Technical and Test Institute for Construction Prague
Prosecká 811/76a
190 00 Prague
Czech Republic
eota@tzus.cz

Designated according to Article 29 of Regulation (EU) No 305/2011

Member of EOTA
www.eota.eu

European Technical Assessment

ETA 17/0005 of 03/07/2023

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague	
Trade name of the construction product	Injection system Hilti HIT-1 / HIT-1 CE
Product family to which the construction product belongs	Product area code: 33 Bonded injection type anchor for use in uncracked concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant(s)	Hilti Werke
This European Technical Assessment contains	15 pages including 12 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 Bonded fasteners for use in concrete
This version replaces	ETA 17/0005 issued on 10/09/2019

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

1. Technical description of the product

The Injection system Hilti HIT-1 / HIT-1 CE for uncracked concrete is a bonded anchor consisting of a cartridge with injection mortar and a steel element. The steel elements consists of Hilti threaded rods and commercial threaded rod, a hexagon nut and a washer. The steel elements are made of galvanized steel or stainless steel.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

The illustration and the description of the product are given in Annex A.

2. Specification of the intended use in accordance with the applicable EAD

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 provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the 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)	Annex C 1
Characteristic resistance to shear load (static and quasi-static loading)	Annex C 2
Displacements under short term and long term loading	Annex C 3
Durability	Annex B 1

3.2 Hygiene, health and environment (BWR 3)

No performance determined.

3.3 General aspects relating to fitness for use

Durability and serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

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

According to the Decision 96/582/EC of the European Commission[1] the system of assessment verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the construction works) or heavy units	-	1

[1] Official Journal of the European Communities L 254 of 08.10.1996

5. Technical details necessary for the implementation of the AVCP system, as provided in the applicable EAD

The factory production control shall be in accordance with the control plan which is a part of the technical documentation of this European Technical Assessment. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Technický a zkušební ústav stavební Praha, s.p.[2] The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

Issued in Prague on 03.07.2023

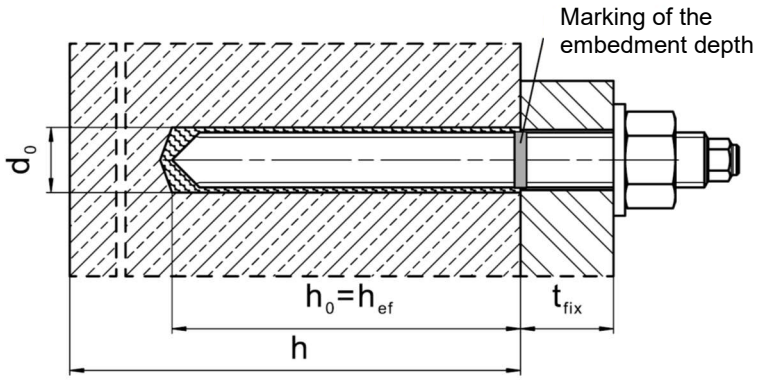
By

Ing. Jiří Studnička, Ph.D.
Head of the Technical Assessment Body

[2] The control plan is a confidential part of the documentation of the European Technical Assessment, but not published together with the ETA and only handed over to the approved body involved in the procedure of AVCP.

Installed condition

Figure A1:
Threaded rod, HAS…, HAS-U…, HIT-V-…



Injection system Hilti HIT-1 / HIT-1 CE	**Annex A 1**
Product description Installed conditions	

Product description: Injection mortar and steel elements

Injection mortar Hilti HIT-1 / HIT-1 CE: hybrid system with aggregate

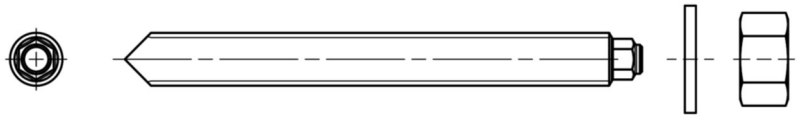
300 ml

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

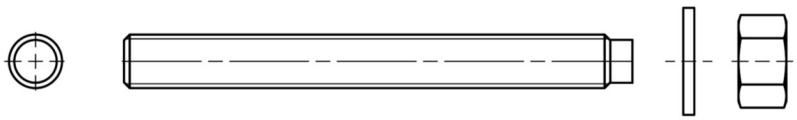
Product name: “Hilti HIT-1 / HIT-1 CE”

Static mixer Hilti HIT PM

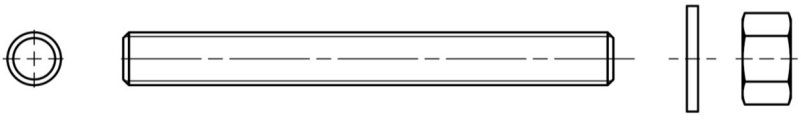
Steel elements



HAS-U…: M8 to M16 washer nut



HIT-V-…: M8 to M16 washer nut



HAS…, Threaded rod: M8 to M16 washer nut

Commercial standard threaded rod with:

- Materials and mechanical properties according to Table A1.
- Inspection certificate 3.1 according to EN 10204:2004. The document shall be stored.
- Marking of embedment depth.

Injection system Hilti HIT-1 / HIT-1 CE	**Annex A 2**
Product description Injection mortar / Static mixer / Steel elements	

Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
HAS 5.8 (HDG) HAS-U 5.8 (HDG), HIT-V-5.8 (F), Threaded rod 5.8	Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm² Elongation at fracture (l_0 = 5d) > 8% ductile Electroplated zinc coated ≥ 5 μm, (F) or (HDG) hot dip galvanized ≥ 50 μm
Threaded rod 6.8	Strength class 6.8, f_{uk} = 600 N/mm², f_{yk} = 480 N/mm² Elongation at fracture (l_0 = 5d) > 8% ductile Electroplated zinc coated ≥ 5 μm or hot dip galvanized ≥ 50 μm
HAS 8.8 (HDG) HAS-U 8.8 (HDG), HIT-V-8.8 (F), Threaded rod 8.8	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) or (HDG) hot dip galvanized ≥ 50 μm
Washer	Electroplated zinc coated ≥ 5 μm, hot dip galvanized ≥ 50 μm
Nut	Strength class of nut adapted to strength class of threaded rod Electroplated zinc coated ≥ 5 μm, hot dip galvanized ≥ 50 μm
Metal parts made of stainless steel Corrosion resistance class (CRC) II according EN 1993-1-4:2006+A1:2015	
Threaded rod	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile Stainless steel 1.4301, 1.4307, 1.4311, 1.4541, 1.4306, 1.4567 EN 10088-1:2014
Washer	Stainless steel EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod Stainless steel EN 10088-1: 2014
Metal parts made of stainless steel Corrosion resistance class (CRC) III according EN 1993-1-4:2006+A1:2015	
HAS A4 HAS-U A4, HIT-V-R	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile
Threaded rod	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Washer	Stainless steel EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod Stainless steel EN 10088-1: 2014
Metal parts made of high corrosion resistant steel Corrosion resistance class (CRC) V according EN 1993-1-4:2006+A1:2015	
HAS-U HCR, HIT-V-HCR	f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile
Threaded rod	f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Washer	High corrosion resistant steel EN 10088-1:2014
Nut	Strength class of nut adapted to strength class of threaded rod High corrosion resistant steel EN 10088-1:2014

Injection system Hilti HIT-1 / HIT-1 CE

Product description
Materials

Annex A 3

Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.

Base material:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2013.
- Strength classes C20/25 to C50/60 according to EN 206-1:2013.
- Uncracked concrete

Temperature in the base material:

- **at installation**

  - 5 °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)

Table B1: Specifications of intended use

		HIT-1 / HIT-1 CE with …
Elements		Threaded rod according to Annex A 
Hammer drilling 		✓
Use category	Dry or wet concrete (not in flooded holes)	✓
Static and quasi static loading in uncracked concrete		M8 to M16

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 materials are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- The anchorages are designed in accordance with:

  EN 1992-4:2018

Installation:

- Use category: dry or wet concrete (not in flooded holes)
- Drilling technique:
  - Hammer drilling
- Installation direction D3: downward and horizontal and upward (e.g. overhead) installation admissible for all elements.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site

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Injection system Hilti HIT-1 / HIT-1 CE	**Annex B 2**
Intended use Specifications	

Table B2: Installation parameters for threaded rod according to Annex A

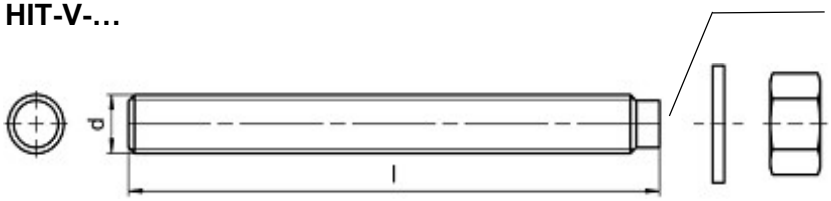
Threaded rod according to Annex A			M 8	M 10	M 12	M 16
Diameter of element	d	[mm]	8	10	12	16
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18
Effective embedment depth a drill hole depth	$h_{ef} = h_0$	[mm]	60 to 160	60 to 200	70 to 240	80 to 320
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18
Diameter of steel brush	d_b	[mm]	10	12	14	18
Minimum thickness of member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + $2d_0$
Maximum torque moment	T_{max}	[Nm]	10	20	40	80
Minimum spacing	s_{min}	[mm]	40	50	60	80
Minimum edge distance	c_{min}	[mm]	40	50	60	80

HAS-U…

Marking:

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

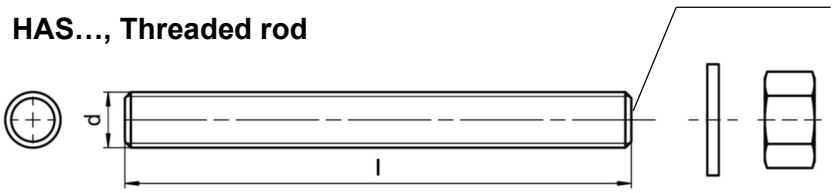
HIT-V-…



Marking:

5.8 - l = HIT-V-5.8 M…x l
5.8F - l = HIT-V-5.8F M…x l
8.8 - l = HIT-V-8.8 M…x l
8.8F - l = HIT-V-8.8F M…x l
R - l = HIT-V-R M…x l
HCR - l = HIT-V-HCR M…x l

HAS…, Threaded rod



HAS Colour code marking:

5.8 = RAL 5010 (blue)
8.8 = RAL 1023 (yellow)
A4 = RAL 3000 (red)

Injection system Hilti HIT-1 / HIT-1 CE

Intended use
Installation parameters

Annex B 3

Table B3: Maximum working time and minimum curing time [1)]

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
-5 °C to -1 °C	1,5 hours	6 hours
0 °C to +4 °C	45 min	3 hours
+5 °C to +9 °C	25 min	2 hours
+10 °C to +14 °C	20 min	100 min
+15 °C to +19 °C	15 min	80 min
+20 °C to +29 °C	6 min	45 min
+30 °C to +34 °C	4 min	25 min
+35 °C to +39 °C	2 min	20 min

[1)] The curing time data are valid for dry base material only.
In wet base material the curing times must be doubled.

Table B4: Parameters of cleaning and setting tools

Elements	Drill and clean		Installation
Threaded rod (Annex A)	Hammer drilling	Brush	Piston plug
			
size	d_0 [mm]	HIT-RB	HIT-SZ
M8	10	10	10
M10	12	12	12
M12	14	14	14
M16	18	18	18

Cleaning alternatives

Manual Cleaning with Machine Brushing (MCMB):
Hilti hand pump for blowing out drill holes with diameters $d_0 \leq 20$ mm and drill hole depths $h_0 \leq 10 \cdot d$

Compressed Air Cleaning with Machine Brushing (CACMB):
Air nozzle with an orifice opening of minimum 3,5 mm in diameter (min. 6 bar).

Injection system Hilti HIT-1 / HIT-1 CE

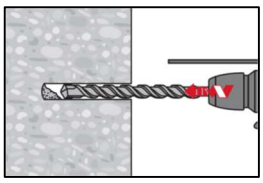
Intended use
Maximum working time and minimum curing time
Parameters of drilling, cleaning and setting tools

Annex B 4

Installation instruction

Hole drilling

Hammer drilling



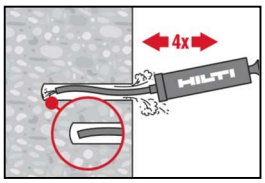
Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B2).

Drill hole cleaning

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

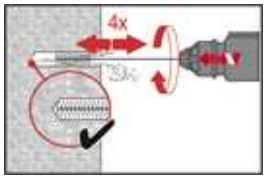
Manual Cleaning with Machine Brushing (MCMB)

for drill hole diameters $d_0 \leq 20$ mm and drill hole depths $h_0 \leq 10 \cdot d$

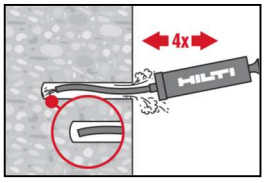


The Hilti hand pump may be used for blowing out drill holes up to diameters $d_0 \leq 20$ mm and embedment depths up to $h_{ef} \leq 10 \cdot d$.

Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust.



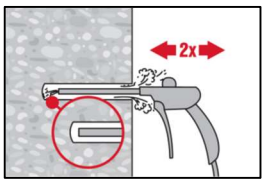
Check brush diameter (Table B2) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized HIT-RB wire brush (Table B4) a minimum of four times.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.



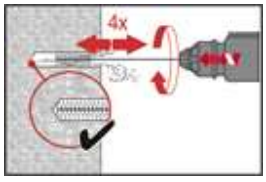
Blow out again with the Hilti hand pump at least 4 times until return air stream is free of noticeable dust.

Compressed Air Cleaning with Machine Brushing (CACMB)

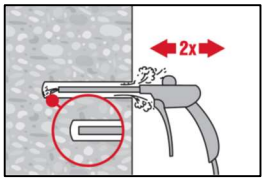
for all drill hole diameters d_0 and all drill hole depths h_0



Blow 4 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.



Check brush diameter (Table B2) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized HIT-RB wire brush (Table B4) a minimum of four times.
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.



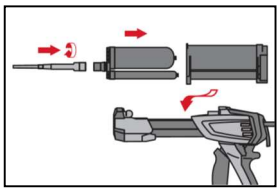
Blow again with compressed air 4 times until return air stream is free of noticeable dust.

Injection system Hilti HIT-1 / HIT-1 CE

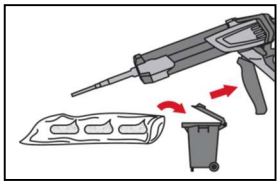
Intended use
Installation instructions

Annex B 5

Injection preparation

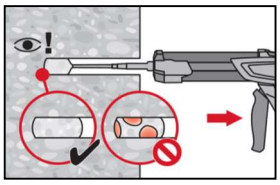


Tightly attach new Hilti mixing nozzle HIT PM to foil pack manifold (snug fit). Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser and the mortar.
Check foil pack holder for proper function. Do not use damaged foil packs / holders.
Insert foil pack into foil pack holder and put holder into HIT-dispenser.

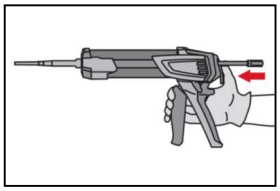


Prior to dispensing into the drill hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey colour. For foil tube cartridges it must be discarded a minimum of six full strokes.

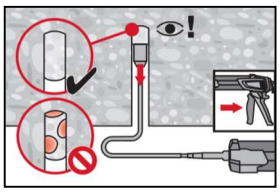
Inject adhesive from the back of the drill hole without forming air voids.



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
Fill approximately 2/3 of the drill hole to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

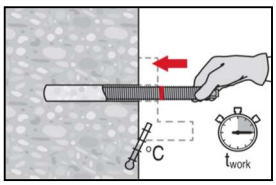


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

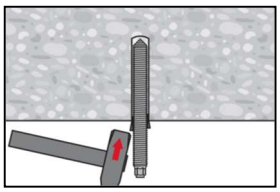


Overhead installation and/or installation with embedment depth hef > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT PM mixer, extension(s) and appropriately sized piston plug (see Table B4). Insert piston plug to back of the hole and inject adhesive.
During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.

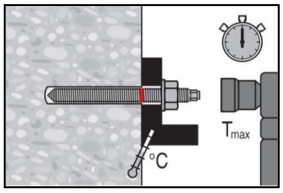
Setting the element



Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth until working time t_{work} has elapsed. The working time t_{work} is given in Table B3.



For overhead installation use piston plugs and fix embedded parts with e.g. wedges (HIT-OHW).

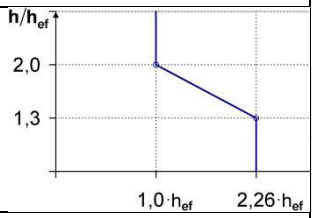


Loading the anchor: After required curing time t_{cure} (see Table B3) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2.

Injection system Hilti HIT-1 / HIT-1 CE	**Annex B 6**
Intended use Installation instructions	

Table C1: Essential characteristics for threaded rod according to Annex A under tension load in uncracked concrete

Threaded rod according to Annex A			**M 8**	**M 10**	**M 12**	**M 16**
Installation safety factor	γ_{inst}	[-]	1,2			
Steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$			
Partial factor grade 5.8 + 6.8	$\gamma_{Ms,N}$ 1)	[-]	1,5			
Partial factor grade 8.8	$\gamma_{Ms,N}$ 1)	[-]	1,5			
Partial factor HAS A4, HAS-U A4, HIT-V-R, Threaded rod: CRC II and III (Table A1)	$\gamma_{Ms,N}$ 1)	[-]	1,86			
Partial factor HAS-U HCR, HIT-V-HCR, Threaded rod: CRC V (Table A1)	$\gamma_{Ms,N}$ 1)	[-]	1,5			
Combined pullout and concrete cone failure						
Characteristic bond resistance in uncracked concrete C20/25						
Temperature range I: 24 °C / 40 °C	$\tau_{Rk,ucr}$	[N/mm²]	7,0	7,0	7,0	6,0
Temperature range II: 50 °C / 80 °C	$\tau_{Rk,ucr}$	[N/mm²]	5,0	5,0	5,0	4,5
Influence factors ψ on bond resistance τ_{Rk}						
Uncracked concrete: Factor for concrete strength	ψ_c	C25/30	1,04			
		C30/37	1,08			
		C35/45	1,13			
		C40/50	1,15			
		C45/55	1,17			
		C50/60	1,19			
Concrete cone failure						
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0			
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 / hef ≥ 2,0		1,0 · hef			
	2,0 > h / hef > 1,3		4,6 hef - 1,8 h			
	h / hef ≤ 1,3		2,26 hef			
Spacing	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$			



1) In absence of national regulations.

Injection system Hilti HIT-1 / HIT-1 CE

Performances
Essential characteristics under tension load in concrete

Annex C 1

Table C2: Essential characteristics for threaded rod according to Annex A under shear load in uncracked concrete

Threaded rod according to Annex A			M 8	M 10	M 12	M 16
Steel failure without lever arm						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$			
Partial factor grade 5.8 + 6.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Partial factor grade 8.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Partial factor HAS A4, HAS-U A4, HIT-V-R, Threaded rod: CRC II and III (Table A1)	$\gamma_{Ms,V}$ [1)]	[-]	1,56			
Partial factor HAS-U HCR, HIT-V-HCR, Threaded rod: CRC V (Table A1)	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Steel failure with lever arm						
Characteristic 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	[-]	$\min (h_{ef}; 12 \cdot d_{nom})$			
Outside diameter of fastener	d_{nom}	[-]	8	10	12	16

[1)] In absence of national regulations.

Injection system Hilti HIT-1 / HIT-1 CE

Performances
Essential characteristics under shear load in concrete

Annex C 2

Table C3: Displacements under tension load

Threaded rod according to Annex A			M 8	M 10	M 12	M 16
Uncracked concrete temperature range I: 24 °C / 40 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,03	0,04	0,05	0,07
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,07	0,08	0,08	0,08
Uncracked concrete temperature range II: 50 °C / 80 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,02	0,03	0,03	0,04
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,15	0,17	0,17	0,17

Table C4: Displacements under shear load

Threaded rod according to Annex A			M 8	M 10	M 12	M 16
Displacement	δ_{V0}-factor	[mm/(kN)]	0,02	0,02	0,01	0,01
	$\delta_{V\infty}$-factor	[mm/(kN)]	0,03	0,02	0,02	0,01