Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-18/0837 of 29 November 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	Injection System Hilti HIT-HY 200 with roughening tool
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Hilti Entwicklungsgesellschaft mbH Hiltistraße 6 86916 Kaufering DEUTSCHLAND
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	38 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

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Specific Part

1 Technical description of the product

The Injection system Hilti HIT-HY 200 is a bonded anchor consisting of a foil pack with injection mortar Hilti HIT-HY 200-A or Hilti HIT-HY 200-R and a steel element according to Annex A.

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 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 static and quasi-static loading	See Annex C1 to C9
Displacements (static and quasi-static loading)	See Annex C10 to C13
Characteristic resistance and displacements for seismic performance category C1 and C2	See Annex C14 to C18

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 the European Assessment Document EAD 330499-00-0601 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 29 November 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Lange

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Installed condition

Figure A1:

Threaded rod, HIT-V-… and AM 8.8

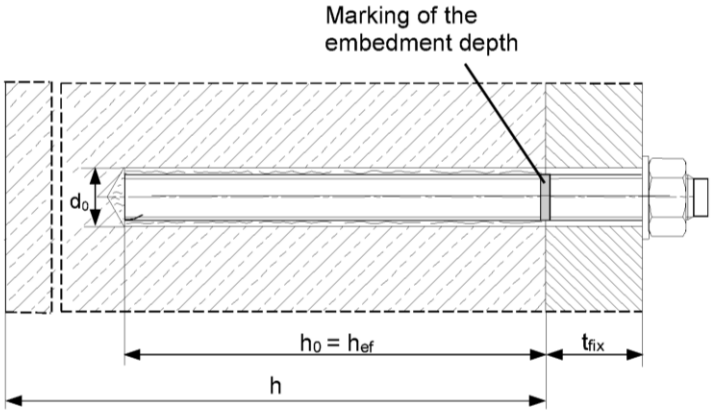


Figure A2:

Threaded rod, HIT-V-… and AM 8.8 with Hilti Filling Set

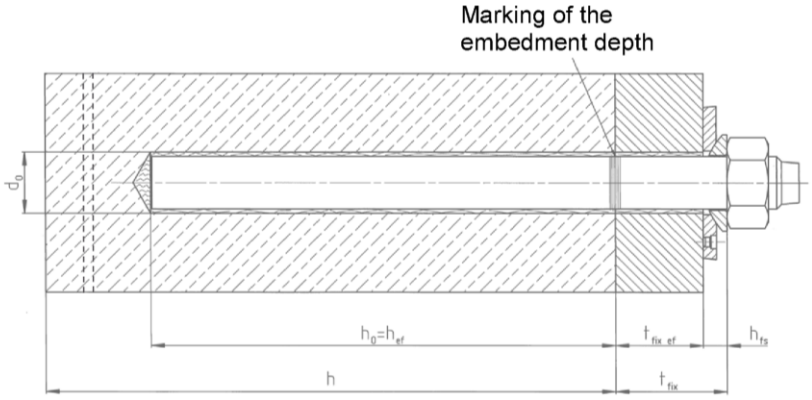
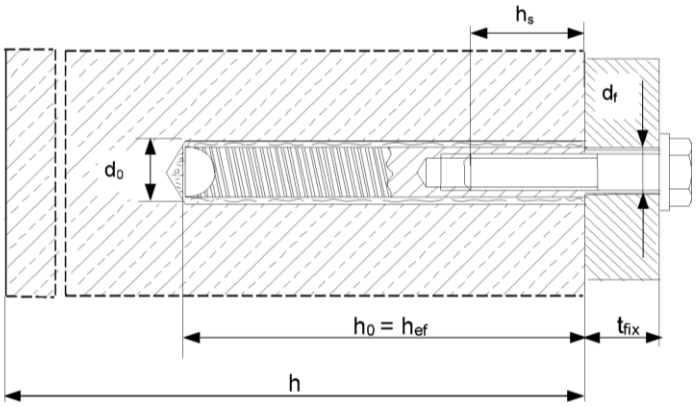


Figure A3:

Internally threaded sleeve HIS-(R)N



Injection System Hilti HIT-HY 200 with roughening tool	Annex A1
Product description Installed condition	

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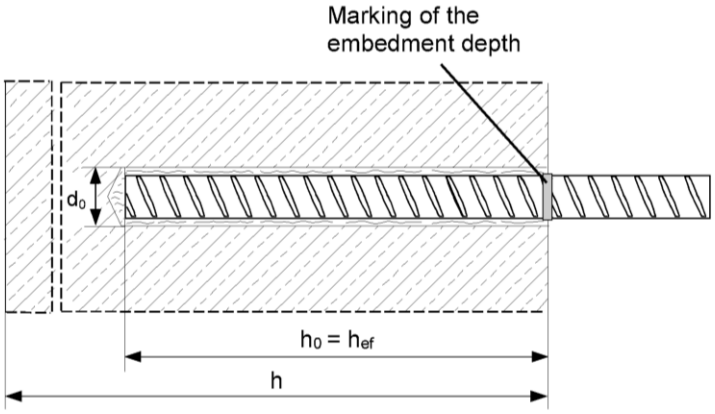
Installed condition

Figure A4:
Reinforcing bar



Injection System Hilti HIT-HY 200 with roughening tool	Annex A2
Product description Installed condition	

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Product description: Injection mortar and steel elements

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

Product name: "Hilti HIT-HY 200-A"

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

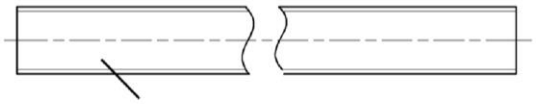
Product name: "Hilti HIT-HY 200-R"

Static mixer Hilti HIT-RE-M

Steel elements

Threaded rod and HIT-V-…: M16 to M30

washer nut



Hilti AM 8.8 meter rod electroplated zinc coated, AM HDG 8.8 hot dip galvanized
M16 to M30, 1m to 3m

Commercial standard threaded rod:
- 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-HY 200 with roughening tool	Annex A3
Product description Injection mortar / Static mixer / Steel elements	

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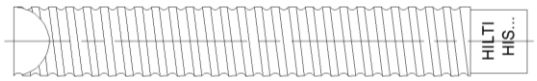
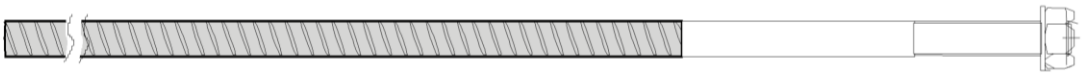
Product description: Injection mortar and steel elements

Steel elements



Internally threaded sleeve: HIS-(R)N M10 to M20



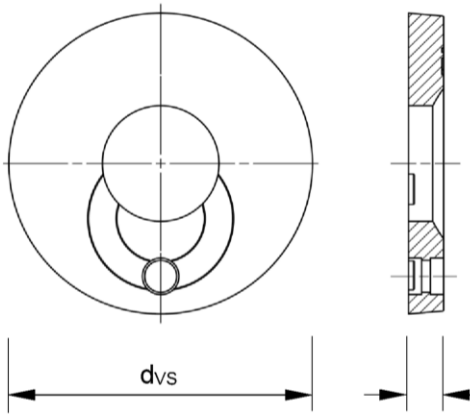
Hilti Tension Anchor: HZA M16 to M27 and HZA-R M16 to M24

Reinforcing bar (rebar): ϕ 14 to ϕ 32

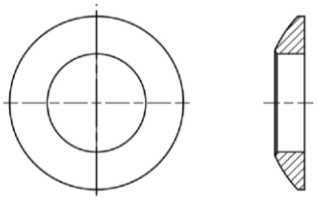
- Materials and mechanical properties according to Table A1
- Dimensions according to Annex B6

Hilti Filling Set to fill the annular gap between anchor and fixture

Sealing washer



Spherical washer



Filling Set			M16	M20	M24
Diameter of sealing washer	d_{VS}	[mm]	56	60	70
Thickness of sealing washer	h_{VS}	[mm]	6		

Injection System Hilti HIT-HY 200 with roughening tool	Annex A4
Product description Injection mortar / Static mixer / Steel elements	

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Table A1: Materials

Designation	Material
Reinforcing bars	
Rebar: EN 1992-1-1: 2004 and AC:2010, Annex C	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$
Metal parts made of zinc coated steel	
Threaded rod, HIT-V-5.8(F)	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) hot dip galvanized ≥ 45 µm
Threaded rod, HIT-V-8.8(F)	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
Hilti Meter rod, AM 8.8 (HDG)	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
Hilti tension anchor HZA	Round steel with threaded part: electroplated zinc coated ≥ 5 µm Rebar: Bars class B according to NDP or NCL of EN 1992-1-1/NA
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, (F) hot dip galvanized ≥ 45 µm
Hilti filling set (F)	Filling washer: Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm Spherical washer: Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm Lock nut: Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm
Metal parts made of stainless steel	
Threaded rod, HIT-V-R	For ≤ M24: strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm²; For > M24: strength class 50, f_{uk} = 500 N/mm², f_{yk} = 210 N/mm²; Elongation at fracture (l_0=5d) > 8% ductile Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Hilti tension anchor HZA-R	Round steel with threaded part: Stainless steel 1.4404, 1.4362, 1.4571 EN 10088-1:2014 Rebar: Bars class B according to NDP or NCL of EN 1992-1-1/NA
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

Injection System Hilti HIT-HY 200 with roughening tool	Annex A5
Product description Materials	

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Table A1: continued

Metal parts made of high corrosion resistant steel	
Threaded rod HIT-V-HCR	For ≤ M20: f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², For > M20: f_{uk} = 700 N/mm², f_{yk} = 400 N/mm², Elongation at fracture (l_0=5d) > 8% 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

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.
- Seismic performance category C1 and C2 (see Table B1).

Base material:

- Reinforced or unreinforced normal weight concrete without fibres according to EN 206-1:2013.
- Strength classes C20/25 to C50/60 according to EN 206-1:2013.
- Cracked and non-cracked 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 time temperature +40 °C)
  Temperature range II: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short time temperature +80 °C)
  Temperature range III: -40 °C to +120 °C
  (max. long term temperature +72 °C and max. short time temperature +120 °C)

Table B1: Specifications of intended use

	HIT-HY 200-A or HIT-HY 200-R with …			
Elements	HIT-V … AM 8.8 	Rebar 	HZA(-R) 	HIS-(R)N 
Diamond drilling with roughening tool TE-YRT 	✓	✓	✓	✓
Static and quasi static loading in cracked and non-cracked concrete	M16 to M30	ϕ 14 to ϕ 32	M16 to M27	M10 to M20
Seismic performance category C1	M16 to M30	ϕ 14 to ϕ 32	M16 to M27	-
Seismic performance category C2	M16 to M24, HIT-V 8.8, AM 8.8 HIT-V-F 8.8, AM HDG 8.8 Commercial standard rod (electroplated zinc coated only)	-	-	-

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

Installation:

- Use category: dry or wet concrete (not in flooded holes)
- Drilling technique: diamond coring with roughening with Hilti roughening tool TE-YRT.
- Installation direction: D3: downward and horizontal and upwards (e.g. overhead) installation for 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.

Injection System Hilti HIT-HY 200 with roughening tool	Annex B2
Intended Use Specifications	

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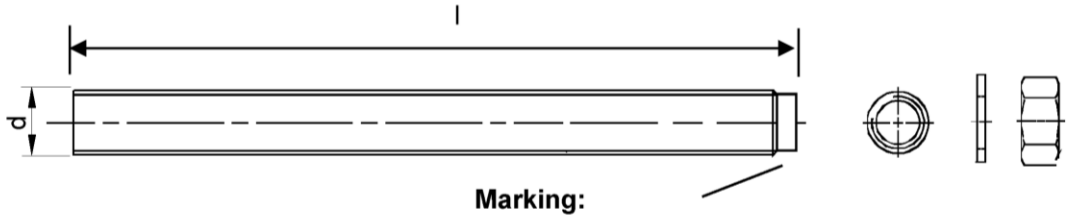
Table B2: Installation parameters of threaded rod, HIT-V-… and AM 8.8

Threaded rod, HIT-V-… and AM 8.8			M16	M20	M24	M27	M30
Diameter of element	d	[mm]	16	20	24	27	30
Nominal diameter of drill bit	d_0	[mm]	18	22	28	30	35
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	80 to 320	90 to 400	96 to 480	108 to 540	120 to 600
Maximum diameter of clearance hole in the fixture	d_f	[mm]	18	22	26	30	33
Thickness of Hilti filling set	h_{fs}	[mm]	11	13	15	-	-
Effective fixture thickness with Hilti filling set	$t_{fix,eff}$	[mm]	$t_{fix,eff} = t_{fix} - h_{fs}$				
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef} + 2 \cdot d_0$				
Maximum torque moment	T_{max}	[Nm]	80	150	200	270	300
Minimum spacing	s_{min}	[mm]	75	90	115	120	140
Minimum edge distance	c_{min}	[mm]	50	55	60	75	80

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

Hilti meter rod AM (HDG) 8.8

Injection System Hilti HIT-HY 200 with roughening tool

Intended Use
Installation parameters of threaded rod, HIT-V-… and AM 8.8

Annex B3

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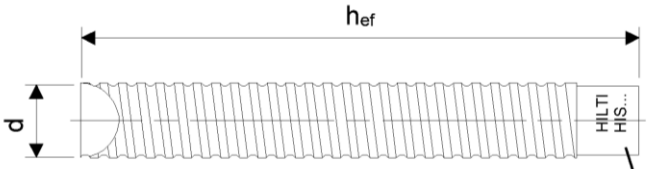
Table B3: Installation parameters of internally threaded sleeve HIS-(R)N

Internally threaded sleeve HIS-(R)N…			**M10**	**M12**	**M16**	**M20**
Outer diameter of sleeve	d	[mm]	16,5	20,5	25,4	27,6
Nominal diameter of drill bit	d_0	[mm]	18	22	28	32
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	110	125	170	205
Maximum diameter of clearance hole in the fixture	d_f	[mm]	12	14	18	22
Minimum thickness of concrete member	h_{min}	[mm]	150	170	230	270
Maximum torque moment	T_{max}	[Nm]	20	40	80	150
Thread engagement length min-max	h_s	[mm]	10-25	12-30	16-40	20-50
Minimum spacing	s_{min}	[mm]	75	90	115	130
Minimum edge distance	c_{min}	[mm]	45	55	65	90

Internally threaded sleeve HIS-(R)N…



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

Injection System Hilti HIT-HY 200 with roughening tool	**Annex B4**
Intended Use Installation parameters of internally threaded sleeve HIS-(R)N	

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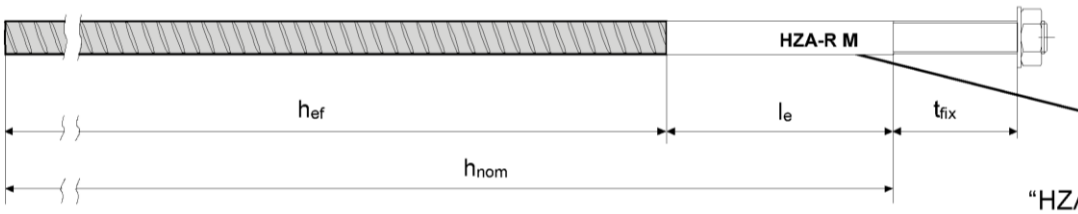
Table B4: Installation parameters of Hilti tension anchor HZA-R

Hilti tension anchor HZA-R …			**M16**	**M20**	**M24**
Rebar diameter	ϕ	[mm]	16	20	25
Nominal embedment depth and drill hole depth	$h_{nom} = h_0$	[mm]	180 to 320	190 to 400	200 to 500
Effective embedment depth ($h_{ef} = h_{nom} - l_e$)	h_{ef}	[mm]	$h_{nom} - 100$		
Length of smooth shaft	l_e	[mm]	100		
Nominal diameter of drill bit	d_0	[mm]	20	25	32
Maximum diameter of clearance hole in the fixture	d_f	[mm]	18	22	26
Maximum torque moment	T_{max}	[Nm]	80	150	200
Minimum thickness of concrete member	h_{min}	[mm]	$h_{nom} + 2 \cdot d_0$		
Minimum spacing	s_{min}	[mm]	80	100	130
Minimum edge distance	c_{min}	[mm]	50	55	60

Table B5: Installation parameters of Hilti tension anchor HZA

Hilti tension anchor HZA…			**M16**	**M20**	**M24**	**M27**
Rebar diameter	ϕ	[mm]	16	20	25	28
Nominal embedment depth and drill hole depth	$h_{nom} = h_0$	[mm]	100 to 320	110 to 400	120 to 500	140 to 560
Effective embedment depth ($h_{ef} = h_{nom} - l_e$)	h_{ef}	[mm]	$h_{nom} - 20$			
Length of smooth shaft	l_e	[mm]	20			
Nominal diameter of drill bit	d_0	[mm]	20	25	32	35
Maximum diameter of clearance hole in the fixture	d_f	[mm]	18	22	26	30
Maximum torque moment	T_{max}	[Nm]	80	150	200	270
Minimum thickness of concrete member	h_{min}	[mm]	$h_{nom} + 2 \cdot d_0$			
Minimum spacing	s_{min}	[mm]	80	100	130	140
Minimum edge distance	c_{min}	[mm]	50	55	60	75



Injection System Hilti HIT-HY 200 with roughening tool

Intended Use
Installation parameters of Hilti tension anchor HZA-(R)

Annex B5

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Table B6: Installation parameters of reinforcing bar

Reinforcing bar (rebar)			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Diameter	ϕ	[mm]	14	16	20	25	26	28	30	32
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	75 to 280	80 to 320	90 to 400	100 to 500	104 to 520	112 to 560	120 to 600	128 to 640
Nominal diameter of drill bit	d_0	[mm]	18	20	25	32	32	35	37	40
Minimum thickness of concrete member	h_{min}	[mm]	$h_{ef} + 2 \cdot d_0$							
Minimum spacing	s_{min}	[mm]	70	80	100	125	130	140	150	160
Minimum edge distance	c_{min}	[mm]	50	50	65	70	75	75	80	80

[1] Each of the two given values can be used.

Reinforcing bar

For rebar bolt

- Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010
- Rib height of the bar h_{rib} shall be in the range $0{,}05 \cdot \phi \le h_{rib} \le 0{,}07 \cdot \phi$
  (ϕ: Nominal diameter of the bar; h_{rib}: Rib height of the bar)

Injection System Hilti HIT-HY 200 with roughening tool

Intended Use
Installation parameters of reinforcing bar (rebar)

Annex B6

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Table B7: Maximum working time and minimum curing time Hilti-HY 200-A

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
> 0 °C to 5 °C	25 min	2 hours
> 5 °C to 10 °C	15 min	75 min
> 10 °C to 20 °C	7 min	45 min
> 20 °C to 30 °C	4 min	30 min
> 30 °C to 40 °C	3 min	30 min

Table B8: Maximum working time and minimum curing time Hilti-HY 200-R

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
> 0 °C to 5 °C	1 hours	4 hours
> 5 °C to 10 °C	40 min	2,5 hours
> 10 °C to 20 °C	15 min	1,5 hours
> 20 °C to 30 °C	9 min	1 hours
> 30 °C to 40 °C	6 min	1 hours

Table B9: Parameters of cleaning and setting tools

Elements				Drill and clean			Installation
Threaded rod, HIT-V-. AM 8.8	HIS-(R)N	Rebar	HZA(-R)	Diamond coring	Roughening tool	Brush	Piston plug
							
size	size	size	size	d_0 [mm]	d_0 [mm]	HIT-RB	HIT-SZ
M16	M10	ϕ14	-	18	18	18 / 20	18
-	-	ϕ16	M16	20	20	20 / 22	20
M20	M12	-	-	22	22	22 / 25	22
-	-	ϕ20	M20	25	25	25 / 28	25
M24	M16	-	-	28	28	28 / 30	28
M27	-	-	-	30	30	30 / 32	30
-	M20	ϕ25 / ϕ26	M24	32	32	32 / 35	32
M30	-	ϕ28	M27	35	35	35 / 40	35

Injection System Hilti HIT-HY 200 with roughening tool

Intended Use
Maximum working time and minimum curing time
Cleaning and setting tools

Annex B7

Deutsches Institut für Bautechnik DIBt

Table B10: Parameters for use of the Hilti Roughening tool TE-YRT

Associated components			
Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
			
d_0 [mm]		d_0 [mm]	size
nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

Table B11: Installation parameters for use of the Hilti Roughening tool TE-YRT

	Roughening time $t_{roughen}$	Minimum blowing time $t_{blowing}$
hef [mm]	$t_{roughen}$ [sec] = h_{ef} [mm] / 10	$t_{blowing}$ [sec] = $t_{roughen}$ [sec] + 20
0 to 100	10	30
101 to 200	20	40
201 to 300	30	50
301 to 400	40	60
401 to 500	50	70
501 to 600	60	80

Hilti roughening tool TE-YRT and wear gauge RTG

Hilti roughening tool TE-YRT	
Wear gauge RTG	

Injection System Hilti HIT-HY 200 with roughening tool	**Annex B8**
Intended Use Parameters for use of the Hilti Roughening tool TE-YRT	

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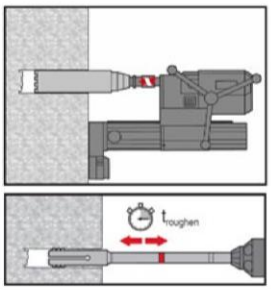
Installation instruction

Hole drilling

Diamond coring with roughening with Hilti roughening tool TE-YRT:



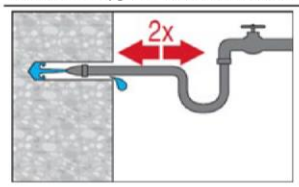
Diamond coring is permissible when suitable diamond core drilling machines and the corresponding core bits are used.

For the use in combination with Hilti roughening tool TE-YRT see parameters in Table B10.

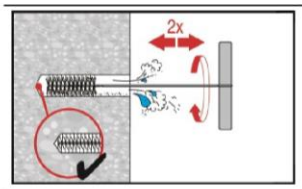
Before roughening water needs to be removed from the borehole. Check usability of the roughening tool with the wear gauge RTG.

Roughen the borehole over the whole length to the required h_{ef}.

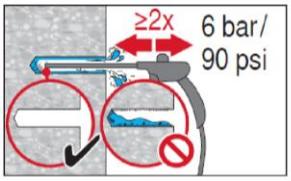
Cleaning of diamond cored holes with roughening with Hilti roughening tool TE-YRT:



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

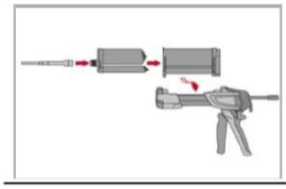


Brush 2 times with the specified brush (see Table B9) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper or bigger brush diameter.

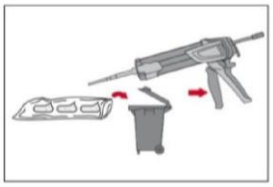


Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust and water. Remove all water from the borehole until borehole is completely dried before mortar injection. For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m³/h.

Injection preparation



Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser.
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 the dispenser.

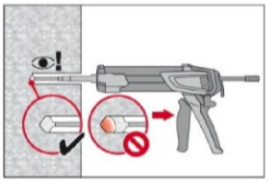


Discard initial adhesive. The foil pack opens automatically as dispensing is initiated.
Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discarded quantities are

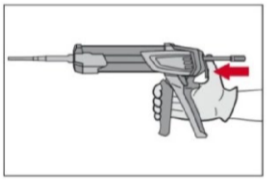
2 strokes	for 330 ml foil pack,
3 strokes	for 500 ml foil pack,
4 strokes	for 500 ml foil pack ≤ 5 °C.

Injection System Hilti HIT-HY 200 with roughening tool	Annex B9
Intended Use Installation instructions	

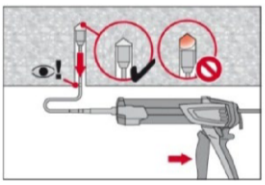
Inject adhesive from the back of the drill hole without forming air voids.



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
Fill holes approximately 2/3 full, to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.
In water saturated concrete it is required to set the anchor immediately after cleaning the borehole.

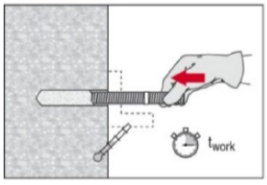


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

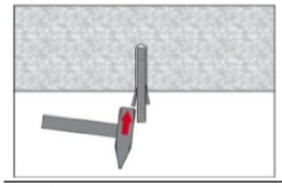


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug (see Table B9). Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.

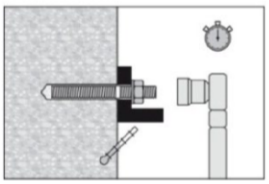
Setting the element



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 B7 or Table B8.



For overhead installation use piston plugs and fix embedded parts with e.g. wedges.



Loading the anchor: After required curing time t_{cure} (see Table B7 or Table B8) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2 to Table B5.

Injection System Hilti HIT-HY 200 with roughening tool	Annex B10
Intended Use Installation instructions	

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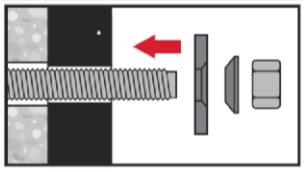
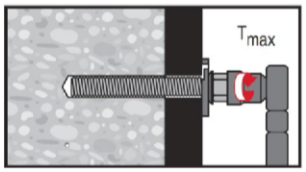
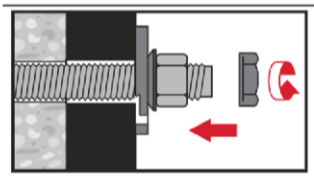
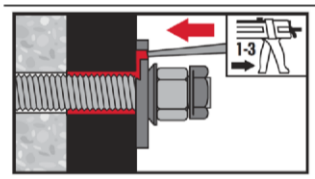
Installation of Filling Set

	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 T_{max} given in Table B2 to Table B5.
	Optional: Installation of lock nut. Tighten with a ¼ to ½ turn. (Not for size M24.)
	Fill the annular gap between the anchor rod and fixture with 1-3 strokes of Hilti injection mortar HIT-HY 200 A. Follow the installation instructions supplied with the HIT-HY 200 A foil pack. After required curing time t_{cure} the anchor can be loaded.

Injection System Hilti HIT-HY 200 with roughening tool

Intended Use
Installation instructions

Annex B11

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Table C1: Essential characteristics for threaded rod, HIT-V-... and AM 8.8 under tension loads in concrete

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Installation factor							
Diamond coring with roughening with Hilti roughening tool TE-YRT	γ_{inst}	[-]	1,0				
Steel failure							
HIT-V-... and AM 8.8	$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$				
Partial factor grade 5.8	$\gamma_{Ms,N}$ [1)]	[-]	1,5				
Partial factor grade 8.8	$\gamma_{Ms,N}$ [1)]	[-]	1,5				
Partial factor HIT-V-R	$\gamma_{Ms,N}$ [1)]	[-]	1,86			2,86	
Partial factor HIT-V-HCR	$\gamma_{Ms,N}$ [1)]	[-]	1,5		2,1		
Combined pullout and concrete cone failure							
non-cracked concrete C20/25							
Temperature range I: 40 °C/24 °C	$\tau_{Rk,ucr}$	[N/mm²]	18				
Temperature range II: 80 °C/50 °C	$\tau_{Rk,ucr}$	[N/mm²]	15				
Temperature range III: 120 °C/72 °C	$\tau_{Rk,ucr}$	[N/mm²]	13				
cracked concrete C20/25							
Temperature range I: 40 °C/24 °C	$\tau_{Rk,cr}$	[N/mm²]	8,5			9,0	
Temperature range II: 80 °C/50 °C	$\tau_{Rk,cr}$	[N/mm²]	7,0			7,5	
Temperature range III: 120 °C/72 °C	$\tau_{Rk,cr}$	[N/mm²]	6,0			6,5	
Factor for concrete compressive strength	ψ_c	C30/37	1,04				
		C40/45	1,07				
		C50/60	1,1				

Injection System Hilti HIT-HY 200 with roughening tool	
Performances Essential characteristics under tension loads in concrete	**Annex C1**

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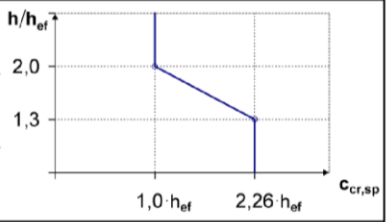
Table C1: continued

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 C2: Essential characteristics for threaded rod, HIT-V-... and AM 8.8 under shear loads

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure without lever arm							
HIT-V-..., AM 8.8	$V^0_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$				
Partial factor grade 5.8	$\gamma_{Ms,V}$ 1)	[-]	1,25				
Partial factor grade 8.8	$\gamma_{Ms,V}$ 1)	[-]	1,25				
Partial factor HIT-V-R	$\gamma_{Ms,V}$ 1)	[-]	1,56			2,38	
Partial factor HIT-V-HCR	$\gamma_{Ms,V}$ 1)	[-]	1,25		1,75		
Ductility factor	k_7	[-]	1,0				
Steel failure with lever arm							
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}; $12 \cdot d_{nom}$)			min (h_{ef}; 300)	
Outside diameter of anchor	d_{nom}	[mm]	16	20	24	27	30

1) In absence of national regulations.

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Essential characteristics under tension and shear loads in concrete

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3: Essential characteristics for internally threaded sleeve HIS-(R)N under tension loads in concrete

Hilti HIT-HY 200 with HIS-(R)N			**M10**	**M12**	**M16**	**M20**
Installation factor						
Diamond coring with roughening with Hilti roughening tool TE-YRT	γ_{inst}	[-]	1,0			
Steel failure threaded rod3s						
HIS-N with screw grade 8.8	$N_{Rk,s}$	[kN]	46	67	125	116
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,50			
HIS-RN with screw grade 70	$N_{Rk,s}$	[kN]	41	59	110	166
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,87			2,4
Combined pull-out and Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	110	125	170	205
Effective anchor diameter	d_1	[mm]	16,5	20,5	25,4	27,6
non-cracked concrete C20/25						
Temperature range I: 40 °C/24 °C	$\tau_{Rk,ucr}$	[N/mm²]	13			
Temperature range II: 80 °C/50 °C	$\tau_{Rk,ucr}$	[N/mm²]	11			
Temperature range III: 120 °C/72 °C	$\tau_{Rk,ucr}$	[N/mm²]	9,5			
cracked concrete C20/25						
Temperature range I: 40 °C/24 °C	$\tau_{Rk,cr}$	[N/mm²]	7			
Temperature range II: 80 °C/50 °C	$\tau_{Rk,cr}$	[N/mm²]	5,5			
Temperature range III: 120 °C/72 °C	$\tau_{Rk,cr}$	[N/mm²]	5			
Factor for concrete compressive strength	ψ_c	C30/37	1,04			
		C40/45	1,07			
		C50/60	1,1			
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]	$3,0 \cdot h_{ef}$			

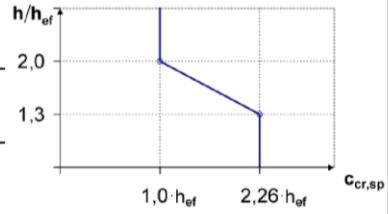
Injection System Hilti HIT-HY 200 with roughening tool

Performances
Essential characteristics under tension loads in concrete

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C3: continued

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

Hilti HIT-HY 200 with HIS-(R)N			**M10**	**M12**	**M16**	**M20**
Steel failure without lever arm						
HIS-N with screw grade 8.8	$V^0_{Rk,s}$	[kN]	23	34	63	58
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25			
HIS-RN with screw grade 70	$V^0_{Rk,s}$	[kN]	20	30	55	83
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,56			2,0
Ductility factor	k_7	[-]	1,0			
Steel failure with lever arm						
HIS-N with screw grade 8.8	$M^0_{Rk,s}$	[Nm]	60	105	266	519
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,25			
HIS-RN with screw grade 70	$M^0_{Rk,s}$	[Nm]	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]	110	125	170	205
Outside diameter of anchor	d_{nom}	[mm]	16,5	20,5	25,4	27,6

1) In absence of national regulations.

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Essential characteristics under tension and shear loads in concrete

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C5: Essential characteristics for Hilti tension anchor HZA / HZA-R under tension loads in concrete

Hilti HIT-HY 200 with HZA, HZA-R				**M16**	**M20**	**M24**	**M27**
Installation factor							
Diamond coring with roughening with Hilti roughening tool TE-YRT		γ_{inst}	[-]	1,0			
Steel failure							
HZA		$N_{Rk,s}$	[kN]	86	135	194	253
HZA-R		$N_{Rk,s}$	[kN]	111	173	248	-
Partial factor		γ_{Ms} 1)	[-]	1,4			
Combined pull-out and concrete cone failure							
Diameter of rebar		d	[mm]	16	20	25	28
non-cracked concrete C20/25							
Effective anchorage depth	HZA	h_{ef}	[mm]	$h_{nom} - 20$			
	HZA-R	h_{ef}	[mm]	$h_{nom} - 100$			-
Temperature range I: 40 °C/24 °C		$\tau_{Rk,ucr}$	[N/mm²]	12			
Temperature range II: 80 °C/50 °C		$\tau_{Rk,ucr}$	[N/mm²]	10			
Temperature range III: 120 °C/72 °C		$\tau_{Rk,ucr}$	[N/mm²]	8,5			
cracked concrete C20/25							
Temperature range I: 40 °C/24 °C		$\tau_{Rk,cr}$	[N/mm²]	7			
Temperature range II: 80 °C/50 °C		$\tau_{Rk,cr}$	[N/mm²]	5,5			
Temperature range III: 120 °C/72 °C		$\tau_{Rk,cr}$	[N/mm²]	5			
Factor for concrete compressive strength		ψ_c	C30/37	1,04			
			C40/45	1,07			
			C50/60	1,1			

Injection System Hilti HIT-HY 200 with roughening tool	**Annex C5**
Performances Essential characteristics under tension loads in concrete	

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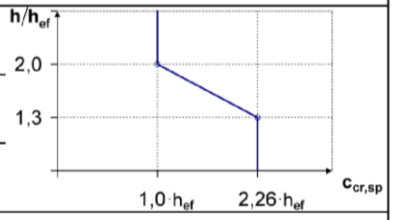
Table C5: continued

Concrete cone failure					
Effective anchorage depth	HZA	h_{ef}	[mm]	h_{nom}	
	HZA-R	h_{ef}	[mm]	h_{nom}	-
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 relevant for non-cracked concrete					
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 national regulations.

Table C6: Essential characteristics for Hilti tension anchor HZA, HZA-R under shear loads in concrete

Hilti HIT-HY 200 with HZA, HZA-R			**M16**	**M20**	**M24**	**M27**
Steel failure without lever arm						
HZA	$V^0_{Rk,s}$	[kN]	43	67	97	126
HZA-R	$V^0_{Rk,s}$	[kN]	55	86	124	-
Partial factor	γ_{Ms} 1)	[-]	1,5			
Ductility factor	k_7	[-]	1,0			
Steel failure with lever arm						
HZA	$M^0_{Rk,s}$	[Nm]	183	357	617	915
HZA-R	$M^0_{Rk,s}$	[Nm]	234	457	790	-
Partial factor	γ_{Ms} 1)	[-]	1,5			
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_{nom}; $12 \cdot d_{nom}$)			min (h_{nom}; 300)
Outside diameter of anchor	d_{nom}	[mm]	16	20	24	27

1) In absence of national regulations.

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Essential characteristics under tension and shear loads in concrete

Annex C6

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Table C7: Essential characteristics for rebar under tension loads in concrete

HIT-HY 200 with rebar			ϕ 14	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 30	ϕ 32
Installation factor										
Diamond coring with roughening with Hilti roughening tool TE-YRT	γ_{inst}	[-]	1,0							
Steel failure										
Rebar	$N_{Rk,s}$	[kN]	85	111	173	270	292	339	388	442
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,4							
Combined pull-out and Concrete cone failure										
Diameter of rebar	d	[mm]	14	16	20	25	26	28	30	32
non-cracked concrete C20/25										
Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	12							
Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	10							
Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	8,5							
cracked concrete C20/25										
Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	7							
Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	5,5							
Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	5							
Factor for concrete compressive strength	ψ_c	C30/37	1,04							
		C40/45	1,07							
		C50/60	1,1							

Table C7: continued

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 relevant for non-cracked concrete			
$h / h_{ef} \geq 2,0$			$1,0 \cdot h_{ef}$

Injection System Hilti HIT-HY 200 with roughening tool

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Essential characteristics under tension loads in concrete

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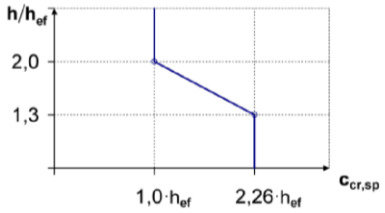
Edge distance $c_{cr,sp}$ [mm] for	$2,0 > h / h_{ef} > 1,3$	$4,6 \cdot h_{ef} - 1,8 \cdot h$	
	$h / h_{ef} \leq 1,3$	$2,26 \cdot h_{ef}$	
Spacing	$s_{cr,sp}$ [mm]	$2\ c_{cr,sp}$	

1) In absence of national regulations.

Table C8: Essential characteristics for rebar under shear loads in concrete

HIT-HY 200 with rebar			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Steel failure without lever arm										
Rebar	$V^0_{Rk,s}$	[kN]	42	55	86	135	146	169	194	221
Partial factor	$\gamma_{Ms,V}$ 1)	[-]	1,5							
Ductility factor	k_7	[-]	1,0							
Steel failure with lever arm										
Rebar	$M^0_{Rk,s}$	[Nm]	178	265	518	1012	1139	1422	1749	2123
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 · d_{nom})			min (h_{nom}; 300)				
Outside diameter of anchor	d_{nom}	[mm]	14	16	20	25	26	28	30	32

1) In absence of national regulations.

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Essential characteristics under tension and shear loads in concrete

Annex C8

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Table C9: Displacements under tension load

Hilti HIT-HY 200 with threaded rod, HIT-V-…, AM 8.8			**M16**	**M20**	**M24**	**M27**	**M30**
Non-cracked concrete temperature range I: 40°C / 24°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,04	0,06	0,07	0,07	0,08
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,08	0,10	0,13	0,14	0,16
Non-cracked concrete temperature range II: 80°C / 50°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,08	0,09	0,10	0,12
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,11	0,13	0,15	0,16
Non-cracked concrete temperature range III: 120°C / 72°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,08	0,10	0,12	0,13	0,16
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,11	0,13	0,15	0,17
Cracked concrete temperature range I: 40°C / 24°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,07				
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16				
Cracked concrete temperature range II: 80°C / 50°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,10				
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,22				
Cracked concrete temperature range III : 120°C / 72°C							
Displacement	δ_{N0}	[mm/(N/mm²)]	0,13				
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,29				

Table C10: Displacements under shear load

Hilti HIT-HY 200 with threaded rod, HIT-V-…			**M16**	**M20**	**M24**	**M27**	**M30**
Displacement	δ_{V0}	[mm/kN]	0,04	0,04	0,03	0,03	0,03
	$\delta_{V\infty}$	[mm/kN]	0,06	0,06	0,05	0,05	0,05

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Displacements with threaded rod, HIT-V-… and AM 8.8

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Table C11: Displacements under tension load

Hilti HIT-HY 200 with HIS-(R)N			M10	M12	M16	M20
Non-cracked concrete temperature range I: 40°C / 24°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,05	0,06	0,07	0,08
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,11	0,13	0,14
Non-cracked concrete temperature range II: 80°C / 50°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,08	0,10	0,11
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,11	0,13	0,15
Non-cracked concrete temperature range III: 120°C / 72°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,08	0,10	0,13	0,14
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,11	0,14	0,15
Cracked concrete temperature range I: 40°C / 24°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,11			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16			
Cracked concrete temperature range II: 80°C / 50°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,15			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,22			
Cracked concrete temperature range III: 120°C / 72°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,20			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,29			

Table C12: Displacements under shear load

Hilti HIT-HY 200 with HIS-(R)N			M10	M12	M16	M20
Displacement	δ_{V0}	[mm/kN]	0,06	0,05	0,04	0,04
	$\delta_{V\infty}$	[mm/kN]	0,08	0,08	0,06	0,06

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Displacements with HIS-(R)N

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Table C13: Displacements under tension load

Hilti HIT-HY 200 with HZA, HZA-R			M16	M20	M24	M27
Non-cracked concrete temperature range I : 40°C / 24°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,04	0,06	0,07	0,08
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,08	0,13	0,13	0,15
Non-cracked concrete temperature range II : 80°C / 50°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,08	0,10	0,11
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,14	0,14	0,15
Non-cracked concrete temperature range III : 120°C / 72°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,08	0,10	0,12	0,14
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,09	0,14	0,14	0,16
Cracked concrete temperature range I : 40°C / 24°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,11			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16			
Cracked concrete temperature range II : 80°C / 50°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,15			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,22			
Cracked concrete temperature range III : 120°C / 72°C						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,20			
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,29			

Table C14: Displacements under shear load

Hilti HIT-HY 200 with HZA, HZA-R			M16	M20	M24	M27
Displacement	δ_{V0}	[mm/kN]	0,04	0,04	0,03	0,03
	$\delta_{V\infty}$	[mm/kN]	0,06	0,06	0,05	0,05

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Displacements with HZA and HZA-R

Annex C11

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Table C15: Displacements under tension load

Hilti HIT-HY 200 with rebar		ϕ 14	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 30	ϕ 32
Non-cracked concrete temperature range I : 40°C / 24°C									
Displacement	δ_{N0} [mm/(N/mm²)]	0,04	0,04	0,06	0,07	0,08	0,08	0,09	0,09
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,07	0,08	0,10	0,13	0,14	0,15	0,16	0,17
Non-cracked concrete temperature range II : 80°C / 50°C									
	δ_{N0} [mm/(N/mm²)]	0,05	0,06	0,08	0,10	0,11	0,11	0,12	0,12
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,07	0,09	0,11	0,14	0,15	0,15	0,16	0,17
Non-cracked concrete temperature range III : 120°C / 72°C									
Displacement	δ_{N0} [mm/(N/mm²)]	0,07	0,08	0,10	0,12	0,13	0,14	0,15	0,16
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,08	0,09	0,11	0,14	0,15	0,16	0,17	0,18
Cracked concrete temperature range I : 40°C / 24°C									
Displacement	δ_{N0} [mm/(N/mm²)]	0,11							
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,16							
Cracked concrete temperature range II : 80°C / 50°C									
Displacement	δ_{N0} [mm/(N/mm²)]	0,15							
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,22							
Cracked concrete temperature range III : 120°C / 72°C									
Displacement	δ_{N0} [mm/(N/mm²)]	0,20							
	$\delta_{N\infty}$ [mm/(N/mm²)]	0,29							

Table C16: Displacements under shear load

Hilti HIT-HY 200 with rebar		ϕ 14	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 30	ϕ 32
Displacement	δ_{V0} [mm/kN]	0,04	0,04	0,04	0,03	0,03	0,03	0,03	0,03
	$\delta_{V\infty}$ [mm/kN]	0,06	0,06	0,05	0,05	0,05	0,04	0,04	0,04

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Displacements with rebar

Annex C12

Table C17: Essential characteristics for threaded rod, HIT-V-... -..., AM 8.8 under tension loads for seismic performance category C1

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Steel failure							
HIT-V-5.8(F), threaded rod 5.8	$N_{Rk,s,eq}$	[kN]	79	123	177	230	281
HIT-V-8.8(F), threaded rod 8.8	$N_{Rk,s,eq}$	[kN]	126	196	282	367	449
HIT-V-R, threaded rod A4-70	$N_{Rk,s,eq}$	[kN]	110	172	247	230	281
HIT-V-HCR, threaded rod HCR-80	$N_{Rk,s,eq}$	[kN]	126	196	247	321	393
Combined pullout and concrete cone failure							
cracked concrete C20/25							
Temperature range I: 40 °C/24 °C	$\tau_{Rk,eq}$	[N/mm²]	7,0				
Temperature range II: 80 °C/50 °C	$\tau_{Rk,eq}$	[N/mm²]	5,7				
Temperature range III: 120 °C/72 °C	$\tau_{Rk,eq}$	[N/mm²]	4,8				

Table C18: Essential characteristics for threaded rod, HIT-V-... and AM 8.8 under shear loads for seismic performance category C1

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Steel failure without lever arm							
HIT-V 5.8(F), threaded rod 5.8	$V_{Rk,s,eq}$	[kN]	27	43	62	81	98
HIT-V 8.8(F), threaded rod 8.8	$V_{Rk,s,eq}$	[kN]	44	69	99	129	157
HIT-V R, threaded rod A4-70	$V_{Rk,s,eq}$	[kN]	39	60	87	81	98
HIT-V HCR, threaded rod HCR-80	$V_{Rk,s,eq}$	[kN]	44	69	87	113	137

Table C19: Displacements under tension load for seismic performance category C1

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Displacement [1]	$\delta_{N,eq}$	[mm]	0,8	0,8	0,8	0,8	0,8

[1] Maximum displacement during cycling (seismic event).

Table C20: Displacements under shear load for seismic performance category C1

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Displacement [1]	$\delta_{V,eq}$	[mm]	4,4	5,0	5,6	6,1	6,5

[1] Maximum displacement during cycling (seismic event).

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Table C21: Essential characteristics for Hilti tension anchor HZA, HZA-R under tension loads for seismic performance category C1

HIT-HY 200 with Hilti tension anchor HZA, HZA-R				M16	M20	M24	M27
Steel failure							
Characteristic resistance HZA		$N_{Rk,s,eq}$	[kN]	86	135	194	253
Characteristic resistance HZA-R		$N_{Rk,s,eq}$	[kN]	111	173	248	-
Partial factor		$\gamma_{Ms,N,eq}$ [1)]	[-]	1,4			
Combined pull-out and concrete cone failure in							
Diameter of rebar		d	[mm]	16	20	25	28
cracked concrete C20/25							
Temperature range I:	40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	6,1			
Temperature range II:	80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	4,8			
Temperature range III:	120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	4,4			

1) In absence of national regulations.

Table C22: Essential characteristics for Hilti tension anchor HZA, HZA-R under shear loads for seismic performance category C1

HIT-HY 200 with Hilti tension anchor HZA, HZA-R				M16	M20	M24	M27
Steel failure without lever arm							
Characteristic resistance	HZA	$V_{Rk,s,eq}$	[kN]	30	47	68	88
Characteristic resistance	HZA-R	$V_{Rk,s,eq}$	[kN]	39	60	124	-
Partial factor		$\gamma_{Ms,V,eq}$ [1)]	[-]	1,5			

1) In absence of national regulations.

Table C23: Displacements under tension load for seismic performance category C1

HIT-HY 200 with Hilti tension anchor HZA, HZA-R			M16	M20	M24	M27
Displacement [1)]	$\delta_{N,eq}$	[mm]	1,3	1,3	1,3	1,3

1) Maximum displacement during cycling (seismic event).

Table C24: Displacements under shear load for seismic performance category C1

HIT-HY 200 with Hilti tension anchor HZA, HZA-R			M16	M20	M24	M27
Displacement [1)]	$\delta_{V,eq}$	[mm]	4,4	5,0	5,6	6,1

1) Maximum displacement during cycling (seismic event).

Injection System Hilti HIT-HY 200 with roughening tool	Annex C14
Performances Characteristic values for seismic performance category C1 and displacements Design according to „EOTA Technical Report TR 045, Edition February 2013“	

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Table C25: Essential characteristics for rebar under tension loads for seismic performance category C1

HIT-HY 200 with rebar			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Steel failure										
Rebar	$N_{Rk,s,eq}$	[kN]	85	111	173	270	292	339	388	442
Combined pull-out and Concrete cone failure in:										
Diameter of rebar	d	[mm]	14	16	20	25	26	28	30	32
cracked concrete C20/25										
Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	6,1							
Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	4,8							
Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	4,4							

Table C26: Essential characteristics for rebar under shear loads for seismic performance category C1

HIT-HY 200 with rebar			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Steel failure without lever arm										
Rebar	$V_{Rk,s,eq}$	[kN]	29	39	60	95	102	118	135	165

Table C27: Displacements under tension load for seismic performance category C1

Hilti HIT-HY 200 with rebar			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Displacement [1]	$\delta_{N,eq}$	[mm]	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3

[1] Maximum displacement during cycling (seismic event).

Table C28: Displacements under shear load for seismic performance category C1

Hilti HIT-HY 200 with rebar			**ϕ 14**	**ϕ 16**	**ϕ 20**	**ϕ 25**	**ϕ 26**	**ϕ 28**	**ϕ 30**	**ϕ 32**
Displacement [1]	$\delta_{V,eq}$	[mm]	4,1	4,4	5,0	5,8	6,2	6,2	6,8	6,8

[1] Maximum displacement during cycling (seismic event).

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Table C29: Essential characteristics for threaded rod, HIT-V… and AM 8.8 under tension loads for seismic performance category C2

HIT-HY 200 with threaded rod, HIT-V-…, AM 8.8			M16	M20	M24	M27	M30
Steel failure							
HIT-V (-F) 8.8, AM (HDG) 8.8 Commercial standard threaded rod electroplated zinc coated 8.8	$N_{Rk,s,eq}$	[kN]	126	196	282	-	
Combined pullout and concrete cone failure in:							
cracked concrete C20/25							
Temperature range I: 40 °C/24 °C	$\tau_{Rk,eq}$	[N/mm²]	3,9	4,3	3,5	-	
Temperature range II: 80 °C/50 °C	$\tau_{Rk,eq}$	[N/mm²]	3,3	3,7	2,9	-	
Temperature range III: 120 °C/72 °C	$\tau_{Rk,eq}$	[N/mm²]	2,8	3,2	2,5	-	

Table C30: Essential characteristics for threaded rod, HIT-V-… and AM 8.8 under shear loads for seismic performance category C2

HIT-HY 200 with threaded rod, HIT-V-…, AM 8.8			M16	M20	M24	M27	M30
Steel failure without lever arm with Hilti Filling Set							
HIT-V 8.8, AM 8.8	$V_{Rk,s,eq}$	[kN]	46	77	103	-	
Steel failure without lever arm without Hilti Filling Set							
HIT-V 8.8, AM 8.8	$V_{Rk,s,eq}$	[kN]	40	71	90	-	
HIT-V-F 8.8, AM-HDG 8.8	$V_{Rk,s,eq}$	[kN]	30	46	66	-	
Commercial standard threaded rod, electroplated zinc coated 8.8	$V_{Rk,s,eq}$	[kN]	28	50	63	-	

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Characteristic values for seismic performance category C2
Design according to „EOTA Technical Report TR 045, Edition February 2013“

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Table C31: Displacements under tension load for seismic performance category C2

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Displacement DLS, HIT-V (-F) 8.8, AM (HDG) 8.8	$\delta_{N,eq(DLS)}$	[mm]	0,2	0,5	0,4	-	
Displacement ULS, HIT-V (-F) 8.8, AM (HDG) 8.8	$\delta_{N,eq(ULS)}$	[mm]	0,6	0,8	1.0	-	

Table C32: Displacements under shear load for seismic performance category C2

HIT-HY 200 with threaded rod, HIT-V-..., AM 8.8			M16	M20	M24	M27	M30
Installation with Hilti Filling Set							
Displacement DLS, HIT-V 8.8, AM 8.8	$\delta_{V,eq(DLS)}$	[mm]	1,2	1,4	1,1	-	
Displacement ULS, HIT-V 8.8, AM 8.8	$\delta_{V,eq(ULS)}$	[mm]	3,2	3,8	2,6	-	
Installation without Hilti Filling Set							
Displacement DLS, HIT-V 8.8, AM 8.8	$\delta_{V,eq(DLS)}$	[mm]	3,2	2,5	3,5	-	
Displacement DLS, HIT-V-F 8.8, AM HDG 8.8	$\delta_{V,eq(DLS)}$	[mm]	2,3	3,8	3,7	-	
Displacement ULS, HIT-V, 8.8 AM 8.8	$\delta_{V,eq(ULS)}$	[mm]	9,2	7,1	10,2	-	
Displacement ULS, HIT-V-F 8.8, AM HDG 8.8	$\delta_{V,eq(ULS)}$	[mm]	4,3	9,1	8,4	-	

Injection System Hilti HIT-HY 200 with roughening tool

Performances
Displacements for seismic performance category C2
Design according to „EOTA Technical Report TR 045, Edition February 2013“

Annex C17