mm]	80	90	110	125	170	210	240	270
	h_{ef2}	[mm]	-	135	165	190	-	-	-	-
Characteristic bond resistance in uncracked concrete C20/25 in **hammer drilled holes**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	12,0	16,0						
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,5	13,0						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	6,0	7,5						
Characteristic bond resistance in uncracked concrete C20/25 in **hammer drilled holes with hollow drill bit TE-CD or TE-YD**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	16,0						
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	13,0						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	7,5						
Characteristic bond resistance in uncracked concrete C20/25 in **diamond cored holes**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	14,0						
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	12,0						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	-	6,5						
Characteristic bond resistance in cracked concrete C20/25 in **hammer drilled holes**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	5,0	8,5						
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	4,0	6,5						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	2,5	4,0						
Characteristic bond resistance in cracked concrete C20/25 in **hammer drilled holes with hollow drill bit TE-CD or TE-YD**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	-	8,5						
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	-	6,5						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	-	4,0						
Characteristic bond resistance in cracked concrete C20/25 in **diamond cored holes**										
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	-	7,0						
Temperature range II:50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	-	6,0						
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	-	3,5						

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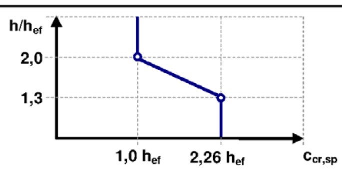
Table C1: continued

HAS-U… and HAS-(E)…			M8	M10	M12	M16	M20	M24	M27	M30
Influence factors ψ on bond resistance τ_{Rk}										
Hammer drilled holes and **hammer drilled holes with hollow drill bit TE-CD or TE-YD**										
Uncracked concrete: Factor for concrete strength	ψ_c	C30/37	1,08							
		C40/50	1,15							
		C50/60	1,20							
Cracked concrete: Factor for concrete strength	ψ_c	C30/37	1,04							
		C40/50	1,07							
		C50/60	1,10							
Cracked and uncracked concrete: Sustained load factor	ψ^0_{sus}	24 °C / 40 °C	1,00							
		50 °C / 80 °C	0,73							
		72 °C / 120 °C	0,73							
Diamond cored holes										
Uncracked concrete: Factor for concrete strength	ψ_c	C30/37	1,08							
		C40/50	1,15							
		C50/60	1,20							
Cracked concrete: Factor for concrete strength	ψ_c	C50/60	1,00							
Cracked and uncracked concrete: Sustained load factor	ψ^0_{sus}	24 °C / 40 °C	0,78							
		50 °C / 80 °C	0,71							
		72 °C / 120 °C	0,78							
Concrete cone failure										
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7							
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$							
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$							
Splitting failure										
Edge distance $c_{cr,sp}$ [mm] for		$h / h_{ef} \geq 2,0$	$1,0 \cdot h_{ef}$							
		$2,0 > h / h_{ef} > 1,3$	$4,6\, h_{ef} - 1,8\, h$							
		$h / h_{ef} \leq 1,3$	$2,26\, h_{ef}$							
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$							



1) In absence of national regulations.

HVU2

Performances
Essential characteristics under tension loads in concrete

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C2: Essential characteristics for internally threaded sleeve HIS-(R)N under tension load in concrete

HIS-(R)N			**M8**	**M10**	**M12**	**M16**	**M20**
Installation safety factor							
Hammer drilling and Hilti hollow drill bit TE-CD or TE-YD	γ_{inst}	[-]	1,0				
Diamond coring	γ_{inst}	[-]	1,0				
Steel failure							
Characteristic resistance HIS-N with screw or threaded rod grade 8.8	$N_{Rk,s}$	[kN]	25	46	67	125	116
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,50				
Characteristic resistance HIS-RN with screw or threaded rod grade 70	$N_{Rk,s}$	[kN]	26	41	59	110	166
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,87				2,40
Combined pullout and concrete cone failure							
Effective embedment depth	h_{ef}	[mm]	90	110	125	170	205
Effective diameter of fastener	d	[mm]	12,5	16,5	20,5	25,4	27,6
Characteristic bond resistance in uncracked concrete C20/25 in **hammer drilled holes and hammer drilled holes with hollow drill bit TE-CD or TE-YD**							
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	11,0				
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,0				
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	5,5				
Characteristic bond resistance in uncracked concrete C20/25 in **diamond cored holes**							
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	11,0				
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,0				
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,ucr}$	[N/mm²]	5,5				
Characteristic bond resistance in cracked concrete C20/25 in **hammer drilled holes and hammer drilled holes with hollow drill bit TE-CD or TE-YD**							
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	6,5				
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	5,0				
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	3,0				
Characteristic bond resistance in cracked concrete C20/25 in **diamond cored holes**							
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,cr}$	[N/mm²]	4,5				
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,cr}$	[N/mm²]	3,5				
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,cr}$	[N/mm²]	2,5				

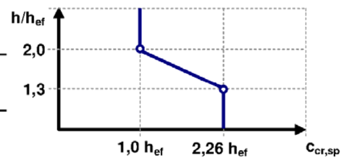
HVU2

Performances
Essential characteristics under tension loads in concrete

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C2: Continued

HIS-(R)N			M8	M10	M12	M16	M20
Influence factors ψ on bond resistance τ_{Rk}							
Hammer drilled holes and **hammer drilled holes with hollow drill bit TE-CD or TE-YD**							
Factor for concrete compressive strength							
Uncracked concrete: Factor for concrete strength	ψ_c	C50/60	1,00				
Cracked concrete: Factor for concrete strength	ψ_c	C30/37	1,08				
		C40/50	1,15				
		C50/60	1,20				
Cracked and uncracked concrete: Sustained load factor	ψ^0_{sus}	24 °C / 40 °C	1,00				
		50 °C / 80 °C	0,73				
		72 °C / 120 °C	0,73				
Diamond cored holes							
Uncracked concrete: Factor for concrete strength	ψ_c	C50/60	1,00				
Cracked concrete: Factor for concrete strength	ψ_c	C50/60	1,00				
Cracked and uncracked concrete: Sustained load factor	ψ^0_{sus}	24 °C / 40 °C	0,78				
		50 °C / 80 °C	0,71				
		72 °C / 120 °C	0,78				
Concrete cone failure							
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11				
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7				
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$				
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$				
Splitting failure							
Edge distance $c_{cr,sp}$ [mm] for		$h / h_{ef} \geq 2,0$	$1,0 \cdot h_{ef}$				
		$2,0 > h / h_{ef} > 1,3$	$4,6\ h_{ef} - 1,8\ h$				
		$h / h_{ef} \leq 1,3$	$2,26\ h_{ef}$				
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$				

1) In absence of national regulations.

Table C3: Essential characteristics for HAS-U… and HAS-(E) under shear load in concrete

HAS-U… and HAS-(E)…			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm										
HAS-(E)…										
Characteristic resistance HAS-(E) 5.8	$V_{Rk,s}$	[kN]	9,5	15,1	21,7	41,1	56,1	80,1	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25						-	-
Characteristic resistance HAS-(E) 8.8	$V_{Rk,s}$	[kN]	13,3	21,1	30,5	57,7	89,7	128,2	173,5	210,7
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25							
Characteristic resistance HAS-R	$V_{Rk,s}$	[kN]	11,6	18,5	26,7	50,5	78,5	112,2	108,4	131,7
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,40				1,56		2,38	
Characteristic resistance HAS-HCR	$V_{Rk,s}$	[kN]	13,3	21,1	30,5	57,7	89,7	112,2	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25					1,75	-	-
Ductility factor	k_7	[-]	1,0							
HAS-U…										
Characteristic resistance	$V_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$							
Partial factor HAS-U 5.8	$\gamma_{Ms,V}$ 1)	[-]	1,25						-	-
Partial factor HAS-U 8.8	$\gamma_{Ms,V}$ 1)	[-]	1,25							
Partial factor HAS-U A4	$\gamma_{Ms,V}$ 1)	[-]	1,56						2,38	
Partial factor HAS-U HCR	$\gamma_{Ms,V}$ 1)	[-]	1,25					1,75	-	-
Ductility factor	k_7	[-]	1,0							
Steel failure with lever arm										
HAS-(E)…										
Characteristic resistance HAS-(E) 5.8	$M^0_{Rk,s}$	[Nm]	18	37	64	167	284	486	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25						-	-
Characteristic resistance HAS-(E) 8.8	$M^0_{Rk,s}$	[Nm]	26	53	90	234	455	777	1223	1638
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25							
Characteristic resistance HAS-R	$M^0_{Rk,s}$	[Nm]	23	45	79	205	398	680	765	1023
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,40				1,56		2,38	
Characteristic resistance HAS-HCR	$M^0_{Rk,s}$	[Nm]	26	52	90	234	455	680	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25					1,75	-	-
Ductility factor	k_7	[-]	1,0							

HVU2

Performances
Essential characteristics under shear loads in concrete

Annex C6

Deutsches Institut für Bautechnik DIBt

Table C3: Continued

HAS-U… and HAS-(E)...			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure with lever arm										
HAS-U…										
Bending moment	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el} \cdot f_{uk}$							
Ductility factor	k_7	[-]	1,0							
Concrete pry-out failure										
Pry-out factor	k_8	[-]	2,0							
Concrete edge failure										
Effective length of fastener	l_f	[mm]	min (h_{ef}; $12 \cdot d_{nom}$)							
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24	27	30

1) In absence of national regulations.

HVU2

Performances
Essential characteristics under shear loads in concrete

Annex C7

Deutsches Institut für Bautechnik DIBt

Table C4: Essential characteristics for internally threaded sleeve HIS-(R)N under shear loads in concrete

HIS-(R)N			**M8**	**M10**	**M12**	**M16**	**M20**
Steel failure without lever arm							
Characteristic resistance HIS-N with screw or threaded rod grade 8.8	$V_{Rk,s}$	[kN]	13	23	34	63	58
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25				
Characteristic resistance HIS-RN with screw or threaded rod grade 70	$V_{Rk,s}$	[kN]	13	20	30	55	83
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,56				2,00
Ductility factor	k_7	[-]	1,0				
Steel failure with lever arm							
Characteristic resistance HIS-N with screw or threaded rod grade 8.8	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25				
Characteristic resistance HIS-RN with screw or threaded rod grade 70	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,56				
Ductility factor	k_7	[-]	1,0				
Concrete pry-out failure							
Pry-out factor	k_8	[-]	2,0				
Concrete edge failure							
Effective length of fastener	l_f	[mm]	90	110	125	170	205
Diameter of fastener	d_{nom}	[mm]	12,5	16,5	20,5	25,4	27,6

[1)] In absence of national regulations.

HVU2

Performances
Essential characteristics under shear loads in concrete

Annex C8

Table C5: Displacements for HAS-U… and HAS-(E) under tension load[1)]

HAS-U… and HAS-(E)...			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete temperature range I to III										
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,06						0,15	
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,10						0,30	
Cracked concrete temperature range I to III										
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,10						0,15	
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,14						0,30	

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$ (τ: bond stress due to applied tension force).

Table C6: Displacements for HAS-U… and HAS-(E) under shear load[1)]

HAS-U… and HAS-(E)...			M8	M10	M12	M16	M20	M24	M27	M30
Displacement	δ_{V0}-factor	[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03		
	$\delta_{V\infty}$-factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05		

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; $\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$ (V: applied shear force).

Table C7: Displacements for internally threaded sleeves HIS-(R)N under tension load[1)]

HIS-(R)N			M8	M10	M12	M16	M20
Uncracked concrete temperature range I to III							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,05				0,15
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,10				0,15
Cracked concrete temperature range I to III							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,13				0,20
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,15				0,20

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$ (τ: bond stress due to applied tension force).

Table C8: Displacements for internally threaded sleeves HIS-(R)N under shear load[1)]

HIS-(R)N			M8	M10	M12	M16	M20
Displacement	δ_{V0}-factor	[mm/kN]	0,06	0,06	0,05	0,04	0,04
	$\delta_{V\infty}$-factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; $\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$ (V: applied shear force).

HVU2

Performances
Displacements

Annex C9

Table C9: Essential characteristics for HAS-U… and HAS-(E) under tension loads for seismic performance category C1

HAS-U… and HAS-(E)...			M10	M12	M16	M20	M24	M27	M30
Steel failure									
HAS-U (HDG) 5.8, HAS-(E)-(F) 5.8	$N_{Rk,s,seis}$	[kN]	29	42	79	123	177	-	
HAS-U (HDG) 8.8, HAS-(E)-(F) 8.8	$N_{Rk,s,seis}$	[kN]	46	67	126	196	282	367	449
HAS-U A4, HAS-R	$N_{Rk,s,seis}$	[kN]	41	59	110	172	247	230	281
HAS-U HCR, HAS-HCR	$N_{Rk,s,seis}$	[kN]	46	67	126	196	247	-	
Combined pullout and concrete cone failure in cracked concrete C20/25									
Hammer drilled holes									
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,seis}$	[N/mm²]	8,5	8,5	8,3	6,9	8,1	6,5	7,6
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,seis}$	[N/mm²]	6,5	6,5	6,4	5,3	6,2	5,0	5,8
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,seis}$	[N/mm²]	4,0	4,0	3,9	3,3	3,8	3,1	3,6
Hammer drilled holes with hollow drill bit TE-CD or TE-YD									
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,seis}$	[N/mm²]	-	8,5	8,3	6,9	8,1	6,5	7,6
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,seis}$	[N/mm²]	-	6,5	6,4	5,3	6,2	5,0	5,8
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,seis}$	[N/mm²]	-	4,0	3,9	3,3	3,8	3,1	3,6
Diamond cored holes									
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,seis}$	[N/mm²]	7,0	7,0	7,0	7,0	7,0	7,0	7,0
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,seis}$	[N/mm²]	6,5	6,5	6,5	6,5	6,5	6,5	6,5
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,seis}$	[N/mm²]	4,0	4,0	4,0	4,0	4,0	4,0	4,0

Table C10: Essential characteristics for HAS-U… and HAS-(E) under shear loads for seismic performance category C1

HAS-U… and HAS-(E)...			M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm									
HAS-U (HDG) 5.8, HAS-(E)-(F) 5.8	$V_{Rk,s,seis}$	[kN]	11	15	27	43	62	-	-
HAS-U (HDG) 8.8, HAS-(E)-(F) 8.8	$V_{Rk,s,seis}$	[kN]	16	24	44	69	99	129	157
HAS-U A4, HAS-R	$V_{Rk,s,seis}$	[kN]	14	21	39	60	87	81	98
HAS-U HCR, HAS-HCR	$V_{Rk,s,seis}$	[kN]	16	24	44	69	87	-	-

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Table C11: Essential characteristics for HAS-U… and HAS-(E) under tension loads for seismic performance category C2

HAS-U… and HAS-(E)...			**M16**	**M20**
Steel failure				
HAS-U (HDG) 8.8, HAS-(E)-(F) 8.8	$N_{Rk,s,seis}$	[kN]	126	196
Combined pullout and concrete cone failure in cracked concrete C20/25 in **hammer drilled holes and with hollow drill bit TE-CD or TE-YD**				
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,seis}$	[N/mm²]	2,9	2,6
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,seis}$	[N/mm²]	2,3	2,1
Temperature range III: 72 °C / 120 °C	$\tau_{Rk,seis}$	[N/mm²]	1,4	1,3

Table C12: Essential characteristics for HAS-U… and HAS-(E) under shear loads for seismic performance category C2

HAS-U… and HAS-(E)...			**M16**	**M20**
Steel failure without lever arm				
HAS-U 8.8, HAS-(E) 8.8	$V_{Rk,s,seis}$	[kN]	40	71
HAS-U HDG 8.8, HAS-F 8.8	$V_{Rk,s,seis}$	[kN]	30	46

Table C13: Displacements under tension load for seismic performance category C2

HAS-U… and HAS-(E)...			**M16**	**M20**
Displacement DLS	$\delta_{N,seis(DLS)}$	[mm]	0,2	0,2
Displacement ULS	$\delta_{N,seis(ULS)}$	[mm]	0,4	0,5

Table C14: Displacements under shear load for seismic performance category C2

HAS-U… and HAS-(E)...			**M16**	**M20**
Displacement DLS HAS-U 8.8, HAS-(E) 8.8	$\delta_{V,seis(DLS)}$	[mm]	3,2	2,5
Displacement DLS HAS-U HDG 8.8, HAS-F 8.8	$\delta_{V,seis(DLS)}$	[mm]	2,3	3,8
Displacement ULS HAS-U 8.8, HAS-(E) 8.8	$\delta_{V,seis(ULS)}$	[mm]	9,2	7,1
Displacement ULS HAS-U HDG 8.8, HAS-F 8.8	$\delta_{V,seis(ULS)}$	[mm]	4,3	9,1

HVU2

Performances
Essential characteristics for seismic performance category C2 and displacements.

Annex C11

Deutsches Institut für Bautechnik DIBt

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA www.eota.eu

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

European Technical Assessment ETA-18/0185 of 14 May 2018

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	HVU2
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Corporation
This European Technical Assessment contains	24 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 330499-00-0601

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

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Specific Part

1 Technical description of the product

The HVU2 is a bonded anchor consisting of a mortar capsule HVU2 M… and a steel element. The steel element is a threaded rod with washer and nut HAS-(E) M24 to M30 or an internally threaded sleeve HIS(R)N M20.
The mortar capsule is placed in the hole and the steel element is driven by machine as specified in Annex B6.

The anchor rod is anchored via the bond between steel element, chemical mortar and concrete.

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 resistance to tension load (static and quasi-static loading)	See Annex C 1 to C 4
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 5 to C 6
Displacements (static and quasi-static loading)	See Annex C 7 to C 8
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristics	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In European Assessment Document EAD 330499-00-0601the 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 14 May 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Lange

Deutsches Institut für Bautechnik DIBt

Installed condition

Figure A1:
HAS-(E)…

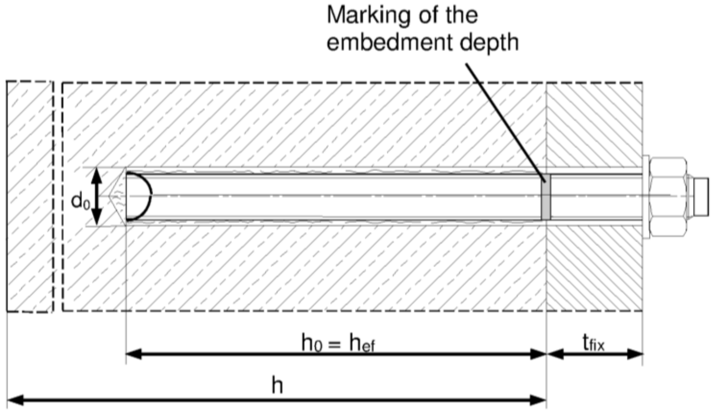
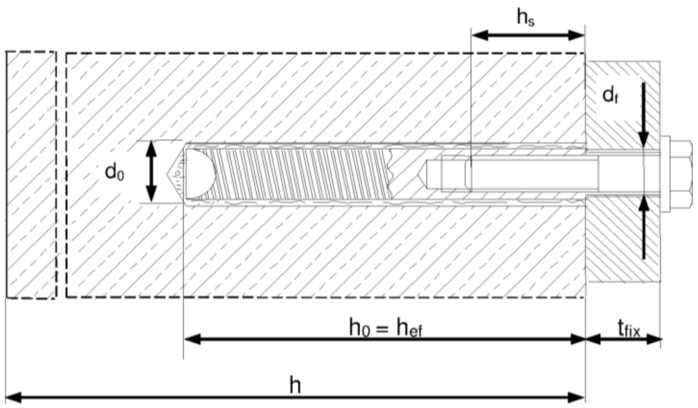


Figure A2:
Internally threaded sleeve HIS-(R)N



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HVU2

Product description
Installed condition

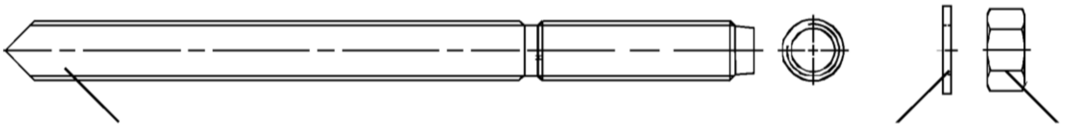
Annex A1

Product description: Mortar capsule and steel elements

Adhesive anchor capsule HVU2 M24 to M30: resin and hardener with aggregate

Marking:
HVU2 M …
Expiry date mm/yyyy

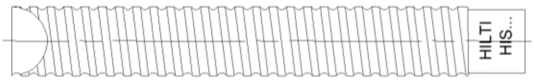
Steel elements



HAS-(E)...: M24 to M30

washer

nut



Internally threaded sleeve HIS-(R)N: M20
Dimensions according to Annex B4.

HVU2	**Annex A2**
Product description Adhesive anchor capsule / Steel elements	

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Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
HAS-(E)	M24: Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm² Elongation after fracture A_f > 0,22 (equal to A (l_0 = 5d) > 8% ductile) M24 to M30: Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm
Internally threaded sleeve HIS-N	Electroplated zinc coated ≥ 5 µm
Washer	Electroplated zinc coated ≥ 5 µm, hot dip galvanized ≥ 45 µm
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5 µm, hot dip galvanized ≥ 45 µm
Metal parts made of stainless steel	
HAS-(E)R	M24: Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm² M27 and M30: Strength class 70, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Internally threaded sleeve HIS-RN	Stainless steel 1.4401, 1.4571 EN 10088-1:2014
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod. Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Metal parts made of high corrosion resistant steel	
HAS-(E)HCR	M24: f_{uk} = 700 N/mm², f_{yk} = 400 N/mm² Rupture elongation A (l_0 = 5d) > 12% ductile High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod. High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

HVU2

Product description
Materials

Annex A3

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.

Base material:

- Reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked or uncracked concrete.

Temperature in the base material:

- **At installation**
  0 °C to +40 °C
- **In-service**
  Temperature range I: -40 °C to +40 °C
  (max. long term temperature +24 °C and max. short term temperature +40 °C)
  Temperature range II: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short term temperature +80 °C)
  Temperature range III: -40 °C to +120 °C
  (max. long term temperature +72 °C and max. short term temperature +120 °C)

Table B1: Specifications of intended use

	Foil capsule HVU2 with …	
Elements	Threaded rod HAS-(E)…	HIS-(R)N
Hammer drilling with hollow drill bit TE-YD	M24 to M30	M20
Hammer drilling	M24 to M30	M20
Diamond coring	M24 to M30	M20

HVU2	**Annex B1**
Intended Use Specifications	

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Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal conditions, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal conditions, if other particular aggressive conditions exist
  (high corrosion resistant steel).
  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 products 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 loading are designed in accordance with:
  FprEN 1992-4:2017 and EOTA Technical Report TR 055

Installation:

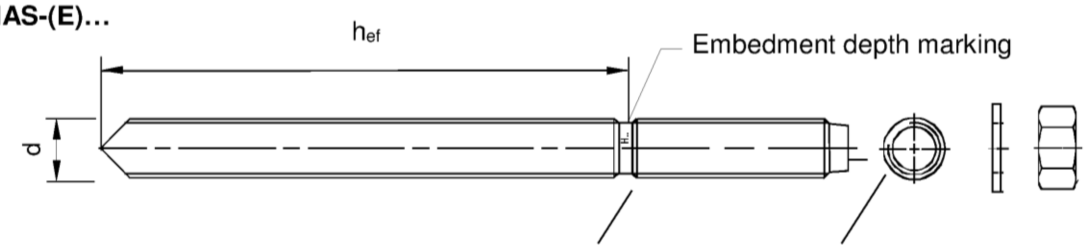
- Concrete condition I1:
  Installation in dry or wet (water saturated) concrete and use in service in dry or wet concrete.
- Drilling technique: hammer drilling, diamond coring (e.g. Hilti DD 30-W or other Hilti DD machines), hammer drilling with hollow drill bit TE-YD.
- Installation direction:
  D2: downward and horizontal installation for threaded rod (HAS) M24 to M30 and internally threaded sleeve HIS-N M20.
  D3: downward and horizontal and upward (e.g. overhead) installation for threaded rod (HAS) M24 and internally threaded sleeve HIS-N M20.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

HVU2	
Intended Use Specifications	**Annex B2**

Table B2: Installation parameters of HAS-(E)…

HAS-(E)…			**M24**	**M27**	**M30**
Foil capsule HVU2 M…			**24x210**	**27x240**	**30x270**
Diameter of fastener	$d = d_{nom}$	[mm]	24	27	30
Nominal diameter of drill bit	d_0	[mm]	28	30	35
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	210	240	270
Maximum diameter of clearance hole in the fixture	d_f	[mm]	26	30	33
Minimum allowed thickness of concrete member	h_{min}	[mm]	270	300	340
Maximum torque moment	max T_{fix}	[Nm]	200	270	300
Minimum allowable spacing	s_{min}	[mm]	115	120	140
Minimum allowable edge distance	c_{min}	[mm]	60	75	80

HAS-(E)…



Marking:
identifying mark - H, embossing "1" HAS-(E)
identifying mark - H, embossing "=" HAS-(E)R
identifying mark - H, embossing "CR" HAS-(E)HCR

HVU2

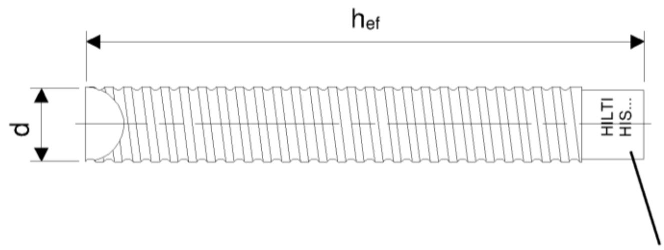
Intended Use
Installation parameters

Annex B3

Table B3: Installation parameters of internally threaded sleeve HIS-(R)N

Internally threaded sleeve HIS-(R)N			**M20**
Foil capsule HVU2 M…			**24x210**
Diameter of fastener	$d = d_{nom}$	[mm]	27,8
Nominal diameter of drill bit	d_0	[mm]	32
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	205
Maximum diameter of clearance hole in the fixture	d_f	[mm]	22
Minimum allowed thickness of concrete member	h_{min}	[mm]	270
Maximum torque moment	max T_{fix}	[Nm]	150
Thread engagement length min-max	h_s	[mm]	20-50
Minimum allowable spacing	s_{min}	[mm]	130
Minimum allowable edge distance	c_{min}	[mm]	90

Internally threaded sleeve HIS-(R)N…



Marking:
Identifying mark - HILTI and
embossing "HIS-N" (for zinc coated steel)
embossing "HIS-RN" (for stainless steel)

Table B4: Minimum curing time

Temperature in the base material T	**Minimum curing time t_{cure}**
0 °C to 4 °C	40 min
5 °C to 9 °C	20 min
10 °C to 19 °C	10 min
20 °C to 40 °C	5 min

HVU2

Intended Use
Installation parameters
Minimum curing time

Annex B4

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Table B5: Parameters of drilling and cleaning tools

Elements		Drill and clean			
HAS-(E)…	HIS-(R)N	Hammer drilling: Standard drill bit	Hammer drilling: Hollow drill bit TE-YD	Diamond coring	Brush
					
Size	Name	d_0 [mm]	d_0 [mm]	d_0 [mm]	HIT-RB
M24	-	28	28	28	28
M27	-	30	-	30	30
-	M20	32	32	32	32
M30	-	35	35	35	35

Cleaning alternatives

Compressed Air Cleaning (CAC):
Air nozzle with an orifice opening of minimum 3,5 mm in diameter.

Automatic Cleaning (AC):
Cleaning is performed during drilling with Hilti TE-YD drilling system including vacuum cleaner.

HVU2

Intended Use
Cleaning tools

Annex B5

Table B6: Parameters of setting tools HAS-(E)…

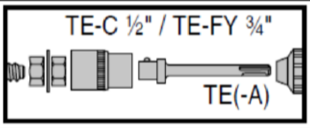
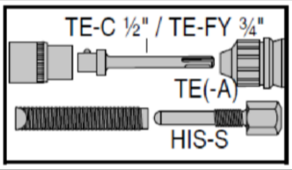
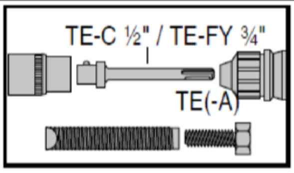
Elements	Setting tools		Operating mode
HAS-(E) M24 to M30 		HAS-(E) with double nut and TE-FY ¾” adapter	Rotary hammer tool in rotation hammer mode

Table B7: Parameters of setting tools HIS-(R)N…

Elements	Setting tools		Setting mode
HIS-(R)N M20 		HIS-N with HIS-S and TE-FY ¾” adapter	Rotary hammer tool in rotation hammer mode
		HIS-N with screw and TE-FY ¾” adapter	Rotary hammer tool in rotation hammer mode

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FOR REVIEW

HVU2	
Intended Use Setting tools	**Annex B6**

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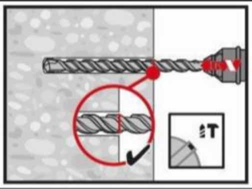
Installation instruction

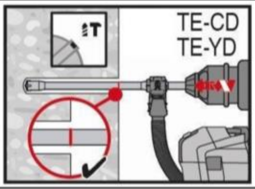
Hole drilling

a) Hammer drilling: For dry or wet concrete



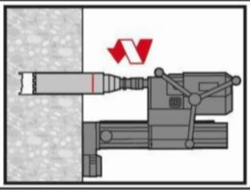
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

b) Hammer drilling with Hilti hollow drill bit: For dry and wet concrete



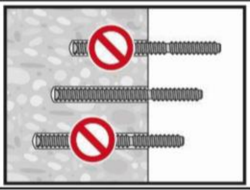
Drill hole to the required embedment depth with an appropriately sized Hilti TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user’s manual. After drilling is completed, proceed to the “setting the element” step in the installation instruction.

c) Diamond coring: For dry or wet concrete



Diamond coring is permissible when suitable diamond core drilling machines and the corresponding core bits are used.

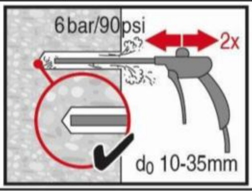
Check setting depth



Check the setting depth with the marked element.
The element has to fit in the hole until the required embedment depth, not deeper.
If it is not possible to insert the element to the required embedment depth, drill deeper.

Drill hole cleaning: Just before setting an anchor, the drill hole must be free of dust and debris.
Inadequate hole cleaning = poor load values.

Compressed Air Cleaning (CAC): For all drill hole diameters d_0 and all drill hole depths h_0.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.

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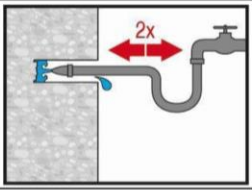
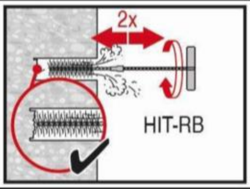
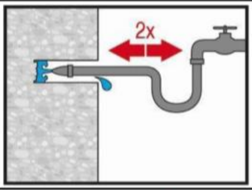
Cleaning of hammer drilled flooded holes and diamond cored holes:
For all drill hole diameters d_0 and all drill hole depths h_0.



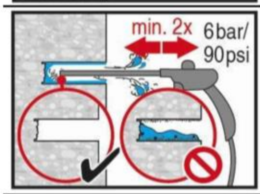
Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



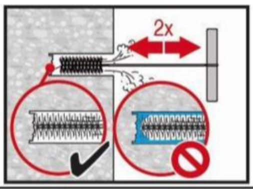
Brush 2 times with the specified brush (see table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not, the brush is too small and must be replaced with the proper brush diameter.



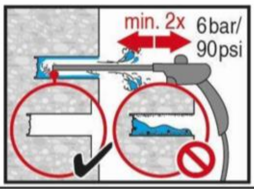
Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust and water.



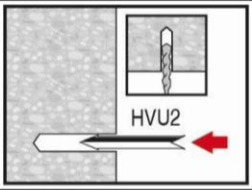
Brush 2 times with the specified brush (see table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not, the brush is too small and must be replaced with the proper brush diameter.



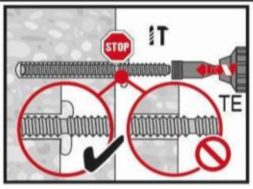
Blow again with compressed air 2 times until return air stream is free of noticeable dust and water.

HVU2	**Annex B8**
Intended Use Installation instructions	

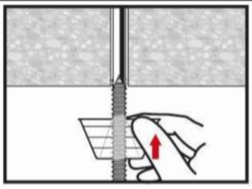
Setting the element



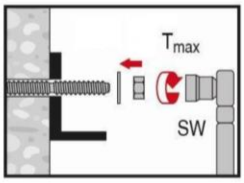
Overhead application is permitted for HVU2 size M24.
Insert the foil capsule with the peak ahead to the back of the hole.



Drive the anchor rod with the plugged tool into the hole, applying moderate pressure.
Rotary hammer tool in rotation hammer mode (450 RPM to maximum 1300 RPM).
Setting tool see Annex B6.
After reaching the embedment depth switch off setting machine immediately.



Overhead installation.
For overhead installation use the overhead dripping cup HIT-OHC.



Loading the anchor: After required curing time t_{cure} (see Table B4) the anchor can be loaded.
The applied installation torque shall not exceed the values maxT_{fix} given in Table B2 and B3.

HVU2

Intended Use
Installation instructions

Annex B9

Table C1: Essential characteristics for HAS-(E) under tension load in concrete

HAS-(E)...			M24	M27	M30
Robustness					
Hammer drilling and drilling with hollow drill bit TE-YD	γ_{inst}	[-]	1,0		
Diamond coring	γ_{inst}	[-]	1,0		
Steel failure					
HAS-(E) 5.8	$N_{Rk,s}$	[kN]	160,2	-	
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,50	-	
HAS-(E) 8.8	$N_{Rk,s}$	[kN]	256,4	347	421,5
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,50		
HAS-R	$N_{Rk,s}$	[kN]	224,3	216,9	263,4
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,87	2,86	
HAS-HCR	$N_{Rk,s}$	[kN]	224,3	-	
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	2,1	-	
Combined pullout and concrete cone failure in					
uncracked concrete C20/25 in **hammer drilled holes and with hollow drill bit TE-YD**					
Temperature range I: 24°C / 40°C	$\tau_{Rk,ucr}$	[N/mm²]	16,0		
Temperature range II: 50°C / 80°C	$\tau_{Rk,ucr}$	[N/mm²]	13,0		
Temperature range III: 72°C / 120°C	$\tau_{Rk,ucr}$	[N/mm²]	7,5		
uncracked concrete C20/25 in **diamond cored holes**					
Temperature range I: 24°C / 40°C	$\tau_{Rk,ucr}$	[N/mm²]	14,0		
Temperature range II: 50°C / 80°C	$\tau_{Rk,ucr}$	[N/mm²]	12,0		
Temperature range III: 72°C / 120°C	$\tau_{Rk,ucr}$	[N/mm²]	7,0		
Factor for concrete compressive strength	ψ_c	C30/37	1,08		
		C40/50	1,15		
		C50/60	1,20		

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FOR REVIEW

HVU2

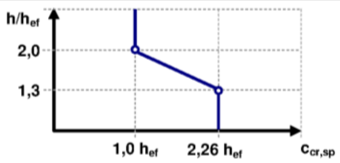
Performances
Essential characteristics under tension load HAS-(E)

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C1: continued

HAS-(E)...			M24	M27	M30
cracked concrete C20/25 in **hammer drilled holes and with hollow drill bit TE-YD**					
Temperature range I: 24°C / 40°C	$\tau_{Rk,cr}$	[N/mm²]	8,5		
Temperature range II: 50°C / 80°C	$\tau_{Rk,cr}$	[N/mm²]	6,5		
Temperature range III: 72°C / 120°C	$\tau_{Rk,cr}$	[N/mm²]	4,0		
Factor for concrete compressive strength for hammer drilled holes and hollow drill bit TE-YD	ψ_c	C30/37	1,08		
		C40/50	1,13		
		C50/60	1,18		
cracked concrete C20/25 in **diamond cored holes**					
Temperature range I: 24°C / 40°C	$\tau_{Rk,cr}$	[N/mm²]	7,0		
Temperature range II: 50°C / 80°C	$\tau_{Rk,cr}$	[N/mm²]	6,0		
Temperature range III: 72°C / 120°C	$\tau_{Rk,cr}$	[N/mm²]	3,5		
Factor for concrete compressive strength for diamond cored holes	ψ_c	C50/60	1,0		
Concrete cone failure					
Factor for uncracked concrete	k_{ucr}	[-]	11,0		
Factor for cracked concrete	k_{cr}	[-]	7,7		
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$		
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$		
Splitting failure					
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$		$1,0 \cdot h_{ef}$		
	$2,0 > h / h_{ef} > 1,3$		$4,6 \cdot h_{ef} - 1,8 \cdot h$		
	$h / h_{ef} \leq 1,3$		$2,26 \cdot h_{ef}$		
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$		



1) In absence of other national regulations

HVU2

Performances
Essential characteristics under tension load HAS-(E)

Annex C2

Table C2: Essential characteristics for internally threaded sleeve HIS-(R)N under tension load in concrete

HIS-(R)N			**M20**
Robustness			
Hammer drilling and drilling with hollow drill bit TE-YD	γ_{inst}	[-]	1,0
Diamond coring	γ_{inst}	[-]	1,0
Steel failure			
HIS-N with with screw or threaded rod grade 8.8	$N_{Rk,s}$	[kN]	116
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	1,5
HIS-RN with with screw or threaded rod grade 70	$N_{Rk,s}$	[kN]	166
Partial factor	$\gamma_{Ms,N}$ 1)	[-]	2,4
Combined pullout and concrete cone failure in			
uncracked concrete C20/25 in **hammer drilled holes and hammer drilled holes with hollow drill bit TE-YD**			
Diameter of fastener	d	[mm]	27,6
Temperature range I: 24°C / 40°C	$\tau_{Rk,ucr}$	[N/mm²]	11,0
Temperature range II: 50°C / 80°C	$\tau_{Rk,ucr}$	[N/mm²]	9,0
Temperature range III: 72°C / 120°C	$\tau_{Rk,ucr}$	[N/mm²]	5,5
uncracked concrete C20/25 in **diamond cored holes**			
Temperature range I: 24°C / 40°C	$\tau_{Rk,ucr}$	[N/mm²]	11,0
Temperature range II: 50°C / 80°C	$\tau_{Rk,ucr}$	[N/mm²]	9,0
Temperature range III: 72°C / 120°C	$\tau_{Rk,ucr}$	[N/mm²]	5,5
Factor for concrete compressive strength	ψ_c	C50/60	1,0

HVU2	**Annex C3**
Performances Essential characteristics under tension load HIS-(R)N	

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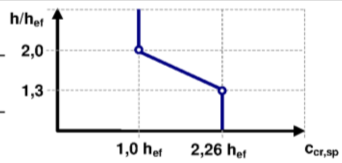
Table C2: continued

HIS-(R)N			**M20**
cracked concrete C20/25 in **hammer drilled holes and hammer drilled holes with hollow drill bit TE-YD**			
Temperature range I: 24°C / 40°C	$\tau_{Rk,cr}$	[N/mm²]	6,5
Temperature range II: 50°C / 80°C	$\tau_{Rk,cr}$	[N/mm²]	5,0
Temperature range III: 72°C / 120°C	$\tau_{Rk,cr}$	[N/mm²]	3,0
Factor for concrete compressive strength for hammer drilled holes and hollow drill bit TE-YD	ψ_c	C30/37	1,08
		C40/50	1,15
		C50/60	1,20
cracked concrete C20/25 in **diamond cored holes**			
Temperature range I: 24°C / 40°C	$\tau_{Rk,cr}$	[N/mm²]	4,5
Temperature range II: 50°C / 80°C	$\tau_{Rk,cr}$	[N/mm²]	3,5
Temperature range III: 72°C / 120°C	$\tau_{Rk,cr}$	[N/mm²]	2,5
Factor for concrete compressive strength for diamond cored holes	ψ_c	C50/60	1,0
Concrete cone failure			
Factor for uncracked concrete	k_{ucr}	[-]	11,0
Factor for cracked concrete	k_{cr}	[-]	7,7
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$
Splitting failure			
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$		$1,0 \cdot h_{ef}$
	$2,0 > h / h_{ef} > 1,3$		$4,6\ h_{ef} - 1,8\ h$
	$h / h_{ef} \leq 1,3$		$2,26\ h_{ef}$
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$



[1)] In absence of national regulations.

Table C3: Essential characteristics for HAS-(E) under shear load in concrete

HAS-(E)...			M24	M27	M30
Robustness					
Hammer drilling and drilling with hollow drill bit TE-YD	γ_{inst}	[-]	1,0		
Diamond coring	γ_{inst}	[-]	1,0		
Steel failure without lever arm					
HAS-(E) 5.8	$V^0_{Rk,s}$	[kN]	80,1	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25	-	-
HAS-(E) 8.8	$V^0_{Rk,s}$	[kN]	128,2	173,5	210,7
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25		
HAS-R	$V^0_{Rk,s}$	[kN]	112,2	108,4	131,7
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,56	2,38	
HAS-HCR	$V^0_{Rk,s}$	[kN]	112,2	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,75	-	-
Ductility factor	k_7	[-]	1,0		
Steel failure with lever arm					
HAS-(E) 5.8	$M^0_{Rk,s}$	[kN]	486	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25	-	-
HAS-(E) 8.8	$M^0_{Rk,s}$	[kN]	777	1223	1638
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25		
HAS-R	$M^0_{Rk,s}$	[kN]	680	765	1023
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,56	2,38	
HAS-HCR	$M^0_{Rk,s}$	[kN]	680	-	-
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,75	-	-
Ductility factor	k_7	[-]	1,0		
Concrete pry-out failure					
Pry-out factor	k_8	[-]	2,0		
Concrete edge failure					
Effective length of fastener	l_f	[mm]	210	240	270
Outside diameter of fastener	d_{nom}	[mm]	24	27	30

1) In absence of national regulations.

HVU2

Performances
Essential characteristics under shear load HAS-(E)

Annex C5

Table C4: Essential characteristics for internally threaded sleeve HIS-(R)N under shear load in concrete

HIS-(R)N			M20
Robustness			
Hammer drilling and drilling with hollow drill bit TE-YD	γ_{inst}	[-]	1,0
Diamond coring	γ_{inst}	[-]	1,0
Steel failure without lever arm			
HIS-N with screw or threaded rod grade 8.8	$V^0_{Rk,s}$	[kN]	58
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25
HIS-RN with screw or threaded rod grade 70	$V^0_{Rk,s}$	[kN]	83
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	2,0
Ductility factor	k_7	[-]	1,0
Steel failure with lever arm			
HIS-N with screw or threaded rod grade 8.8	$M^0_{Rk,s}$	[Nm]	519
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25
HIS-RN with screw or threaded rod grade 70	$M^0_{Rk,s}$	[Nm]	454
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,56
Ductility factor	k_7	[-]	1,0
Concrete pry-out failure			
Pry-out factor	k_8	[-]	2,0
Concrete edge failure			
Effective length of fastener	l_f	[mm]	205
Outside diameter of fastener	d_{nom}	[mm]	27,6

1) In absence of national regulations.

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Performances
Essential characteristics under shear load HIS-(R)N

Annex C6

Table C5: Displacements for HAS-(E) under tension load[1)]

HAS-(E)-…			M24	M27	M30
Uncracked concrete					
Temperature range I to III					
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,06	0,15	
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,10	0,30	
Cracked concrete					
Temperature range I to III					
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,10	0,15	
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,14	0,30	

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$ (τ: action bond stress).

Table C6: Displacements for HAS-(E) under shear load[1)]

HAS-(E)-…			M24	M27	M30
Displacement	δ_{V0}-factor	[mm/kN]	0,03	0,03	
Displacement	$\delta_{V\infty}$-factor	[mm/kN]	0,05	0,05	

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; $\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$ (V: action shear load).

HVU2	Annex C7
Performances Displacements HAS-(E)	

Table C7: Displacements for internally threaded sleeves HIS-(R)N under tension load[1)]

HIS-(R)N			M20
Uncracked concrete			
Temperature range I to III			
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,15
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,15
Cracked concrete			
Temperature range I to III			
Displacement	δ_{N0}-factor	[mm/10kN]	0,20
Displacement	$\delta_{N\infty}$-factor	[mm/10kN]	0,20

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot N$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot N$ (N: action tension load).

Table C8: Displacements for internally threaded sleeves HIS-(R)N under shear load[1)]

HIS-(R)N			M20
Displacement	δ_{V0}-factor	[mm/kN]	0,04
Displacement	$\delta_{V\infty}$-factor	[mm/kN]	0,06

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; $\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$ (V: action shear load).

HVU2

Performances
Displacements HIS-(R)N

Annex C8

附件二 HILTI HVU 2 原廠型錄
與技術資料

基本設計參數

尺寸			M8	M10	M12	M16	M20	M24	M27	M30
錨固深度(h_{ef}) mm			80	90	110	125	170	210	240	270
基材最小厚度(h_{min}) mm			110	120	140	160	220	270	300	340
鑽尾尺寸(d_0) mm			10	12	14	18	22	28	30	35
設計承載力	未開裂混凝土	拉力 N_{Rd} (kN)	12.6	20.1	28.9	47.1	74.6	106.8	136.3	162.7
		剪力 V_{Rd} (kN)	7.6	12.1	17.4	32.9	44.9	64.1	138.8	168.6
	開裂混凝土	拉力 N_{Rd} (kN)	6.7	16	23.5	33.5	53.2	78.1	95.4	113.9
		剪力 V_{Rd} (kN)	7.6	12.1	17.4	32.9	44.9	64.1	81.8	75.9

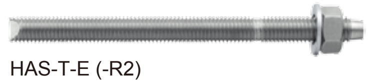
註：以上承載力數據只適合單根錨栓安裝於C20/25混凝土中的抗力與抗剪承載力。未考慮不同混凝土強度、錨栓間邊距、荷載方向、基材溫度及潮濕度的影響。
註：有關設計技術細節，參見喜利得緊固技術手冊(FTM)，PROFIS Anchor設計軟體或聯繫喜利得工程師。
註：M8~M24螺桿強度為5.8級鋼、M27~M30螺桿強度為8.8級鋼。

HVU2 + HAS-T (-E) 錨栓系統（鍍鋅螺桿）

螺桿品名	品號	數量 (支/盒)	孔深 (mm)	螺桿長度 (mm)	最大固定物厚度(mm)	HVU2 藥劑品名	數量 (包/盒)	HVU2 品號
HAS-T M8x110	3524255	10	80	110	14	HVU2 M8x80	20	2164505
HAS-T M10x130	3498675	10	90	130	21	HVU2 M10x90	20	2164506
HAS-T M12x160	3498676	10	110	160	28	HVU2 M12x110	20	2164507
HAS-T M16x190	3498677	10	125	190	38	HVU2 M16x125	20	2164508
HAS-T-E M20x244	3498678	5	170	240	48	HVU2 M20x170	10	2164509
HAS-T-E M24x295	3498679	5	210	290	54	HVU2 M24x210	5	2164560
						HVU2 M27x240	4	2164561
						HVU2 M30x270	4	2164562

HVU2


HAS-T (-R2)


HAS-T-E (-R2)

HVU2 + HAS-T (-E)-R2 錨栓系統（SS304不鏽鋼螺桿）

螺桿品名	品號	數量 (支/盒)	孔深 (mm)	螺桿長度 (mm)	最大固定物厚度(mm)	HVU2 藥劑品名	數量 (包/盒)	HVU2 品號
HAS-T-R2 M8x110	3502680	10	80	110	14	HVU2 M8x80	20	2164505
HAS-T-R2 M10x130	3502681	10	90	130	21	HVU2 M10x90	20	2164506
HAS-T-R2 M12x160	3502682	10	110	160	28	HVU2 M12x110	20	2164507
HAS-T-R2 M16x190	3503113	10	125	190	38	HVU2 M16x125	20	2164508
HAS-T-E-R2 M20x244	3503114	5	170	240	48	HVU2 M20x170	10	2164509
HAS-T-E-R2 M24x295	3503115	5	210	290	54	HVU2 M24x210	5	2164560
						HVU2 M27x240	4	2164561
						HVU2 M30x270	4	2164562

HAS-T 安裝工具

品名	適用螺桿	品號
TE-C HVU2	HAS-T M8~M16	2181356 *
TE-Y-E M20	HAS-E (-F, -R) M20	369228 *
TE-Y-E M24	HAS-E (-F, -R) M24	369229 *

註：品號後帶*產品需特別訂購


TE-C HVU2 安裝轉接頭


TE-Y-E 安裝工具

更多配套產品，更高工作效率


TE 70 鑽鑿兩用電鎚鑽


SF 充電式螺絲起子


DD 120 鑽石鑽孔系統


喜利得四溝、五溝鑽頭系列


PS 50 多功能牆體探測儀


PS 250 鋼筋探測儀

HILTI

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傳真：02-2397-3683

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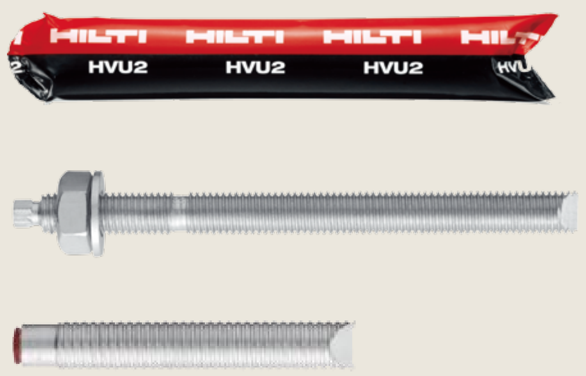
經典再現 全面升級

HVU2 新一代化學錨栓藥劑包

HVU2 新一代化學錨栓藥劑包



特點

- 新一代化學錨栓，適用於開裂、未開裂混凝土基材
- 固化時間快，顯著提升施工效率
- 安裝不受惡劣環境影響，在孔壁光滑、潮濕、倒吊安裝、天氣炎熱等惡劣條件下表現卓越，鑽石鑽孔不需打毛處理
- 無膨脹應力，適用於小間距，小邊距用安裝
- 傑出的長期性能及耐火性能
- 傑出的抗震性能，獲得歐洲ETA抗震認證
- 安裝工具多樣化：電動螺絲起子、電鎚鑽都適用
- 配套安裝工具升級，確保安裝更高效
- HVU2最長可保存24個月

應用

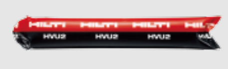
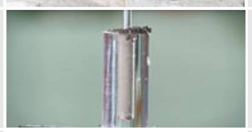
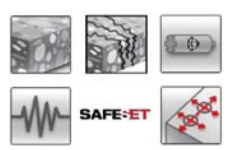
- 小邊距、小間距的設備或結構固定
- 重型荷載、動荷載固定（螺桿系列詳見產品目錄）
- 結構連接固定（帷幕系統與結構主體連接固定）
- 潮濕孔、倒吊安裝、鑽石鑽孔中的後置錨固應用

基材

- 混凝土（非開裂／開裂）

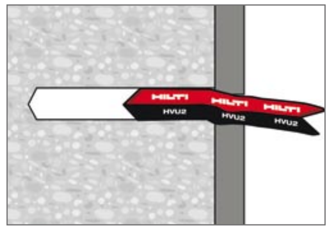
材質

- 環氧樹脂、甲基苯烯酸

系統特點		客戶價值
包裝不易破碎		✓ 減少運輸及現場安裝過程中的不必要浪費 ✓ 防紫外線包裝，儲存運輸更安心
配套安裝工具隨盒配送		✓ 螺桿產品隨盒配送配套安裝工具，搭配電動螺絲起子安裝無憂 ✓ 優化升級設計的安裝工具確保安裝更高效便捷
電動螺絲起子、電鎚鑽都適用		✓ 電動螺絲起子即可實現錨栓安裝，輕鬆便捷，省力省時 ✓ 大規格（M20及以上）推薦使用電鎚鑽安裝，更高效
新配方，承載力更高		✓ 新配方，承載力優異 ✓ 適用於更嚴苛的工況要求
適用於各種工況		✓ 適用於開裂、未開裂混凝土基材 ✓ 適用於小間距，小邊距工況 ✓ 適用於抗震荷載要求 ✓ 適用於鑽石鑽孔等
超級快乾		✓ 大大縮短固化時間，在基材溫度為20˚C情況下，固化僅需5分鐘，節約工期
長期保存		✓ 大幅提升最長保存期限至24個月，減少損耗浪費

HVU2適合特別工況

垂直頭頂安裝不掉落



適用於不規則孔洞安裝

固化時間

安裝基材溫度℃	固化時間
-10至-6	5小時
-5至-1	3小時
0至4	40分鐘
5至9	20分鐘
10至19	10分鐘
20至40	5分鐘

應用圖片

帷幕系統與主體結構連接

設備錨固

機器人錨固

鋼板包覆錨固

隔音牆錨固

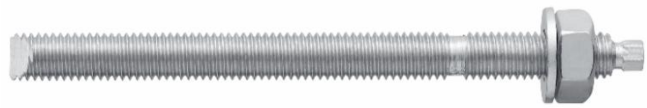
附屬設施後置錨固

HVU2 adhesive capsule

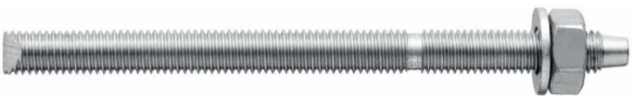
Anchor design (ETAG 001) / Rods&Sleeves / Concrete

Anchor version

HVU2
Mortar capsule



Anchor rod:
HAS
HAS-R
HAS-HCR
(M8-M30)



Anchor rod:
HAS-E
HAS-E-R
HAS-E-HCR
(M8-M30)

Internally threaded sleeve:
HIS-N
HIS-RN
(M8-M20)

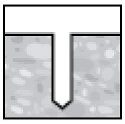
Benefits

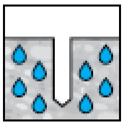
- **SafeSet** technology: Hilti hollow drill bit for automatic cleaning
- Suitable for cracked and non-cracked concrete C20/25 to C50/60 both for hammer drilled and diamond cored holes
- Clean and fast installation that suits hard jobsite conditions
- Suitable for dry and water saturated concrete
- High loading capacity
- Instant curing
- Max. in service temperature range up to 120°C short term / 72°C long term

Base material

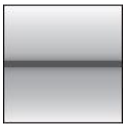

Concrete (non-cracked)


Concrete (cracked)


Dry concrete

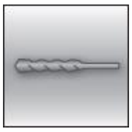

Wet concrete

Load conditions


Static/ quasi-static

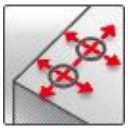

Fire resistance

Installation conditions


Hammer drilled holes


Diamond drilled holes

SAFESET
Hilti SafeSet technology


Small edge distance and spacing

Other information

European Technical Assessment

CE conformity

PROFIS Anchor design Software

A4 316
Corrosion resistance

HCR highMo
High corrosion resistance

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment a)	DIBt, Berlin	ETA-16/0515 / 2017-12-14
European Technical Assessment a)	DIBt, Berlin	ETA-18/0184 / 2018-05-14
European Technical Assessment a)	DIBt, Berlin	ETA-18/0185 / 2018-05-14
Fire test assessment	ING.Thiele, Pirmasens	21735 / 2017-08-01

a) All data given in this section according ETA-16/0515, issue 2017-12-14, ETA-18/0184, issue 2018-05-14 and ETA 18/0185, issue 2018-05-14.

Static and quasi-static resistance (for a single anchor)

All data in this section applies to:
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²

Effective anchorage depth for static

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
HAS										
Eff. Anchorage depth	h_{ef}	[mm]	80	90	110	125	170	210	240	270
Base material thickness	h_{min}	[mm]	110	120	140	160	220	270	300	340
HIS-N										
Eff. Anchorage depth	h_{ef}	[mm]	90	110	125	170	205	-	-	-
Base material thickness	h_{min}	[mm]	120	150	170	230	270	-	-	-

Hammer drilled holes and hammer drilled holes with hollow drill bit1):

Design resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rd}	HAS-(E) 5.8	[kN]	12.6	20.1	28.9	47.1	74.6	106.8	-	-
	HAS-(E) 8.8		16.1	28.1	38.8	47.1	74.6	111.6	136.3	162.7
	HAS-(E-)R		13.8	22.0	31.7	47.1	74.6	111.6	75.8	92.1
	HAS-(E-)HCR		16.1	28.1	38.8	47.1	74.6	106.8	-	-
	HIS-N 8.8		16,7	30,7	44,7	72,7	77,3	-	-	-
	HIS-RN 70		13,9	21,9	31,6	58,8	69,2	-	-	-
Shear V_{Rd}	HAS-(E) 5.8	[kN]	7.6	12.1	17.4	32.9	44.9	64.1	-	-
	HAS-(E) 8.8		10.6	16.9	24.4	46.2	71.8	102.6	138.8	168.6
	HAS-(E-)R		8,3	13,2	19,1	36,1	50,3	71,9	54,2	65,8
	HAS-(E-)HCR		10.6	16.9	24.4	46.2	71.8	64.1	-	-
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-
	HIS-RN 70		8,3	12,8	19,2	35,3	41,5	-	-	-
Cracked concrete										
Tension N_{Rd}	HAS-(E) 5.8	[kN]	6.7	16.0	23.5	33.5	53.2	78.1	-	-
	HAS-(E) 8.8		6.7	16.0	23.5	33.5	53.2	78.1	95.4	113.9
	HAS-(E-)R		6.7	16.0	23.5	33.5	53.2	78.1	75.8	92.1
	HAS-(E-)HCR		6.7	16.0	23.5	33.5	53.2	78.1	-	-
	HIS-N 8.8		15.3	24.7	33.5	53.2	70.4	-	-	-
	HIS-RN 70		13,9	21,9	31,6	50,9	67,4	-	-	-
Shear V_{Rd}	HAS-(E) 5.8	[kN]	7.6	12.1	17.4	32.9	44.9	64.1	-	-
	HAS-(E) 8.8		10.6	16.9	24.4	46.2	71.8	93.7	81.8	75.9
	HAS-(E-)R		8.3	13.2	19.1	36.1	50.3	71.9	45.5	55.3
	HAS-(E-)HCR		10.6	16.9	24.4	46.2	71.8	64.1	-	-
	HIS-N 8.8		10.4	18.4	27.2	50.4	46.4	-	-	-
	HIS-RN 70		8,3	12,8	19,2	35,3	41,5	-	-	-

1) Hilti hollow drill bit is available for the element sizes M12 to M20.

Materials

Mechanical properties for HAS

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal tensile strength f_{uk}	HAS-(E) 5.8	[N/mm²]	570	570	570	570	500	500	500	500
	HAS-(E) 8.8		800	800	800	800	800	800	800	800
	HAS-(E-)R		700	700	700	700	700	700	500	500
	HAS-(E-)HCR		800	800	800	800	800	700	700	700
Yield strength f_{yk}	HAS-(E) 5.8	[N/mm²]	400	400	400	400	400	400	400	400
	HAS-(E) 8.8		640	640	640	640	640	640	640	640
	HAS-(E-)R		450	450	450	450	450	450	210	210
	HAS-(E-)HCR		640	640	640	640	640	400	400	400
Stressed cross-section A_s	HAS	[mm²]	33,2	52,3	76,2	144,0	225,0	324,0	427,0	519,0
Moment of resistance W	HAS	[mm³]	27,0	54,1	93,8	244,0	474,0	809,0	1274,0	1706,0

Mechanical properties for HIS-N

Anchor size			M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HIS-N	[N/mm²]	490	490	460	460	460
	Screw 8.8		800	800	800	800	800
	HIS-RN		700	700	700	700	700
	Screw 70		700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm²]	410	410	375	375	375
	Screw 8.8		640	640	640	640	640
	HIS-RN		350	350	350	350	350
	Screw 70		450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm²]	51,5	108,0	169,1	256,1	237,6
	Screw		36,6	58,0	84,3	157,0	245,0
Moment of resistance W	HIS-(R)N	[mm³]	145	430	840	1595	1543
	Screw		31,2	62,3	109,0	277,0	541,0

Material quality for HAS

Part	Material
HAS HAS-E	Strength class 5.8 or 8.8; Rupture elongation (l_0=5d) > 8% ductile Electroplated zinc coated (≥5 µm); (F) hot dip galvanized ≥45 µm
HAS-R HAS-E-R	For ≤ M24: Strength class 70; Rupture elongation (l_0=5d) > 8% ductile Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4438, 1.43362 EN 10088-1:2014
HAS-HCR HAS-E-HCR	Rupture elongation (l_0=5d) > 8% ductile High corrosion resistance steel 1.4529, 1.1.4565 EN 10088-1:2014
Washer	Electroplated zinc coated (≥5 µm); (F) hot dip galvanized ≥45 µm
	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
	High corrosion resistance steel 1.4529, 1.1.4565 EN 10088-1:2014
Nut	Strength class adapted to strength class of threaded rod. Electroplated zinc coated (≥5 µm); hot dip galvanized ≥45 µm
	Strength class adapted to strength class of threaded rod. Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
	Strength class adapted to strength class of threaded rod. High corrosion resistance steel 1.4529, 1.1.4565 EN 10088-1:2014

Material quality for HIS-N

Part		Material
HIS-N	Internal threaded sleeve	C-steel 1.0718; Steel galvanized ≥ 5 µm
	Screw 8.8	Strength class 8.8, A5 > 8 % Ductile Steel galvanized ≥ 5 µm
HIS-RN	Internal threaded sleeve	Stainless steel 1.4401,1.4571
	Screw 70	Strength class 70, A5 > 8 % Ductile Stainless steel 1.4401; 1.4404, 1.4578; 1.4571; 1.4439; 1.4362

Setting information

Installation temperature range:
-10°C to +40°C

In service temperature range

Hilti HVU 2 adhesive may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °C

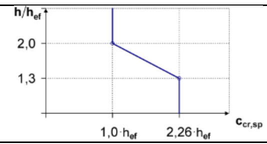
Max short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.
Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Curing time

Temperature of the base material	Minimum curing time t_{cure}
-10 °C to -6 °C [1)]	5 hours [1)]
-5 °C to -1 °C [1)]	3 hours [1)]
0 °C to 4 °C	40 min
5 °C to 9 °C	20 min
10 °C to 19 °C	10 min
20 °C to 40 °C	5 min

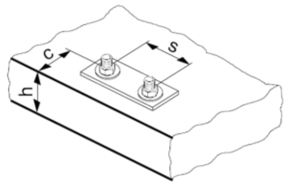
1) The utilisation of HAS sizes M24, M27 and M30 and HIS size M20 is only allowed for temperatures above 0 ºC.

Setting details for HAS

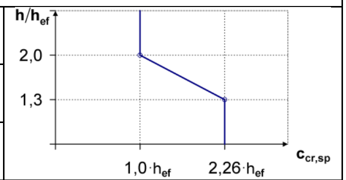
Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Foil capsule HVU2			**8x80**	**10x90**	**12x110**	**16x125**	**20x170**	**24x210**	**27x240**	**30x270**
Diameter of element	$d_1=d_{nom}$	[mm]	8	10	12	16	20	24	27	30
Nom. diameter of drill	d_0	[mm]	10	12	14	18	22	28	30	35
Eff. Embedment depth and drill hole in the fixture	$h_{ef}=h_0$	[mm]	80	90	110	125	170	210	240	270
Max. diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	30	33
Min. thickness of concrete member	h_{min}	[mm]	110	120	140	160	220	270	300	340
Max. torque moment [a)]	T_{max}	[Nm]	10	20	40	80	150	200	270	300
Min. spacing	s_{min}	[mm]	40	50	60	75	90	115	120	140
Min. edge distance	c_{min}	[mm]	40	45	45	50	55	60	75	80
Critical spacing for splitting failure	$s_{cr,sp}$		$2\ c_{cr,sp}$							
Critical edge distance for splitting failure [b)]	$c_{cr,sp}$	[mm]	**$1{,}0 \cdot h_{ef}$**			for $h / h_{ef} \geq 2{,}0$				
			$4{,}6\ h_{ef}-1{,}8\ h$			for $2{,}0 > h/h_{ef} > 1{,}3$				
			$2{,}26\ h_{ef}$			for $h / h_{ef} \leq 1{,}3$				
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$					$3\ h_{ef}$		
Critical edge distance for concrete cone [c)]	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$							

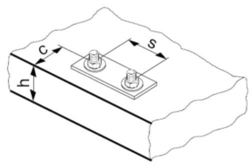
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) Max. recommended torque moment to avoid splitting failure during installation with min. spacing and/or edge distance
b) h: base material thickness ($h \geq h_{min}$)
c) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side.



Setting details of HIS-(R)N

Anchor size			M8	M10	M12	M16	M20
Foil capsule HVU2			**10x90**	**12x110**	**16x125**	**20x170**	**24x210**
Diameter of element	$d_1=d_{nom}$	[mm]	12,5	16,5	20,5	25,4	27,8
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Eff. Embedment depth and drill hole in the fixture	$h_{ef}=h_0$	[mm]	90	110	125	170	205
Max. diameter of clearance hole in the	d_f	[mm]	9	12	14	18	22
Min. thickness of concrete member	h_{min}	[mm]	120	150	170	230	270
Max. torque moment[a)]	T_{max}	[Nm]	10	20	40	80	150
Thread engagement	h_s		8-20	10-25	12-30	16-40	20-50
Min. spacing	s_{min}	[mm]	60	75	90	115	130
Min. edge distance	c_{min}	[mm]	40	45	55	65	90
Critical spacing for	$s_{cr,sp}$		$2\ c_{cr,sp}$				
Critical edge distance for splitting failure [b)]	$c_{cr,sp}$	[mm]	**$1{,}0 \cdot h_{ef}$**		for $h / h_{ef} \geq 2{,}0$		
			$4{,}6\ h_{ef} - 1{,}8\ h$		for $2{,}0 > h/h_{ef} > 1{,}3$		
			$2{,}26\ h_{ef}$		for $h / h_{ef} \leq 1{,}3$		
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$				$1{,}5\ h_{ef}$
Critical edge distance for concrete cone [c)]	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$				



For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) Max. recommended torque moment to avoid splitting failure during installation with min. spacing and/or edge distance

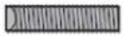
b) h: base material thickness ($h \geq h_{min}$)

c) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side.

Installation equipment

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30
Rotary hammer		TE 1- TE 30		TE 1-TE 60	TE 50-TE 60	TE 50–TE 80			
Drill driver	HAS	SF (H)				-			
	HIS-N	-							
Other tools		Compressed air gun, blow out pump, Hilti hollow drill bit							
		Set of cleaning brushes							

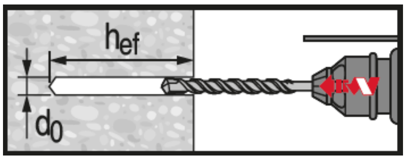
Drilling and cleaning parameters

HAS	HIS-N	Hammer drill	Hollow Drill Bit	Diamond coring	Brush HIT-RB
		d_0 [mm]			size [mm]
					
M8	**-**	10	-	-	-
M10	**-**	12	-	12	12
M12	**M8**	14	14	14	14
M16	**M10**	18	18	18	18
M20	**M12**	22	22	22	22
M24	**M16**	28	28	28	28
M27	**-**	30	-	30	30
-	**M20**	32	32	32	32
M30	**-**	35	35	35	35

Setting instructions

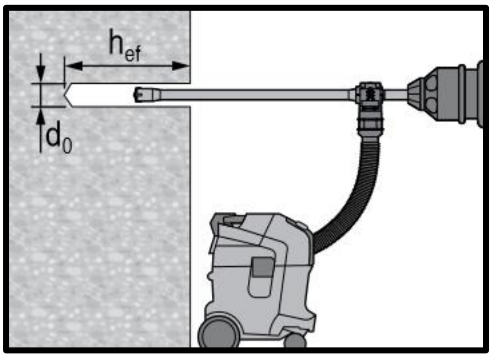
***For detailed information on installation see instruction for use given with the package of the product.**

Hole drilling



Hammer drilled hole

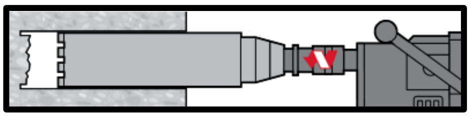
For dry or wet concrete and installation in flooded holes (no sea water).



Hammer drilled hole with Hollow drill bit

For dry and wet concrete, only.

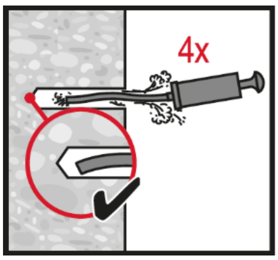
No cleaning required.



Diamond Coring

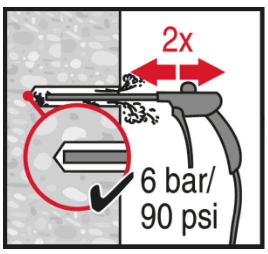
For dry and wet concrete only.

Hole cleaning



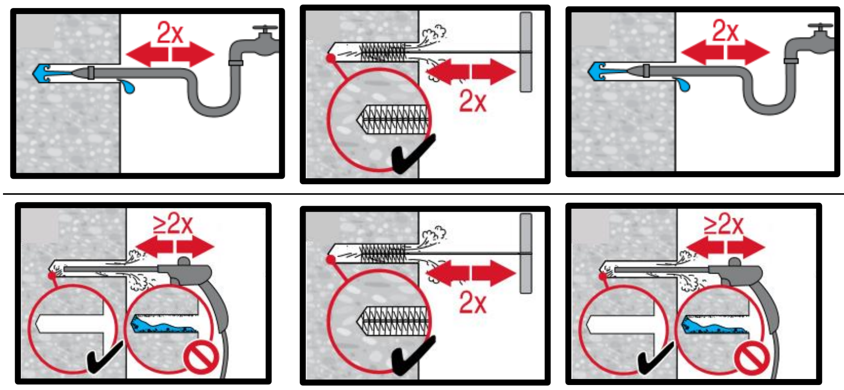
Manual cleaning for hammer drilled hole

for drill diameters $d_0 \leq 18$ mm and drill hole depth $h_0 \leq 10 \cdot d$.



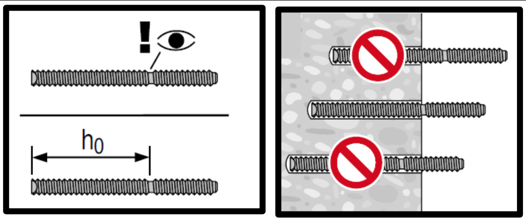
Compressed air cleaning (CAC) for hammer drilled hole

for all drill hole diameters d_0 and drill hole depths h_0.

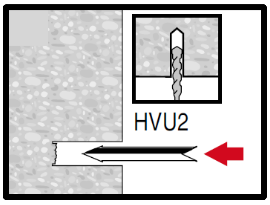


Hammer drilled flooded holes and diamond cored holes:
for all drill hole diameters d_0 and drill hole depths h_0.

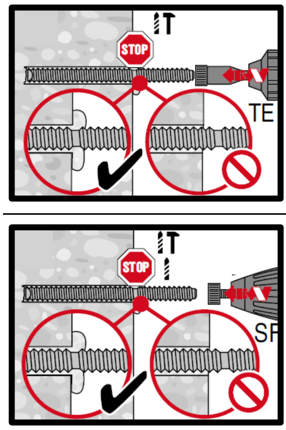
Setting the element



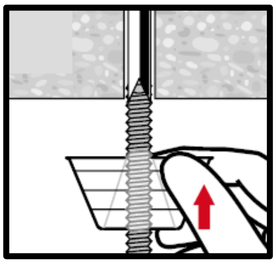
Check the setting depth.



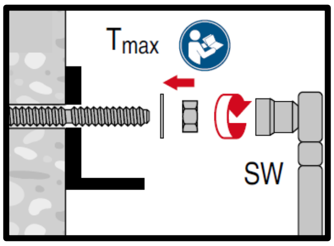
Insert the foil capsule with the peak ahead to the back of the hole.



Drive the anchor rod with the plugged tool into the hole.



Overhead installation.



Loading the anchor after required curing time t_{cure}.

附件三 材料廠商公司資料

經濟部商工登記公示資料查詢服務

公司基本資料

統一編號	22348814
公司狀況	核准設立
股權狀況	僑外資
公司名稱	喜利得股份有限公司
章程所訂外文公司名稱	Hilti Taiwan Company Ltd.
資本總額(元)	170,000,000
實收資本額(元)	110,000,000
每股金額(元)	100
已發行股份總數(股)	1,100,000
代表人姓名	Laurent Camille Gimenez
公司所在地	新北市板橋區新站路16號24樓 電子地圖
登記機關	新北市政府
核准設立日期	075年12月31日
最後核准變更日期	109年07月17日
複數表決權特別股	無
對於特定事項具否決權特別股	無
特別股股東被選為董事、監察人之禁止或限制或當選一定名額之權利	無
所營事業資料	F106010 五金批發業 F107170 工業助劑批發業 F107990 其他化學製品批發業 F113010 機械批發業 F113020 電器批發業 F113030 精密儀器批發業 F113060 度量衡器批發業 F120010 耐火材料批發業 F206010 五金零售業 F207170 工業助劑零售業 F207990 其他化學製品零售業 F213080 機械器具零售業 F213010 電器零售業 F213040 精密儀器零售業 F213050 度量衡器零售業 F220010 耐火材料零售業 F401010 國際貿易業 F401021 電信管制射頻器材輸入業 E903010 防蝕、防銹工程業 EZ99990 其他工程業 JA02010 電器及電子產品修理業 JE01010 租賃業 I301010 資訊軟體服務業 I301030 電子資訊供應服務業 ZZ99999 除許可業務外，得經營法令非禁止或限制之業務

正本

郵掛
2

新北市政府　函

機關地址：22001新北市板橋區中山路1段
161號3樓
承辦人：林梅蓁（603）
電　話：(02)29603456轉5289
傳　真：(02)29568030
電子郵件：AE9557@ntpc.gov.tw

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臺北市松山區敦化北路168號15樓
受文者：喜利得股份有限公司代理人：馬靜如律師

發文日期：中華民國109年07月17日
發文字號：新北府經司字第1098050134號
速別：普通件
密等及解密條件：普通
附件：規費收據暨變更登記表1份

主旨：貴公司（統一編號：22348814）申請法人股東改派代表人為董事、補選Laurent Camille Gimenez為董事長、委任盧俊文為經理人、經理人解任變更登記，經核符合規定，准予登記。

說明：

一、依公司法辦理兼復貴公司109年07月15日補正（收文日）申請書。

二、處分相對人名稱：喜利得股份有限公司（代表人姓名：Laurent Camille Gimenez、身分證照號碼：13BC8****）、公司所在地：新北市板橋區新站路16號24樓。

三、檢附規費收據暨變更登記表1份，請查收。

四、依公司法第22條-1規定，除外商公司、公開發行股票公司及國營事業外，公司應檢視本次變更若有董事、監察人、經理人及持有已發行股份總數或資本總額超過百分之十之股東等申報資料如有變動，公司應於變動後15日內前往「公司負責人及主要股東資訊申報平臺」(網址：https://ctp.tdcc.com.tw)執行變動申報。未依規定完成申報或申報不實之公司，經限期通知改正仍未改正者，可處新臺幣5~500萬元罰鍰，最重將可廢止公司登記。申報方式及相關規定可前往申報平臺瀏覽或電洽412-1166。

五、如涉及稅籍登記部分，請於開始營業前檢送負責人身分證明文件、公司章程、許可業務之核准文件等影本洽營業所在地稽徵機關辦理；詳細文件請逕洽各地區國稅局。

六、對本行政處分如有不服，請依訴願法第14條及第58條規定，自行政處分書到達之次日起30日內，繕具訴願書，向本府遞送（以實際收受訴願書之日期為準，而非投郵日），並將副本抄送經濟部（地址：臺北市中正區福州街15號）。

※有關全民健康保險部分，請檢送相關表件自行向衛生福利部中央健康保險署各分區業務組，辦理有關投保單位變更事宜，相關規定請至該署全球資訊網(https://www.nhi.gov.tw)參閱。

※如需查詢公司登記公示資料可至本部「商工登記公示資料查詢服務」(網址為https://findbiz.nat.gov.tw)輸入統一編號或公司名稱即可查

喜利得股份有限公司
送審專用
FOR REVIEW

喜利得股份有限公司　紀明智

統一編號：22348814

詢，公示資料查得之資料與本部公司登記資料一致，敬請多加利用。

正本：喜利得股份有限公司代理人：馬靜如律師
副本：喜利得股份有限公司　負責人：Laurent Camille Gimenez（無附件）

市長 侯友宜

本案依分層負責規定授權業務主管決行

裝 訂 線

喜利得股份有限公司 紀明智

喜利得股份有限公司
送審專用
FOR REVIEW

Certificate

Site certificate of main certificate Reg. no. H12455

SQS certifies herewith that the organisation mentioned below has at its disposal a management system which complies with the requirements of the normative directive listed.

Hilti Taiwan Co., Ltd.

24F., No. 16, Xinzhan Rd.,
Banqiao Dist., New Taipei City 220,
10060 Taipei Taiwan

Scope of certification

Sales

Normative base

ISO 9001:2015 Quality Management System

喜利得股份有限公司
送審專用
FOR REVIEW

喜利得股份有限公司 紀明智

Reg. no. S39941

Validity 01. 07. 2019 – 30. 06. 2022
Issue 01. 07. 2019

A. Grisard, President SQS

F. Müller, CEO SQS

sqs.ch

Swiss Association for Quality and Management Systems (SQS)
Bernstrasse 103, 3052 Zollikofen, Switzerland

Swiss Made

Partner of IQNet

4040_2/June 2019/Version 2.0