Deutsches Institut für Bautechnik DIBt

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European Technical Assessment Body for construction products

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European Technical Assessment

ETA-23/0277 of 2 June 2025

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4
Product family to which the construction product belongs	Post-installed fasteners in concrete under fatigue cyclic loading
Manufacturer	Hilti Aktiengesellschaft Feldkircherstrasse 100 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Plants
This European Technical Assessment contains	18 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 330250-01-0601, Edition 08/2024
This version replaces	ETA-23/0277 issued on 8 February 2024

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Specific Part

1 Technical description of the product

The Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4 is a bonded fasteners consisting of a cartridge with injection mortar Hilti HIT 200-A V3 or Hilti HIT 200-R V3 or HIT RE 500 V4 or mortar capsule HVU2 and steel element HAS-U A4 with lock nut, nut, spherical washer and Hilti sealing washer or a steel element HAS-U A4 with lock nut, nut and washer.

The load transfer is achieved by the bond between the steel element, the bonding mortar and the 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 (Assessment method C: Linearized function)	**Performance**
Characteristic fatigue resistance under cyclic tension loading	
Characteristic steel fatigue resistance $\Delta N_{Rk,s,0,n}$ (n = 1 to $n = \infty$)	See Annex C1, C2 and C4
Characteristic concrete cone and splitting fatigue resistance $\Delta N_{Rk,c,0,n}$ $\Delta N_{Rk,sp,0,n}$ (n = 1 to $n = \infty$)	
Characteristic combined pull-out /concrete cone fatigue resistance $\Delta\tau_{Rk,p,0,n}$ (n = 1 to $n = 10^8$ or $n = \infty$, depending on mortar and drilling method)	
Characteristic fatigue resistance under cyclic shear loading	
Characteristic steel fatigue resistance $\Delta V_{Rk,s,0,n}$ (n = 1 to $n = \infty$)	See Annex C3 and C4
Characteristic concrete edge fatigue resistance $\Delta V_{Rk,c,0,n}$ (n = 1 to $n = \infty$)	
Characteristic concrete pry out fatigue resistance $\Delta V_{Rk,cp,0,n}$ (n = 1 to $n = \infty$)	

Essential characteristic (Assessment method C: Linearized function)	**Performance**
Characteristic fatigue resistance under cyclic combined tension and shear loading	
Characteristic steel fatigue resistance a_s (n = 1 to n = ∞)	See Annex C3 and C5
Load transfer factor for cyclic tension and shear loading	
Load transfer factor ψ_{FN}, ψ_{FV}	See Annex C2 to C4

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

In accordance with European Assessment Document No. 330250-01-0601, 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 with Deutsches Institut für Bautechnik.

The following standards and documents are referred to in this European Technical Assessment:

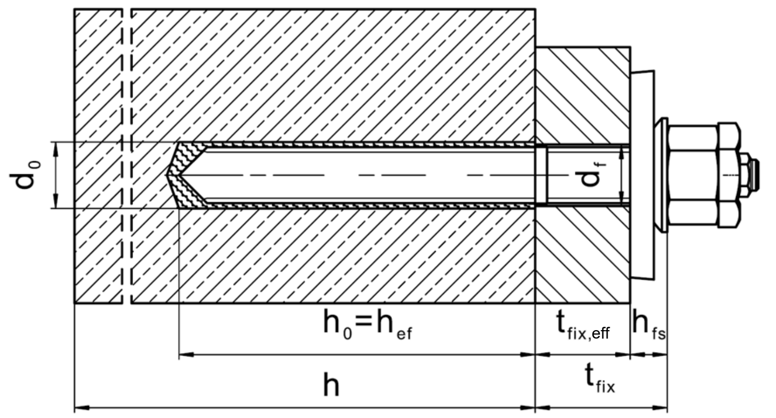
-	EN 1993-1-4:2006 + A1:2015	Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels
-	EN 10088-1:2014	Stainless steels - Part 1: List of stainless steels
-	EN 206:2013 + A2:2021	Concrete - Specification, performance, production and conformity
-	EN 1992-4:2018	Eurocode 2: Design of concrete structures - Part 4: Design of fastenings for use in concrete
-	EOTA TR 061	Design Method for fasteners in concrete under fatigue cyclic loading, August 2023
-	ETA-16/0515	European Technical Assessment for HVU2, 14 September 2023
-	ETA-19/0601	European Technical Assessment for Injection System Hilti HIT-HY 200-A V3 and HIT-HY 200-R V3, 29 January 2024
-	ETA-20/0541	European Technical Assessment for Injection system Hilti HIT-RE 500 V4, 9 June 2023

Issued in Berlin on 2 June 2025 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Stiller

Installed condition



Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4	**Annex A1**
Product description Installed condition	

Product description: Mortar capsule, injection mortar, fastener, and filling set

Adhesive anchor capsule HVU2 M8 to M24: resin and hardener with aggregate

Marking:
HVU2 M …
Expiry date mm/yyyy

Product name: “HVU2”

Injection mortar Hilti HIT-HY 200-A V3 and Hilti HIT-HY 200-R V3: hybrid system with aggregate
330 ml and 500 ml

Marking:
HILTI HIT
Production number and production line
Expiry date mm/yyyy

Product name: “Hilti HIT-HY 200-A V3”

Product name: “Hilti HIT-HY 200-R V3”

Injection mortar Hilti HIT-RE 500 V4: epoxy resin system with aggregate
330 ml, 500 ml and 1400 ml

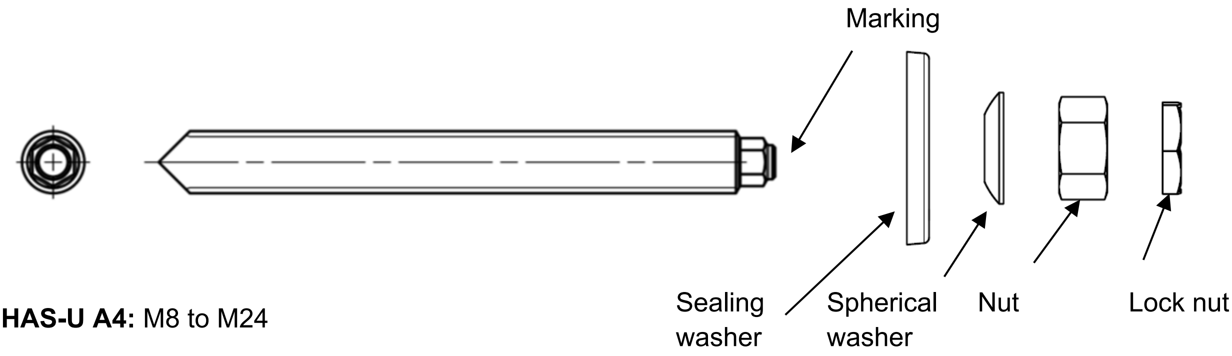
Marking:
HILTI HIT
Production number and production line
Expiry date mm/yyyy

Product name: “Hilti HIT-RE 500 V4”

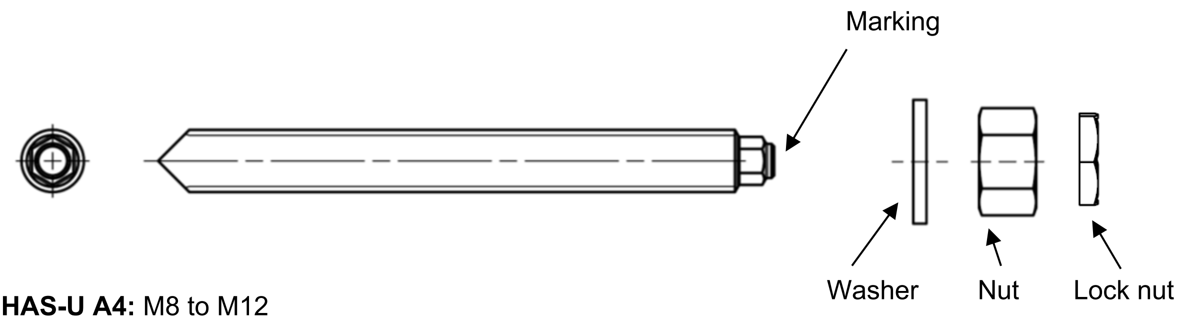
Static mixer Hilti HIT-RE-M

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4	**Annex A2**
Product description Mortar capsule and injection mortar	

Steel element



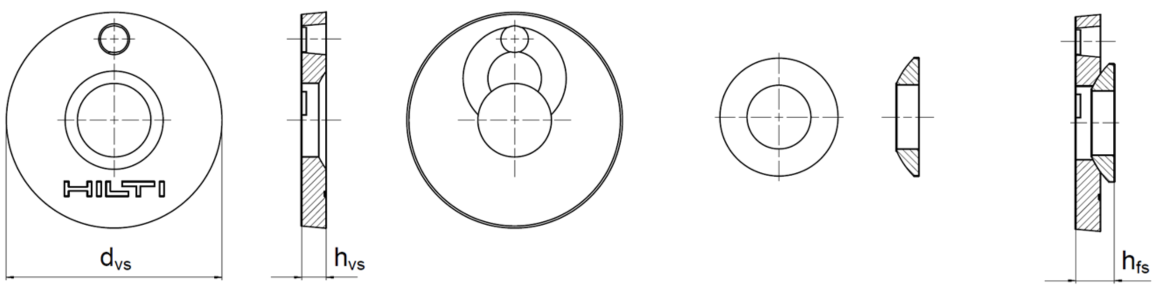
HAS-U A4: M8 to M24



HAS-U A4: M8 to M12

Hilti Filling Set to fill the annular gap between steel element and fixture.

Sealing washer Spherical washer Filling set



Hilti Filling Set			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Diameter of sealing washer	d_{VS}	[mm]	38	42	44	52	60	70
Thickness of sealing washer	h_{VS}	[mm]	5			6		
Thickness of Hilti Filling Set	h_{fS}	[mm]	8	9	10	11	13	15

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4

Product description
Steel element and Hilti Filling Set

Annex A3

Table A1: Materials

Steel elements made of stainless steel corrosion resistance class (CRC) III according EN 1993-1-4	
HAS-U A4	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm², Elongation at fracture (l_0=5d) > 12% ductile.
Nut	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm²; Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1
Washer	Stainless steel EN 10088-1
Lock nut	Stainless steel EN 10088-1
Hilti Filling Set A4	Filling washer: Stainless steel EN 10088-1 Spherical washer: Stainless steel EN 10088-1 Lock nut: Stainless steel EN 10088-1

Specifications of intended use

Anchorages subject to:

- Fatigue cycling load for size M8 to M24.
  Note: static and quasi-static load according to ETA-16/0515 for HVU2, ETA-19/0601 for HIT-HY 200-A V3 and HIT-HY 200-R V3 as well as ETA-20/0541 for HIT-RE 500 V4.

Base material:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206.
- Strength classes C20/25 to C50/60 according to EN 206.
- Cracked and uncracked concrete.

Temperature in the base material:

at installation and **in-service:**
See Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.
Note: max. short term temperature +80 °C for Hilti capsule and injection mortars.

Use conditions (Environmental conditions):

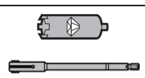
- For all conditions according EN 1993-1-4
  corresponding to corrosion resistance classes Annex A4 Table A1 (stainless steel).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Anchorages under fatigue cycling load are designed in accordance with:
  EN 1992-4 or EOTA Technical Report TR 061.NOTE: TR061 allows annular gap not filled for tension loading only (see table B2)
  NOTE: TR061 allows annular gap not filled for tension loading only (see table B2)

Installation:
See Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.

Table B1: Specifications of intended use – drilling techniques

Mortar capsule and injection mortar	HVU2	HIT-HY 200-A V3 HIT-HY 200-R V3	HIT-RE 500 V4
Hammer drilling 	✓	✓	✓
Hammer drilling with hollow drill bit TE-CD or TE-YD 	✓ ≥ M12	✓ ≥ M10	✓ ≥ M10
Diamond coring 	✓	-	✓ uncracked concrete only
Diamond coring with roughening with Hilti Roughening tool TE-YRT 	-	✓ ≥ M16	✓ ≥ M16

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4

Intended use
Specifications

Annex B1

Table B2: Specifications of intended use – installation options

Installation option	Annular gap filled		Annular gap not filled[3]	
	Hilti filling set[1] (pre-setting or through-setting)	Washer, nut, lock nut[2] (through-setting only)	Hilti filling set	Washer, nut, lock nut
all load direction	✓ M8 to M24	✓ M8 to M12	-	-
tension load only	-	-	✓ M8 to M24	✓ M8 to M12

1) Filling the gap between steel element and fixture using Hilti filling set with injection mortar HIT-HY … or HIT-RE ….
2) Filling the gap between steel element and fixture during setting of the steel element (ensure sufficient excess mortar so that the gap is 100% filled); use injection mortar HIT-HY 200-A V3/-R V3 only, maximum fixture thickness 2·d, even/flat concrete surface.
3) Unfilled annular gap covered by design according EOTA Technical Report TR 061 only.

Table B3: Installation parameters[1]

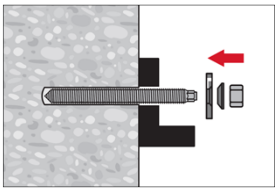
HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Steel stress cross section	A_s	[mm²]	36,6	58	84,3	157	245	353
Pre-setting: Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26
Through-setting: Maximum diameter of clearance hole in the fixture	d_f	[mm]	11	14	16	20	24	30
Minimum fixture thickness	$t_{fix,min}$ [2]	[mm]	8	10	12	16	20	24
Thickness of Hilti Filling Set	h_{fs}	[mm]	8	9	10	11	13	15
Effective fixture thickness with Hilti Filling Set	$t_{fix,eff}$	[mm]	$t_{fix,eff} = t_{fix} - h_{fs} \geq t_{fix,min}$					

1) See Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.
2) The minimum fixture thickness $t_{fix,min}$ can be replaced by a reduced minimum fixture thickness $t_{fix,min,red}$ if a reduced fatigue resistance in transverse direction $\Delta V_{Rk,s,0,red}$ is considered:
$t_{fix,min,red} = (0,5 + 0,5 \cdot \Delta V_{Rk,s,0,(n,\infty),red} / \Delta V_{Rk,s}) \cdot t_{fix,min}$
with $\Delta V_{Rk,s} = \Delta V_{Rk,s,0,n}$ for design method I (Table C2)
$\Delta V_{Rk,s} = \Delta V_{Rk,s,0,\infty}$ for design method II (Table C5)

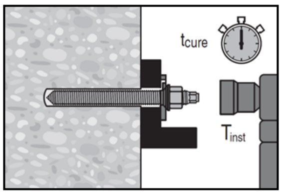
Installation instruction

See Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.

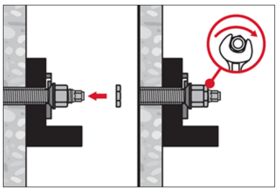
Installation of Hilti Filling Set to fill the annular gap between fastener and fixture.
Note: if the fastener is loaded in the axial direction only, the gap does not have to be filled.



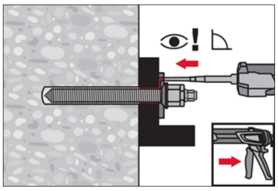
Use Hilti filling set with standard nut. Observe the correct orientation of filling washer and spherical washer.



The applied installation torque shall not exceed the values max. T_{inst} given in Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.

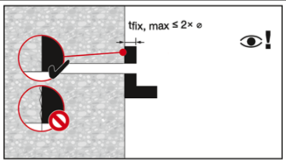


Installation of lock nut. Tighten with a ¼ to ½ turn.

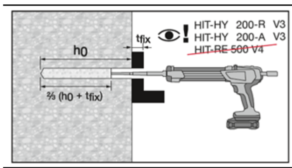


Fill the annular gap between the anchor rod and fixture with 1-3 strokes of a Hilti injection mortar HIT-HY … or HIT-RE … . Follow the installation instructions supplied with the Hilti injection mortar. After required curing time t_{cure} (see Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars) the anchor can be loaded.

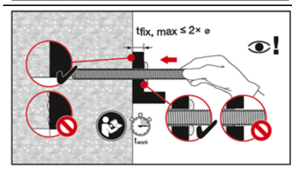
Through-setting to fill the annular gap between fastener and fixture. **Only with HIT-HY 200-A V3/-R V3.**
Note: if the fastener is loaded in the axial direction only, the gap does not have to be filled.



Observe an even/flat concrete surface and maximum fixture thickness of 2·d



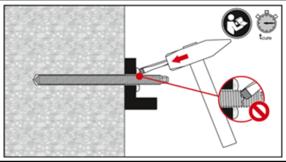
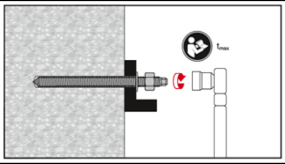
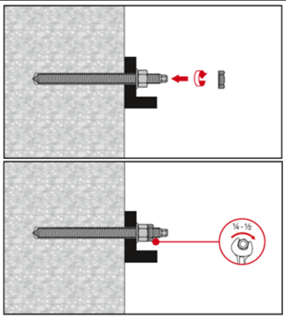
Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill minimum 2/3 of the drill hole depth and fixture thickness.



Set element to the required embedment depth before working time t_{work} has elapsed. The working time t_{work} is given in Annex B of the relevant ETA of injection mortar HIT-HY 200-A V3/-R V3. After setting the element the annular gap between the anchor and the fixture has to be filled with mortar.

In case of not completely filled annular gap additional use of Hilti filling set is required.

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4	**Annex B3**
Intended use Installation instructions	

	After required curing time t_{cure} (see Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars) remove excess mortar. Do not damage thread of element while removing excess mortar from through-setting.
	The applied installation torque shall not exceed the values max. T_{inst} given in Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars.
	Installation of lock nut. Tighten with a ¼ to ½ turn.

**Setting the fastener with clearance between concrete and anchor plate
(only if the fastener is loaded in the axial direction)**

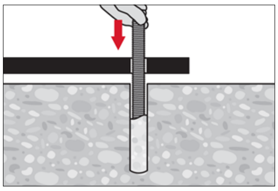
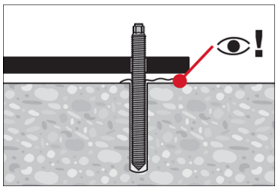
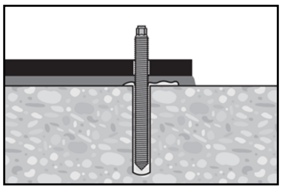
	Set the fastener to the required embedment depth before working time t_{work} (see Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars) has elapsed.
	Check if mortar excess from the borehole. The annular gap in the fixture does not have to be filled.
	After required curing time t_{cure} (see Annex B of the relevant ETA for the corresponding Hilti capsule and injection mortars) backfill the anchor plate.

Table C1: Essential characteristics under tension fatigue load in concrete (Design method I acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Steel failure								
Characteristic steel resistance		[N/mm²]	$\Delta\sigma_{Rk,s,N,0,n}$					
Number of cycles		$n \leq 10^4$	207,0	253,5				
		$10^4 \leq n \leq 5 \cdot 10^6$	$10^{(-0,194 \cdot \log(n)+3,092)}$	$10^{(-0,148 \cdot \log(n)+2,996)}$				
		$5 \cdot 10^6 < n \leq 10^8$	$10^{(-0,089 \cdot \log(n)+2,387)}$	$10^{(-0,069 \cdot \log(n)+2,466)}$				
		$n > 10^8$	47,3	82,0				
Characteristic steel resistance		[kN]	$\Delta N_{Rk,s,0,n} = A_s \cdot \Delta\sigma_{Rk,s,N,0,n}$					
Number of cycles	n	$\leq 10^4$	7,6	12,0	21,4	39,8	62,1	89,5
		$2 \cdot 10^5$	4,2	6,7	13,7	25,5	39,9	57,4
		10^6	3,1	4,9	10,8	20,1	31,4	45,3
		$2 \cdot 10^6$	2,7	4,3	9,8	18,2	28,4	40,9
		$5 \cdot 10^6$	2,3	3,6	8,5	15,9	24,8	35,7
		$\geq 10^8$	1,7	2,7	6,9	12,9	20,1	29,0
Combined pull-out and concrete cone failure in uncracked and cracked concrete for: • **HIT-HY 200-A V3 and HIT-HY 200-R V3** • **HIT-RE 500 V4 (Hammer drilling, Hammer drilling with hollow drill bit TE CD or TE YD, Diamond coring with roughening with Hilti Roughening tool TE-YRT)**								
Characteristic combined pull-out/concrete cone resistance		[N/mm²]	$\Delta\tau_{Rk,p(ucr,cr),0,n} = \eta_{k,p,N,fat,n} \cdot \tau_{Rk,(ucr,cr)}$ 1)					
Reduction factor		[-]	$\eta_{k,p,N,fat,n}$					
Number of cycles		$n \leq 10^4$	0,54					
		$10^4 \leq n \leq 5 \cdot 10^6$	$10^{(-0,0257 \cdot \log(n)-0,1643)}$					
		e.g. $2 \cdot 10^5$	0,50					
		e.g. 10^6	0,48					
		$5 \cdot 10^6 < n \leq 10^8$	$10^{(-0,0127 \cdot \log(n)-0,2514)}$					
		$n > 10^8$	0,44					
Combined pull-out and concrete cone failure in uncracked and cracked concrete for: • **HIT-RE 500 V4 (Diamond coring)** • **HVU2**								
Characteristic combined pull-out/concrete cone resistance		[N/mm²]	$\Delta\tau_{Rk,p(ucr,cr),0,n} = \eta_{k,p,N,fat,n} \cdot \tau_{Rk,(ucr,cr)}$ 1)					
Reduction factor		[-]	$\eta_{k,p,N,fat,n} = \max(1,2 \cdot n^{-0,08}; 0,4)$ with $n \leq 10^8$					
Number of cycles	n	$\leq 10^4$	0,57					
		e.g. $2 \cdot 10^5$	0,45					
		e.g. 10^6	0,4					
		$\leq 10^8$						

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4	**Annex C1**
Performance Essential characteristics under tension fatigue load in concrete (Design method I acc. to TR 061)	

Table C1: continued

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Concrete cone and splitting failure in uncracked and cracked concrete									
Characteristic concrete cone and splitting resistance		[kN]		$\Delta N_{Rk,(c,sp),0,n} = \eta_{k,(c,p),N,fat,n} \cdot N_{Rk,(c,sp)}$ [2)]					
Reduction factor		[-]		$\eta_{k,(c,sp),N,fat,n} = \max(1{,}1 \cdot n^{-0{,}055}; 0{,}5)$					
Number of cycles	n		$\leq 10^4$	0,66					
			$2 \cdot 10^5$	0,56					
			10^6	0,51					
			$\geq 2 \cdot 10^6$	0,50					
Load transfer factor for fastener group	ψ_{FN}	[-]		0,80					

1) $\tau_{Rk,(ucr,cr)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars.
2) $N_{Rk,(c,sp)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars and EN 1992-4.

Table C2: Essential characteristics under shear fatigue load in concrete (Design method I acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Steel failure without lever arm								
Characteristic steel resistance		[N/mm²]	$\Delta\sigma_{Rk,s,V,0,n}$					
Number of cycles		$n \leq 10^4$	135,2					
		$10^4 \leq n \leq 5 \cdot 10^6$	$10^{(-0,144 \cdot \log(n)+2,707)}$					
		$5 \cdot 10^6 < n \leq 10^8$	$10^{(-0,067 \cdot \log(n)+2,192)}$					
		$n > 10^8$	45,3					
Characteristic steel resistance		[kN]	$\Delta V_{Rk,s,0,n} = A_s \cdot \Delta\sigma_{Rk,s,V,0,n}$					
Number of cycles	n	$\leq 10^4$	4,9	7,8	11,4	21,2	33,1	47,7
		$2 \cdot 10^5$	3,2	5,1	7,4	13,8	21,5	31,0
		10^6	2,5	4,0	5,9	10,9	17,1	24,6
		$2 \cdot 10^6$	2,3	3,7	5,3	9,9	15,4	22,3
		$5 \cdot 10^6$	2,0	3,2	4,7	8,7	13,5	19,5
		$\geq 10^8$	1,7	2,6	3,8	7,1	11,1	16,0
Concrete pry-out failure in uncracked and cracked concrete								
Characteristic concrete pry-out resistance		[kN]	$\Delta V_{Rk,cp,0,n} = \eta_{k,cp,V,fat,n} \cdot V_{Rk,cp}$ [1)]					
Reduction factor		[-]	$\eta_{k,cp,V,fat,n} = \max(1,2 \cdot n^{-0,08}; 0,5)$					
Number of cycles	n	$\leq 10^4$	0,57					
		$\geq 2 \cdot 10^5$	0,50					
Concrete edge failure in uncracked and cracked concrete								
Effective length of fastener	l_f	[mm]	$\min(h_{ef}; 12 \cdot d_{nom})$					
Effective outside diameter	d_{nom}	[mm]	8	10	12	16	20	24
Characteristic concrete edge fatigue resistance		[kN]	$\Delta V_{Rk,c,0,n} = \eta_{k,c,V,fat,n} \cdot V_{Rk,c}$ [1)]					
Reduction factor		[-]	$\eta_{k,c,V,fat,n} = \max(1,2 \cdot n^{-0,08}; 0,5)$					
Number of cycles	n	$\leq 10^4$	0,57					
		$\geq 2 \cdot 10^5$	0,50					
Load transfer factor for fastener group	ψ_{FV}	[-]	0,80					

[1)] $V_{Rk,(cp,c)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars and EN 1992-4.

Table C3: Essential characteristics for combined fatigue load in concrete (Design method I acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Exponent for combined fatigue load	$\alpha_s = \alpha_{sn}$	[-]	1,0		1,4			
	α_c	[-]	1,5					

Table C4: Essential characteristics under tension fatigue load in concrete (Design method II acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Steel failure								
Characteristic steel resistance	$\Delta N_{Rk,s,0,\infty}$	[kN]	1,7	2,7	6,9	12,9	20,1	29,0
Combined pull-out and concrete failure in uncracked and cracked concrete for: • **HIT-HY 200-A V3 and HIT-HY 200-R V3** • **HIT-RE 500 V4 (Hammer drilling, Hammer drilling with hollow drill bit TE CD or TE YD, Diamond coring with roughening with Hilti Roughening tool TE-YRT)**								
Characteristic combined pull-out/concrete cone resistance		[N/mm²]	$\Delta\tau_{Rk,p(ucr,cr),0,10^8} = 0{,}44 \cdot \tau_{Rk,(ucr,cr)}$ 1)					
Combined pull-out and concrete failure in uncracked and cracked concrete for: • **HIT-RE 500 V4 (Diamond coring)** • **HVU2**								
Characteristic combined pull-out/concrete cone resistance		[N/mm²]	$\Delta\tau_{Rk,p(ucr,cr),0,10^8} = 0{,}4 \cdot \tau_{Rk,(ucr,cr)}$ 1)					
Concrete cone and splitting failure in uncracked and cracked concrete								
Characteristic concrete cone and splitting resistance		[kN]	$\Delta N_{Rk,(c,sp),0,\infty} = 0{,}5 \cdot N_{Rk,(c,sp)}$ 2)					
Load transfer factor for fastener group	ψ_{FN}	[-]	0,80					

1) $\tau_{Rk,(ucr,cr)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars.
2) $N_{Rk,(c,sp)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars and EN 1992-4.

Table C5: Essential characteristics under shear fatigue load in concrete (Design method II acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Steel failure without lever arm								
Characteristic resistance	$\Delta V_{Rk,s,0,\infty}$	[kN]	1,7	2,6	3,8	7,1	11,1	16,0
Concrete pry-out failure in uncracked and cracked concrete								
Characteristic concrete pry-out resistance		[kN]	$\Delta V_{Rk,cp,0,\infty} = 0{,}5 \cdot V_{Rk,cp}$ 1)					
Concrete edge failure in uncracked and cracked concrete								
Effective length of fastener	l_f	[mm]	min (h_{ef}; $12 \cdot d_{nom}$)					
Effective outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24
Characteristic concrete edge fatigue resistance		[kN]	$\Delta V_{Rk,c,0,\infty} = 0{,}5 \cdot V_{Rk,c}$ 1)					
Load transfer factor for fastener group	ψ_{FV}	[-]	0,80					

1) $V_{Rk,(cp,c)}$ see Annex C of the relevant ETA for the corresponding Hilti capsule and injection mortars and EN 1992-4.

Table C6: Essential characteristics for combined fatigue load in concrete (Design method II acc. to TR 061)

HIT-HY 200-A V3, HIT-HY 200-R V3, HIT-RE 500 V4 and HVU2 with HAS-U A4…			M8	M10	M12	M16	M20	M24
Exponent for combined fatigue load	$\alpha_s = \alpha_{sn}$	[-]	1,0		1,4			
	α_c	[-]	1,5					

Hilti injection system HIT-HY 200-A V3, HIT-HY 200-R V3, HIT RE 500 V4 and mortar capsule HVU2 with HAS-U A4	Annex C5
Performance Essential characteristics under tension, shear and combined fatigue load in concrete (Design method II acc. to TR 061)	