Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment ETA-15/0195 of 12 November 2015

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-A and Hilti HIT-HY 200-R
Product family to which the construction product belongs	Bonded anchor for use in concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	28 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	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Injection system Hilti HIT-HY 200-A and Hilti HIT-HY 200-R 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. The steel element consist of

- a threaded rod Hilti HAS- or HIT-V or a commercial threaded rod with washer and hexagon nut in the range of 3/8 inch to 1 1/4 inch or
- an internal threaded sleeve HIS-(R)N in the range of of 3/8 inch to 3/4 inch

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 for static and quasi static loads, Displacements	See Annex C1 – C8
Characteristic resistance for seismic performance category C1, Displacements	See Annex C9 – C10

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC]

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 12 November 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
G. Lange

Deutsches Institut für Bautechnik

DIBt

Installed condition

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

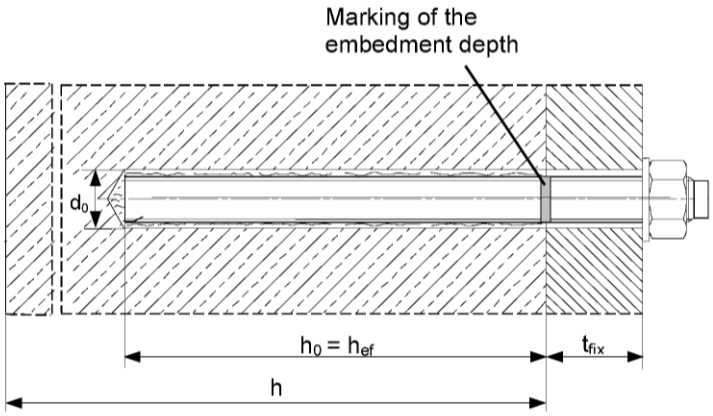
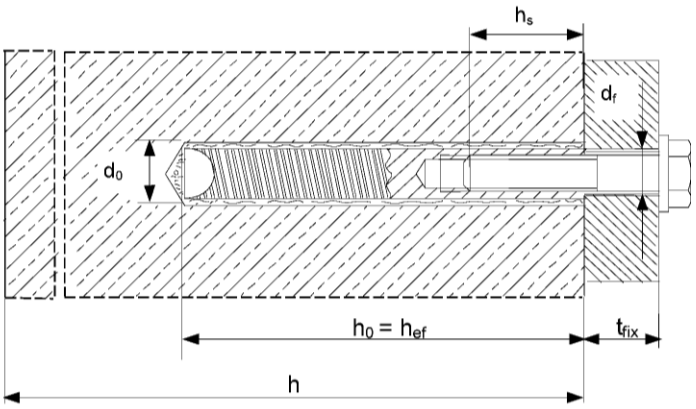


Figure A2:
Internally threaded sleeve HIS-(R)N



Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	
Product description Installed condition	**Annex A1**

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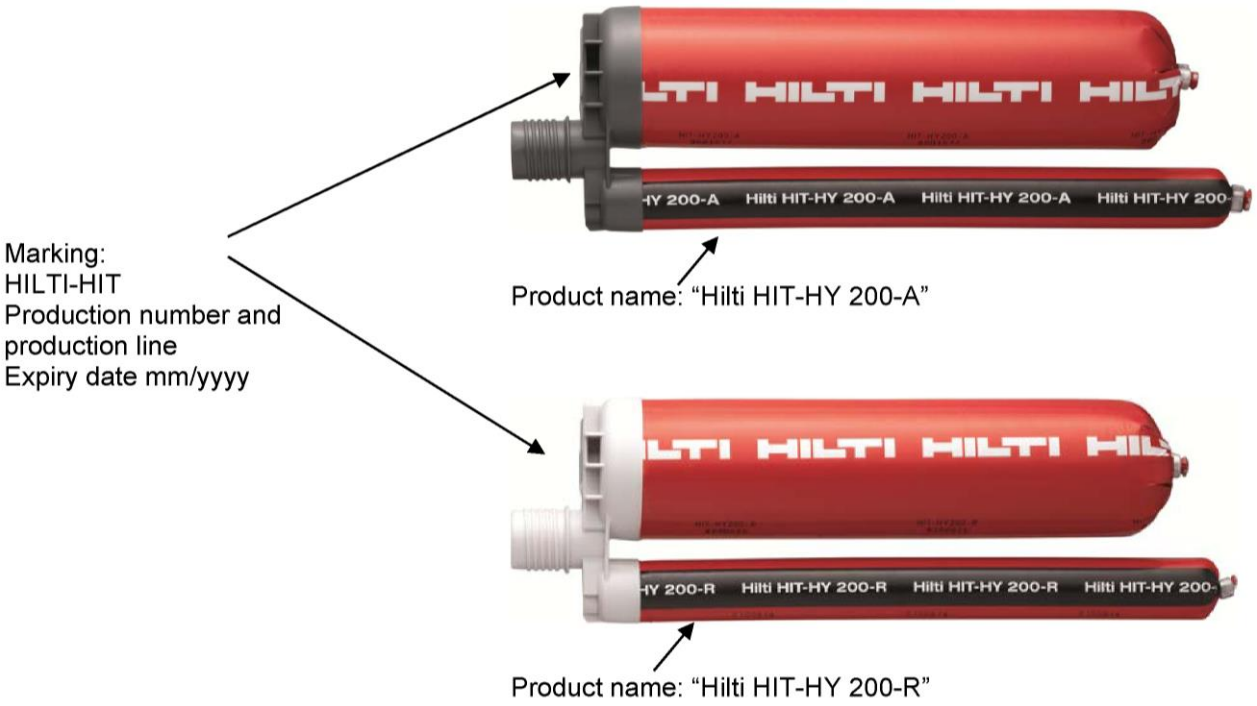
Product description: Injection mortar and steel elements

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



Static mixer Hilti HIT-RE-M

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	**Annex A2**
Product description Injection mortar / Static mixer	

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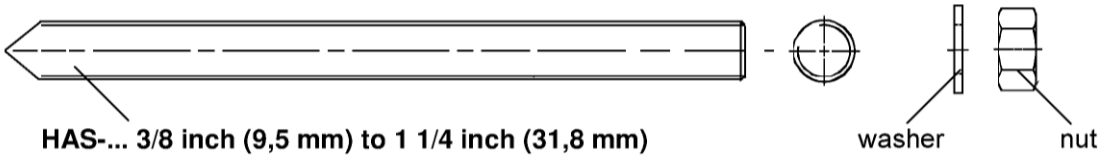
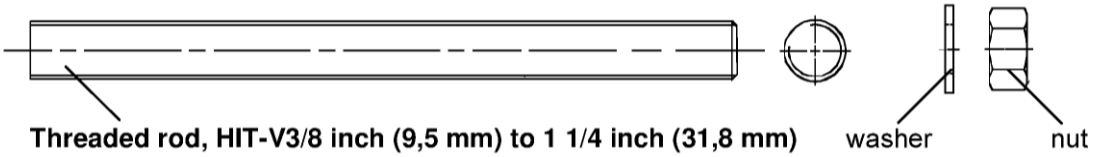
Steel elements



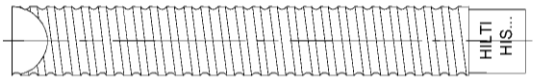
HAS-... 3/8 inch (9,5 mm) to 1 1/4 inch (31,8 mm)



Threaded rod, HIT-V3/8 inch (9,5 mm) to 1 1/4 inch (31,8 mm)

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.
- Continuously threaded rods (all-thread) with characteristics comparable to ANSI B1.1 UNC coarse thread series.



Internally threaded sleeve HIS-(R)N...3/8 inch (9,5 mm) to 3/4 inch (31,8 mm)

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	**Annex A3**
Product description Steel elements	

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Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
Threaded rod, HAS-E	Strength class 5.8, f_{uk} = 500 N/mm² (72 500 psi), f_{yk} = 400 N/mm² (58 000 psi); Elongation at fracture (l_0=5d) > 8% ductile; Electroplated zinc coated ≥ 5 µm
Threaded rod, HIT-V	ASTM A 307 Grade A, f_{uk} = 414 N/mm² (60 000 psi), f_{yk} = 259 N/mm² (37 500 psi); Elongation at fracture (l_0=5d) > 8% ductile; Electroplated zinc coated ≥ 5 µm
Threaded rod, HAS-E-B	ASTM A 193 Grade B7, f_{uk} = 862 N/mm² (125 000 psi), f_{yk} = 724 N/mm² (105 000 psi); Elongation at fracture (l_0=5d) > 8% ductile; Electroplated zinc coated ≥ 5 µm
Washer	Electroplated zinc coated ≥ 5 µm
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5 µm
Internally threaded sleeve HIS-N	Electroplated zinc coated ≥ 5 µm
Metal parts made of stainless steel 304	
Threaded rod, HAS-R 304	Size 3/8 inch to 5/8 inch: ASTM F 593 CW1, f_{uk} = 690 N/mm² (100 000 psi), f_{yk} = 448 N/mm² (65 000 psi); Size 3/4 inch to 1 1/4 inch: ASTM F 593 CW2, f_{uk} = 586 N/mm² (85 000 psi), f_{yk} = 310 N/mm² (45 000 psi); Elongation at fracture (l_0=5d) > 8% ductile
Washer	ASTM A 240 and ANSI B18.22.1 Type A Plain
Nut	Strength class of nut adapted to strength class of threaded rod. ASTM F 594, Alloy group 1, 2 or 3
Metal parts made of stainless steel 316	
Threaded rod, HAS-R 316	Size 3/8 inch to 5/8 inch: ASTM F 593 CW1, f_{uk} = 690 N/mm² (100 000 psi), f_{yk} = 448 N/mm² (65 000 psi); Size 3/4 inch to 1 1/4 inch: ASTM F 593 CW2, f_{uk} = 586 N/mm² (85 000 psi), f_{yk} = 310 N/mm² (45 000 psi); Elongation at fracture (l_0=5d) > 8% ductile
Washer	ASTM A 240 and ANSI B18.22.1 Type A Plain
Nut	Strength class of nut adapted to strength class of threaded rod. ASTM F 594, Alloy group 1, 2 or 3
Internally threaded sleeve HIS-RN	Stainless steel 1.4401, 1.4571 EN 10088-1:2014

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.
- Seismic performance category C1: Threaded rod, HAS-..., HIT-V, (not HIS-N).

Base material:

- Reinforced or unreinforced normal weight concrete according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and non-cracked concrete.

Temperature in the base material:

- **at installation**
  -10 °C to +40 °C
- **in-service**
  Temperature range I: -40 °C to +40 °C
  (max. long term temperature +24 °C and max. short term temperature +40 °C)
  Temperature range II: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short term temperature +80 °C)
  Temperature range III: -40 °C to +120 °C
  (max. long term temperature +72 °C and max. short term temperature +120 °C)

Table B1: Specifications of intended use

	HIT-HY 200-A or HIT-HY 200-R with …	
Elements	Threaded rod, HAS…, HIT-V … 	HIS-(R)N 
Hammer drilling with hollow drill bit TE-CD or TE-YD 	✓	✓
Hammer drilling	✓	✓
Static and quasi static loading in cracked and non-cracked concrete	3/8 inch to 1 1/4 inch (9,5 mm to 31,8 mm)	3/8 inch to 3/4 inch (9,5 mm to 19,1 mm)
Seismic performance category C1	3/8 inch to 1 1/4 inch (9,5 mm to 31,8 mm)	--

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	**Annex B1**
Intended Use Specifications	

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Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel 304 or 316).
- 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 316).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing products are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static loading are designed in accordance with:
  "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"
- Anchorages under seismic actions (cracked concrete) are designed in accordance with:
  "EOTA Technical Report TR 045, 02/2013"
  Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastenings in stand-off installation or with a grout layer under seismic action are not covered in this European technical assessment (ETA).

Installation:

- Use category: dry or wet concrete (not in flooded holes).
- Overhead installation is admissible.
- 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-A and Hilti HIT-HY 200-R	Annex B2
Intended Use Specifications	

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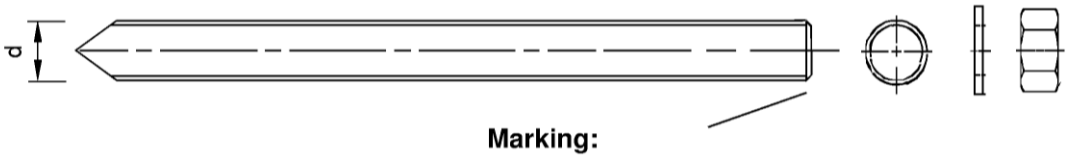
Table B2: Installation parameters of threaded rod, HAS-..., HIT-V-...

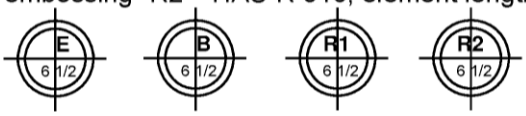
Threaded rod, HAS-(E)-..., HIT-V-...	**size**	**[in]**	**3/8**	**1/2**	**5/8**	**3/4**	**7/8**	**1**	**1 1/4**
Diameter of element	$d^{1)} = d_{nom}{}^{2)}$	[mm]	9,5	12,7	15,9	19,1	22,2	25,4	31,8
Effective cross sectional area	A_s [3)]	[mm²] ([in²])	50 (0,0775)	92 (0,1419)	146 (0,2260)	216 (0,3345)	298 (0,4617)	391 (0,6057)	625 (0,9691)
Nominal diameter of drill bit	d_0	[in] ([mm])	7/16 (11,1)	9/16 (14,3)	3/4 (19,1)	7/8 (22,2)	1 (25,4)	1 1/8 (28,6)	1 3/8 (34,9)
Effective embedment depth and drill hole depth $h_{ef} = h_0$	h_{ef} = h_o	[mm] ([in])	60 - 191 (2⅜ - 7½)	70 - 254 (2¾ - 10)	79 - 318 (3⅛ -12½)	89 - 381 (3½ - 15)	89 – 445 (3½- 17½)	102 - 508 (4 – 20)	127 - 635 (5 – 25)
Maximum diameter of clearance hole in the fixture [4)]	d_f	[in] ([mm])	7/16 (11,1)	9/16 (14,3)	11/16 (17,5)	13/16 (20,6)	15/16 (23,8)	1 1/8 (28,6)	1 3/8 (34,9)
Minimum thickness of concrete member	h_{min}	[mm] ([in])	h_{ef} + 30 mm ≥ 100 mm (h_{ef} + 1 ¼ in) (≥ 4 in)		$h_{ef} + 2 \cdot d_0$				
Maximum torque moment	T_{max}	[Nm] ([ft-lb])	20 (15)	41 (30)	81 (60)	136 (100)	169 (125)	203 (150)	271 (200)
Minimum spacing	s_{min}	[mm] ([in])	45 (1 ¾)	60 (2 ¼)	80 (3)	90 (3 ½)	105 (4)	115 (4 ½)	140 (5 ½)
Minimum edge distance	c_{min}	[mm] ([in])	45 (1 ¾)	45 (1 ¾)	50 (2)	55 (2 ⅛)	60 (2 ¼)	70 (2 ¾)	80 (3 ⅛)

[1)] Parameter for design according to "EOTA Technical Report TR 029".
[2)] Parameter for design according to "CEN/TS 1992-4:2009".
[3)] Effective cross sectional area for calculation of characteristic steel resistance (Annex C).
[4)] For larger clearance hole see "TR 029 section 1.1"

HAS-...



Marking:
embossing "E" HAS-E, element length [in]
embossing "B" HAS-E-B, element length [in]
embossing "R1" HAS-R 304, element length [in]
embossing "R2" HAS-R 316, element length [in]



Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Intended Use
Installation parameters

Annex B3

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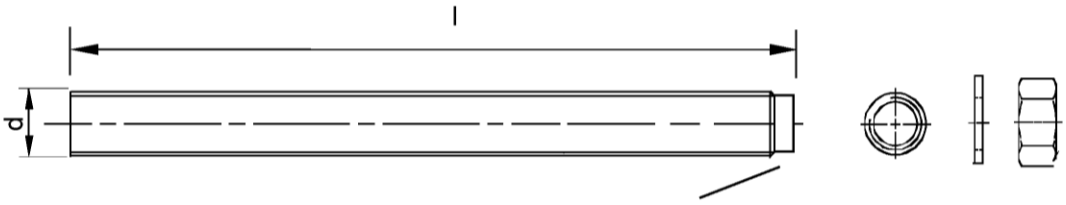
HIT-V-...



Marking:
embossing "V" HIT-V, element length [in]

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	
Intended Use Installation parameters	**Annex B4**

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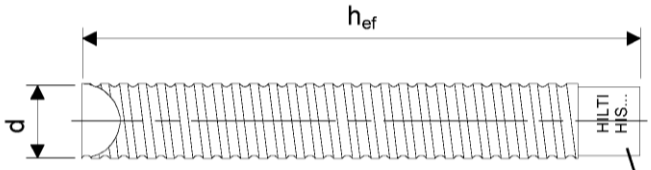
Table B3: Installation parameters of internally threaded sleeve HIS-(R)N

HIS-(R)N	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)
Outer diameter of sleeve	$d^{1)} = d_{nom}{}^{2)}$	[mm] ([in])	16,5 (0,65)	20,5 (0,81)	25,4 (1)	27,6 (1,09)
Nominal diameter of drill bit	d_0	[in] ([mm])	11/16 (17,5)	7/8 (22,2)	1 1/8 (28,6)	1 1/4 (31,8)
Effective embedment depth and drill hole depth $h_{ef} = h_0$	h_{ef} = h_0	[mm] ([in])	110 (4⅜)	125 (5)	170 (6¾)	205 (8⅛)
Maximum diameter of clearance hole in the fixture [3)]	d_f	[in] ([mm])	7/16 (11,1)	9/16 (14,3)	11/16 (17,5)	13/16 (20,6)
Minimum thickness of concrete member	h_{min}	[mm] ([in])	150 (5,9)	170 (6,7)	230 (9,1)	270 (10,6)
Maximum torque moment	T_{max}	[Nm] ([ft-lb])	20 (15)	41 (30)	81 (60)	136 (100)
Thread engagement length min-max	h_s	[mm] ([in])	10-25 (3/8-15/16)	12-30 (1/2-1 3/16)	16-40 (5/8-1 1/2)	20-50 (6/8-1 7/8)
Minimum spacing	s_{min}	[mm] ([in])	70 (2 ¾)	90 (3 ½)	115 (4 ½)	130 (5)
Minimum edge distance	c_{min}	[mm] ([in])	45 (1 ¾)	55 (2 ⅛)	65 (2 ½)	90 (3 ½)

1) Parameter for design according to "EOTA Technical Report TR 029".
2) Parameter for design according to "CEN/TS 1992-4:2009".
3) For larger clearance hole see "TR 029 section 1.1".

Internally threaded sleeve HIS-(R)N...



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

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Table B4: Maximum working time and minimum curing time HY 200-A

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
-10 °C to -5 °C	1,5 hours	7 hours
> -5 °C to 0 °C	50 min	4 hours
> 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 B5: Maximum working time and minimum curing time HY 200-R

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
-10 °C to -5 °C	3 hours	20 hours
> -5 °C to 0 °C	2 hours	8 hours
> 0 °C to 5 °C	1 hour	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

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	Annex B6
Intended Use Maximum working time and minimum curing time	

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Table B6: Parameters of cleaning and setting tools

Elements		Drill and clean			Installation
Threaded rod, HAS-…, HIT-V-…	HIS-(R)N	Hammer drilling		Brush	Piston plug
			Hollow drill bit TE-CD, TE-YD		
					
Size [in] ([mm])	Name [in] ([mm])	d_0 [in] ([mm])	d_0 [in] ([mm])	HIT-RB [Name]	HIT-IP [Name]
3/8 (9,5)	-	7/16 (11,1)	-	7/16 "	-
1/2 (12,7)	-	9/16 (14,3)	9/16 (14,3)	9/16 "	9/16 "
-	3/8 (9,5)	11/16 (17,5)	-	11/16 "	11/16 "
5/8 (15,9)	-	3/4 (19,1)	3/4 (19,1)	3/4 "	3/4 "
3/4 (19,1)	1/2 (12,7)	7/8 (22,2)	7/8 (22,2)	7/8 "	7/8 "
7/8 (22,2)	-	1 (25,4)	1 (25,4)	1 "	1 "
1 (25,4)	5/8 (15,9)	1 1/8 (28,6)	1 1/8 (28,6)	1 1/8 "	1 1/8 "
-	3/4 (19,1)	1 1/4 (31,8)	-	1 1/4 "	1 1/4 "
1 1/4 (31,8)	-	1 3/8 (34,9)	-	1 3/8 "	1 3/8 "

Cleaning alternatives

Manual Cleaning (MC):
Hilti hand pump for blowing out drill holes with diameters $d_0 \leq 3/4$ in (19 mm) and drill hole depths $h_0 \leq 10 \cdot d$.

Compressed air cleaning (CAC):
Air nozzle with an orifice opening of minimum 1/7 in (3,5 mm) in diameter.

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

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Intended Use
Cleaning and setting tools

Annex B7

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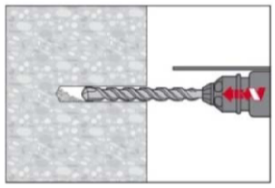
Installation instruction

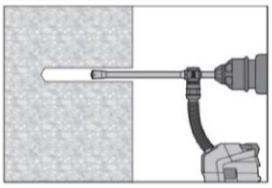
Hole drilling

a) Hammer drilling



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

b) Hammer drilling with Hilti hollow drill bit



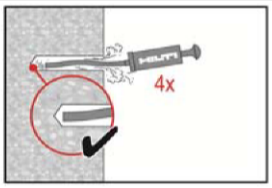
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user's manual. After drilling is completed, proceed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

Drill hole cleaning

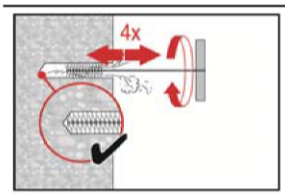
Just before setting an anchor, the drill hole must be free of dust and debris.
Inadequate hole cleaning = poor load values.

Manual Cleaning

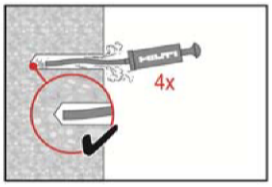
non-cracked concrete only
For drill hole diameters $d_0 \leq 3/4$ in (19 mm) and drill hole depths $h_0 \leq 10 \cdot d$.



The Hilti hand pump may be used for blowing out drill holes up to diameters $d_0 \leq 3/4$ in (19 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.



Brush 4 times with the specified brush (see Table B6) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

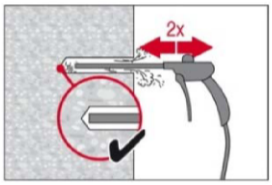


Blow out again with Hilti hand pump at least 4 times until return air stream is free of noticeable dust.

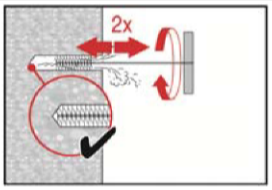
Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	Annex B8
Intended Use Installation instructions	

Deutsches Institut für Bautechnik DIBt

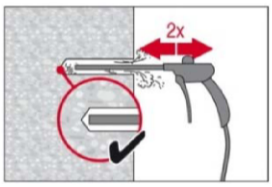
Compressed air cleaning (CAC) for all drill hole diameters d_0 and all drill hole depths h_0.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.
For drill hole diameters ≥ 1 1/4 in (32 mm) the compressor has to supply a minimum air flow of 140 m³/h.

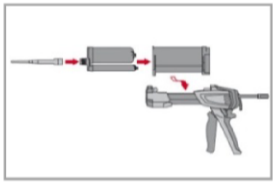


Brush 2 times with the specified brush (see Table B6) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

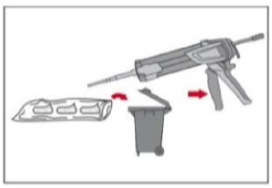


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation



Tightly attach Hilti mixing nozzle HIT-RE-M to foil pack manifold. Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser.
Check foil pack holder for proper function. Insert foil pack into foil pack holder and put holder into the dispenser.



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-A and Hilti HIT-HY 200-R	Annex B9
Intended Use Installation instructions	

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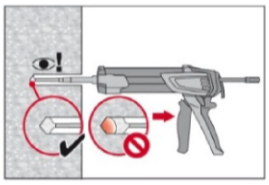
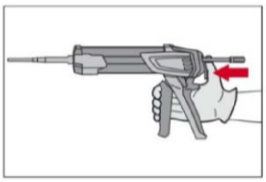
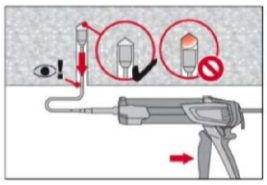
Inject adhesive from the back of the drill hole without forming air voids.



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.

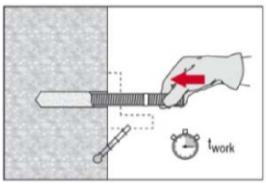


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

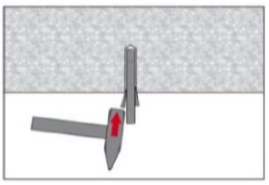


Overhead installation and/or installation with embedment depth h_{ef} > 250mm (9 5/6 in). For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug (see Table B6). Insert piston plug 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.

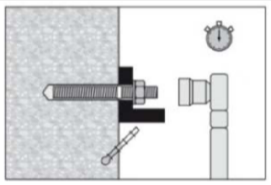
Setting the element



Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth before working time t_{work} has elapsed.
The working time t_{work} is given in Table B4 (HY 200-A) and Table B5 (HY 200-R).



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



Loading the anchor: After required curing time t_{cure} (see Table B4 for HY 200-A and Table B5 for HY 200-R) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2 and Table B3.

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	**Annex B10**
Intended Use Installation instructions	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic resistance for threaded rods under tension load in concrete

Threaded rod, HIT-V-... and HAS-...	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Installation safety factor	γ_2 [1] = γ_{inst} [2]	[-]	1,0						
Steel failure threaded rods									
Characteristic resistance [3]	$N_{Rk,s}$	[kN], ([lb])	$A_s \cdot f_{uk}$						
Combined pullout and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	18 (2610)						
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	15 (2175)						
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	13 (1885)						
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 [2]	[-]	10,1						
Characteristic bond resistance in cracked concrete C20/25									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	7,5 (1090)		8,5 (1235)		9,0 (1305)		
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	6,0 (870)		7,0 (1015)			7,5 (1090)	
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	5,5 (800)		6,0 (870)		6,5 (945)		
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 [2]	[-]	7,2						
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,04						
		C40/50	1,07						
		C50/60	1,10						
Concrete cone failure									
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2]	[-]	10,1						
	k_{cr} [2]	[-]	7,2						
Edge distance	$c_{cr,N}$	[mm], ([in])	$1,5 \cdot h_{ef}$						
Spacing	$s_{cr,N}$	[mm], ([in])	$3,0 \cdot h_{ef}$						

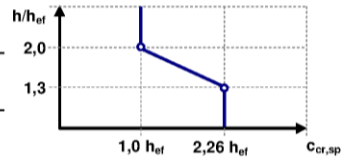
Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Performances
Characteristic resistance under tension load in concrete
Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C1 continued

Splitting failure			
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2)] [-]		10,1
	k_{cr} [2)] [-]		7,2
Edge distance $c_{cr,sp}$ [mm], [(in)] 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], ([in])		$2 \cdot c_{cr,sp}$

[1)] Parameter for design according to "EOTA Technical Report TR 029".
[2)] Parameter for design according to "CEN/TS 1992-4:2009".
[3)] Effective cross sectional area according to Table B2.

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R	**Annex C2**
Performances Characteristic resistance under tension load in concrete Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"	

Deutsches Institut für Bautechnik DIBt

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

HIS-(R)N	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)
Installation safety factor	γ_2 [1] = γ_{inst} [2]	[-]	1,0			
Steel failure internally threaded sleeve						
Characteristic resistance HIS-N Screw acc. to SAE J429 Grade 5 or ASTM A325 (1/2 inch to 3/4 inch)	$N_{Rk,s}$	[kN] ([lb])	41 (9300)	76 (17030)	121 (27120)	130 (29145)
Partial safety factor	$\gamma_{Ms,N}$ [3]	[-]	1,57			1,5
Characteristic resistance HIS-N Screw acc. to ASTM A193 Grade B7	$N_{Rk,s}$	[kN] ([lb])	43 (9690)	77 (17250)	128 (28680)	130 (29145)
Partial safety factor	$\gamma_{Ms,N}$ [3]	[-]	1,43	1,5		
Characteristic resistance HIS-RN Screw acc. to ASTM A193 Grade B8M (AISI 316)	$N_{Rk,s}$	[kN] ([lb])	38 (8525)	110 (24645)	182 (40970)	185 (41635)
Partial safety factor	$\gamma_{Ms,N}$ [3]	[-]	1,4	2,4		
Characteristic steel resistance HIS-RN Screw acc. to ASTM A193 Grade B8T (AISI 321)	$N_{Rk,s}$	[kN] ([lb])	43 (9690)	110 (24645)	182 (40970)	185 (41635)
Partial safety factor	$\gamma_{Ms,N}$ [3]	[-]	1,5	2,4		
Combined pull-out and concrete cone failure						
Effective anchorage depth	h_{ef}	[mm] ([in])	110 (4⅜)	125 (5)	170 (6¾)	205 (8⅛)
Effective anchor diameter	d [1] = d_{nom} [2]	[mm] ([in])	16,5 (0,65)	20,5 (0,81)	25,4 (1)	27,6 (1,09)
Characteristic bond resistance in non-cracked concrete C20/25						
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	13 (1885)			
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	11 (1595)			
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	9,5 (1380)			
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 [2]	[-]	10,1			
Characteristic bond resistance in cracked concrete C20/25						
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	7 (1015)			
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	5,5 (800)			
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,cr}$	[N/mm²] ([psi])	5 (725)			
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 [2]	[-]	7,2			

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

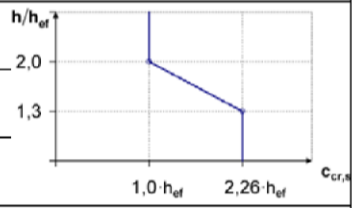
Performances
Characteristic resistance under tension load in concrete
Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C2 continued

Increasing factor for τ_{Rk} in concrete	ψ_c	C30/37	1,04
		C40/45	1,07
		C50/60	1,10
Concrete cone failure			
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2)]	[-]	10,1
	k_{cr} [2)]	[-]	7,2
Edge distance	$c_{cr,N}$	[mm], ([in])	$1,5 \cdot h_{ef}$
Spacing	$s_{cr,N}$	[mm], ([in])	$3,0 \cdot h_{ef}$
Splitting failure			
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2)]	[-]	10,1
	k_{cr} [2)]	[-]	7,2
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], ([in])	$2 \cdot c_{cr,sp}$



[1)] Parameter for design according to "EOTA Technical Report TR 029".
[2)] Parameter for design according to "CEN/TS 1992-4:2009".
[3)] In absence of national regulations.

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Table C3: Characteristic resistance for threaded rods under shear load

Threaded rod, HIT-V-… and HAS-...	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Steel failure without lever arm									
Factor according to section 6.3.2.1 of CEN/TS 1992-4:2009 part 5	k_2 [2)]	[-]	1,0						
Characteristic resistance [3)]	$V_{Rk,s}$	[kN], ([lb])	$0,5 \cdot A_s \cdot f_{uk}$						
Steel failure with lever arm									
Characteristic resistance	$M^0_{Rk,s}$	[Nm] ([ft-lb])	$1,2 \cdot W_{el} \cdot f_{uk}$						
Concrete pry-out failure									
Factor acc. to equation (5.7) of TR 029 or acc. to equation (27) of CEN/TS 1992-4:2009 part 5	k [1)] = k_3 [2)]	[-]	2,0						
Concrete edge failure									
The value of h_{ef} for calculation in equations (5.8a) and (5.8b) of Technical Report TR 029 is limited by:	h_{ef}	[mm] ([in])	$\min$ [1)] $(h_{ef}; 12 \cdot d)$, $\min$ [2)] $(h_{ef}; 12 \cdot d_{nom})$						
Outside diameter of anchor	d [1)] = d_{nom} [2)]	[mm] ([in])	9,5 (3/8)	12,7 (1/2)	15,9 (5/8)	19,1 (3/4)	22,2 (7/8)	25,4 (1)	31,8 (1 1/4)

[1)] Parameter for design according to "EOTA Technical Report TR 029".
[2)] Parameter for design according to "CEN/TS 1992-4:2009".
[3)] Effective cross sectional area according to Table B2.

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Performances
Characteristic resistance under shear load in concrete
Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"

Annex C5

Deutsches Institut für Bautechnik DIBt

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

HIS-(R)N	size (size)	[in] ([mm])	3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)
Steel failure without lever arm						
Factor according to section 6.3.2.1 of CEN/TS 1992-4:2009 part 5	k_2 [2)]	[-]	1,0			
Characteristic resistance HIS-N Screw acc. to SAE J429 Grade 5 or ASTM A325 (1/2 inch to 3/4 inch)	$V_{Rk,s}$	[kN] ([lb])	21 (4650)	38 (8515)	60 (13560)	65 (14575)
Partial safety factor	$\gamma_{Ms,V}$ [3)]	[-]	1,5			1,25
Characteristic resistance HIS-N Screw acc. to ASTM A193 Grade B7	$V_{Rk,s}$	[kN] ([lb])	22 (4845)	40 (8870)	63 (14125)	65 (14575)
Partial safety factor	$\gamma_{Ms,V}$ [3)]	[-]	1,5			1,25
Characteristic resistance HIS-RN Screw acc. to ASTM A193 Grade B8M (AISI 316)	$V_{Rk,s}$	[kN] ([lb])	19 (4265)	35 (7805)	55 (12430)	93 (20820)
Partial safety factor	$\gamma_{Ms,V}$ [3)]	[-]	1,5			2,0
Characteristic resistance HIS-RN Screw acc. to ASTM A193 Grade B8T (AISI 321)	$V_{Rk,s}$	[kN] ([lb])	22 (4845)	40 (8870)	63 (14125)	93 (20820)
Partial safety factor	$\gamma_{Ms,V}$ [3)]	[-]	1,5			2,0
Steel failure with lever arm						
Characteristic resistance HIS-N Screw acc. to SAE J429 Grade 5 or ASTM A325 (1/2 inch to 3/4 inch)	$M^0_{Rk,s}$	[Nm] ([ft-lb])	50 (37)	123 (91)	247 (182)	444 (327)
Characteristic resistance HIS-N Screw acc. to ASTM A193 Grade B7	$M^0_{Rk,s}$	[Nm] ([ft-lb])	52 (38)	128 (94)	257 (189)	463 (341)
Characteristic resistance HIS-RN Screw acc. to ASTM A193 Grade B8M (AISI 316)	$M^0_{Rk,s}$	[Nm] ([ft-lb])	45 (34)	113 (83)	226 (167)	407 (300)
Characteristic resistance HIS-RN Screw acc. to ASTM A193 Grade B8T (AISI 321)	$M^0_{Rk,s}$	[Nm] ([ft-lb])	52 (38)	128 (94)	257 (189)	463 (341)
Partial safety factor	$\gamma_{Ms,V}$ [3)]	[-]	1,5			
Concrete pry-out failure						
Factor acc. to equation (5.7) of TR 029 or acc. to equation (27) of CEN/TS 1992-4:2009 part 5	$k^{1)} = k_3$ [2)]	[-]	2,0			
Concrete edge failure						
Outer diameter of sleeve	$d^{1)} = d_{nom}$ [2)]	[mm] ([in])	16,5 (0,65)	20,5 (0,81)	25,4 (1)	27,6 (1,09)

[1)] Parameter for design according to "EOTA Technical Report TR 029".
[2)] Parameter for design according to "CEN/TS 1992-4:2009".
[3)] In absence of national regulations.

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Performances
Characteristic resistance under shear load in non-cracked concrete
Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"

Annex C6

Deutsches Institut für Bautechnik DIBt

Table C5: Displacements for threaded rods under tension load[1)]

Threaded rod, size [in] HIT-V-… and HAS-... (size) ([mm])			3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)	7/8 (22,2)	1 (25,4)	1 1/4 (31,8)
Non-cracked concrete									
Temperature range I: 40 °C / 24 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,03	0,03	0,04	0,05	0,06	0,07	0,09
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,05	0,07	0,08	0,10	0,12	0,13	0,17
Temperature range II: 80 °C / 50 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,04	0,05	0,06	0,07	0,08	0,10	0,12
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,05	0,07	0,09	0,10	0,12	0,14	0,17
Temperature range III: 120 °C / 72 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,05	0,06	0,08	0,09	0,11	0,13	0,16
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,05	0,07	0,09	0,11	0,13	0,14	0,18
Cracked concrete									
Temperature range I: 40 °C / 24 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,07						
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,16						
Temperature range II: 80 °C / 50 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,10						
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,22						
Temperature range III: 120 °C / 72 °C									
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,13						
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,29						

[1)] Calculation of the displacement

$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$ (τ: action bond strength).

Table C6: Displacements for threaded rods under shear load[1)]

Threaded rod, size [in] HIT-V-… and HAS-... (size) ([mm])			3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)	7/8 (22,2)	1 (25,4)	1 1/4 (31,8)
Displacement	δ_{V0}-factor	[mm/kN]	0,06	0,05	0,04	0,04	0,04	0,03	0,03
Displacement	$\delta_{V\infty}$-factor	[mm/kN]	0,09	0,07	0,07	0,06	0,05	0,05	0,04

[1)] Calculation of the displacement

$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; $\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$ (V: action shear load).

Injection System Hilti HIT-HY 200-A and Hilti HIT-HY 200-R

Performances
Displacements

Annex C7

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

HIS-(R)N	size (size)	[in] ([mm])	3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)
Non-cracked concrete						
Temperature range I: 40 °C / 24 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,05	0,06	0,07	0,08
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,09	0,11	0,13	0,14
Temperature range II: 80 °C / 50 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,06	0,08	0,10	0,11
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,09	0,11	0,14	0,15
Temperature range III: 120 °C / 72 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,08	0,10	0,13	0,14
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,09	0,12	0,14	0,16
Cracked concrete						
Temperature range I: 40 °C / 24 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,11			
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,16			
Temperature range II: 80 °C / 50 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,15			
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,22			
Temperature range III: 120 °C / 72 °C						
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,20			
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,29			

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

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

HIS-(R)N	size (size)	[in] ([mm])	3/8 (9,5)	1/2 (12,7)	5/8 (15,9)	3/4 (19,1)
Displacement	δ_{V0}-factor	[mm/kN]	0,06	0,05	0,04	0,04
Displacement	$\delta_{V\infty}$-factor	[mm/kN]	0,09	0,07	0,07	0,06

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

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Seismic design shall be carried out according to the TR 045 „Design of Metal Anchors under Seismic Action“

Table C9: Characteristic resistance for threaded rods under tension load for seismic performance category C1

Threaded rod, HIT-V-… and HAS-... size (size)		**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Steel failure									
HAS-E	$N_{Rk,s,seis}$	[kN] ([lb])	25 (5620)	46 (10290)	73 (16385)	108 (24250)	149 (33470)	195 (43910)	313 (70260)
HAS-E-B	$N_{Rk,s,seis}$	[kN] ([lb])	43 (9685)	79 (17735)	126 (28250)	186 (41810)	257 (57710)	337 (75710)	539 (121135)
HIT-V	$N_{Rk,s,seis}$	[kN] ([lb])	21 (4655)	38 (8520)	60 (13570)	89 (20085)	123 (27720)	162 (36370)	256 (58190)
HAS R 304/316	$N_{Rk,s,seis}$	[kN] ([lb])	35 (7750)	63 (14190)	101 (22600)	127 (28430)	175 (39245)	229 (51485)	366 (82370)
Combined pullout and concrete cone failure									
Characteristic bond resistance in cracked concrete C20/25									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,seis}$	[N/mm²] ([psi])	5,2 (760)	7,0 (1010)					
Temperature range II: 80 °C / 50 °C	$\tau_{Rk,seis}$	[N/mm²] ([psi])	3,9 (570)	5,7 (820)					
Temperature range III: 120 °C / 72 °C	$\tau_{Rk,seis}$	[N/mm²] ([psi])	3,5 (505)	4,8 (695)					

Table C10: Characteristic resistance for threaded rods under shear loads for seismic performance category C1

Threaded rod, HIT-V-… and HAS-... size (size)		**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Steel failure without lever arm									
HAS-E	$V_{Rk,s,seis}$	[kN] ([lb])	8 (1965)	16 (3600)	25 (5735)	38 (8485)	52 (11715)	68 (15370)	109 (24590)
HAS-E-B	$V_{Rk,s,seis}$	[kN] ([lb])	15 (3390)	27 (6210)	44 (9885)	65 (14635)	90 (10200)	118 (26500)	188 (42395)
HIT-V	$V_{Rk,s,seis}$	[kN] ([lb])	7 (1630)	13 (2980)	21 (4750)	31 (7030)	43 (9705)	56 (12730)	90 (20365)
HAS R 304/316	$V_{Rk,s,seis}$	[kN] ([lb])	11 (2575)	21 (4720)	33 (7515)	41 (9365)	57 (12925)	75 (16960)	120 (27135)

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Table C11: Displacements under tension load for seismic performance category C1

Threaded rod, HIT-V-… and HAS-...	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Displacement [1]	$\delta_{N,seis}$	[mm] ([in])	0,8 (0,03)	0,8 (0,03)	0,8 (0,03)	0,8 (0,03)	0,8 (0,03)	0,8 (0,03)	0,8 (0,03)

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

Table C12: Displacements under shear load for seismic performance category C1

Threaded rod, HIT-V-… and HAS-...	**size** (size)	**[in]** ([mm])	**3/8** (9,5)	**1/2** (12,7)	**5/8** (15,9)	**3/4** (19,1)	**7/8** (22,2)	**1** (25,4)	**1 1/4** (31,8)
Displacement [1]	$\delta_{V,seis}$	[mm] ([in])	3,5 (0,14)	3,9 (0,16)	4,4 (0,18)	4,9 (0,20)	5,4 (0,21)	5,9 (0,23)	6,8 (0,27)

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