Deutsches Institut für Bautechnik
DIBt

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

European Technical Assessment

ETA-15/0196 of 1 September 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-RE 500
Product family to which the construction product belongs	Bonded anchor for use in non-cracked concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	26 pages including 3 annexes
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-RE 500 is a bonded anchor for use in uncracked concrete consisting of a foil pack with injection mortar Hilti HIT-RE 500 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-N in the range 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	See Annex C1 – C6
Displacements	See Annex C7 – C8

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 1 September 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Installed condition

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

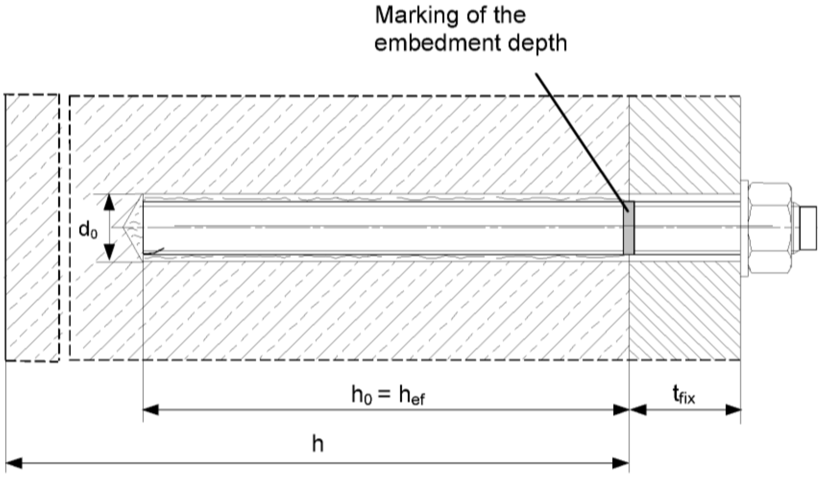
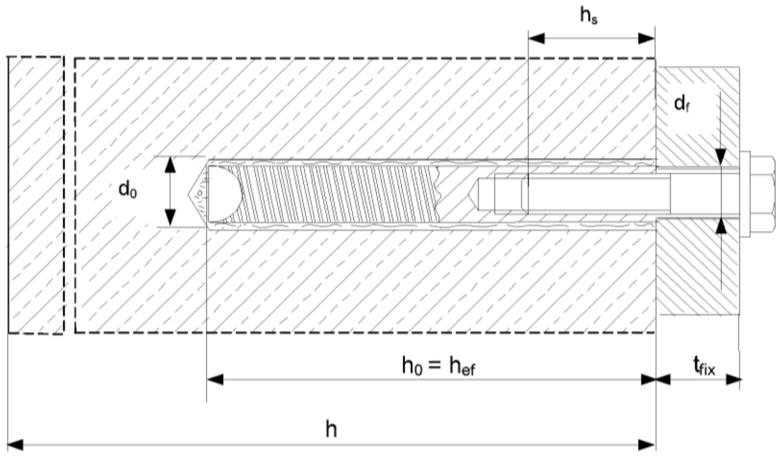


Figure A2:
Internally threaded sleeve HIS-(R)N



Injection system Hilti HIT-RE 500	
Product description Installed condition	**Annex A1**

Product description: Injection mortar and steel elements

Injection mortar Hilti HIT-RE 500: hybrid system with aggregate

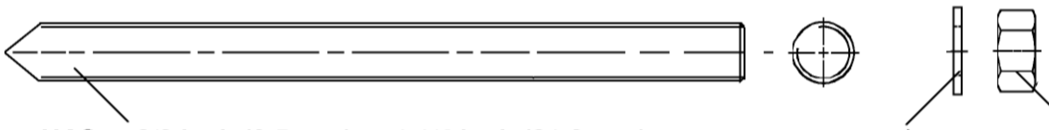
330 ml, 500 ml and 1400 ml

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

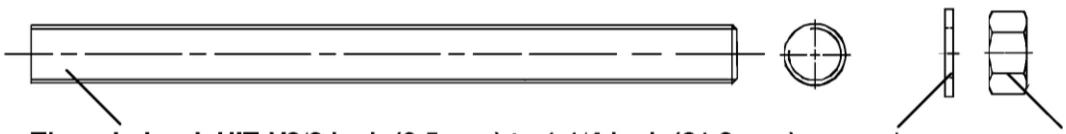
Product name: “Hilti HIT-RE 500”

Static mixer Hilti HIT-RE-M

Steel elements



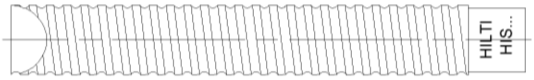
HAS-... 3/8 inch (9,5 mm) to 1 1/4 inch (31,8 mm) washer nut



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

Commercial standard threaded rod:

- Materials, dimensions and mechanical properties according to Table A1.
- Inspection certificate 3.1 according to EN 10204:2004. The documents should 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-RE 500	**Annex A2**
Product description Injection mortar / Static mixer / Steel elements	

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

Specifications of intended use

Anchorages subject to:
- Static and quasi static loading.

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.
- Non-cracked concrete.

Temperature in the base material:
- **at installation**
  +5 °C to +40 °C
- **in-service**
  Temperature range I: -40 °C to +40 °C
  (max. long term temperature +24 °C and max. short term temperature +40 °C)
  Temperature range II: -40 °C to +58°C
  (max. long term temperature +35 °C and max. short term temperature +58 °C)
  Temperature range III: -40 °C to +70 °C
  (max. long term temperature +43 °C and max. short term temperature +70 °C)

Table B1: Specifications of intended use

		HIT-RE 500 with …	
Elements		Threaded rod, HAS-…, HIT-V …	HIS-(R)N
Hammer drilling with hollow drill bit TE-CD and TE-YD		✓	✓
Hammer drilling		✓	✓
Diamond coring		✓	✓
Use category:	dry or wet concrete (not in flooded holes)	✓	✓
	flooded holes	hammer drilling only	hammer drilling only

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"

Installation:

- 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.

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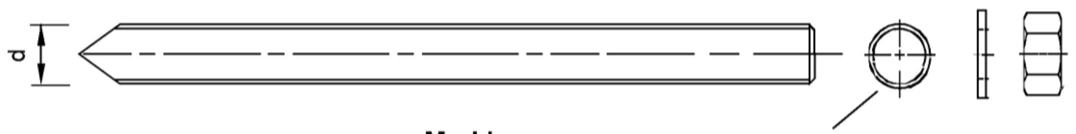
Table B2: Installation parameters of threaded rod, HAS-…, HIT-V-...

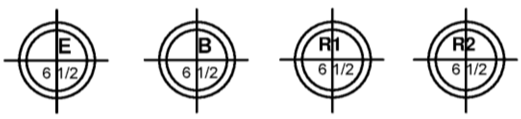
Threaded rod, HAS-…, HIT-V-...	**size**	**[in]**	**3/8**	**1/2**	**5/8**	**3/4**	**7/8**	**1**	**1 1/4**
Diameter of element	d[1] = d_{nom}[2]	[mm]	9,5	12,7	15,9	19,1	22,2	25,4	31,8
Effective cross sectional area	A_s[3]	[mm²] ([in²])	50 (0,0775)	92 (0,1419)	146 (0,2260)	216 (0,3345)	298 (0,4617)	391 (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_0	[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])	50 (1⅞)	65 (2½)	80 (3⅛)	95 (3¾)	110 (4⅜)	130 (5)	160 (6¼)
Minimum edge distance	c_{min}	[mm] ([in])	50 (1⅞)	65 (2½)	80 (3⅛)	95 (3¾)	110 (4⅜)	130 (5)	160 (6¼)

[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]

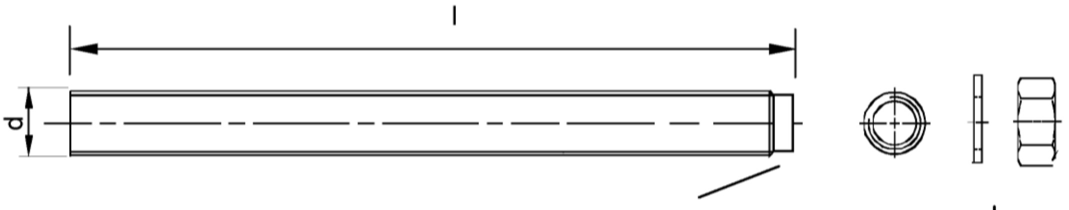


Injection system Hilti HIT-RE 500

Intended Use
Installation parameters

Annex B3

HIT-V-…



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

Injection system Hilti HIT-RE 500

Intended Use
Installation parameters

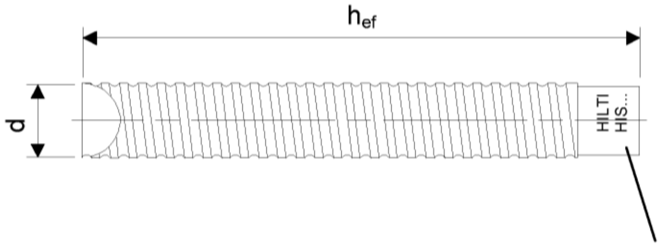
Annex B4

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

HIS-(R)N	**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])	45 (1¾)	55 (2⅛)	65 (2½)	90 (3½)
Minimum edge distance	c_{min}	[mm] ([in])	45 (1¾)	55 (2⅛)	65 (2½)	90 (3½)

[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)

Injection system Hilti HIT-RE 500

Intended Use
Installation parameters

Annex B5

Table B4: Maximum working time and minimum curing time

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
5 °C to 9 °C	120 min	72 hours
10 °C to 14 °C	90 min	48 hours
15 °C to 19 °C	30 min	24 hours
20 °C to 29 °C	20 min	12 hours
30 °C to 39 °C	12 min	8 hours
40 °C	12 min	4 hours

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Table B5: Parameters of cleaning and setting tools

Elements		Drill and clean				Installation
Threaded rod, HAS-…, HIT-V-…	HIS-(R)N	Hammer drilling		Diamond coring	Brush	Piston plug
			Hollow drill bit TE-CD, TE-YD			
						
Size [in] ([mm])	Name [in] ([mm])	d_0 [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 (11,1)	7/16 “	-
1/2 (12,7)	-	9/16 (14,3)	9/16 (14,3)	9/16 (14,3)	9/16 “	9/16 “
-	3/8 (9,5)	11/16 (17,5)	-	11/16 (17,5)	11/16 “	11/16 “
5/8 (15,9)	-	3/4 (19,1)	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 (22,2)	7/8 “	7/8 “
7/8 (22,2)	-	1 (25,4)	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 (28,6)	1 1/8 “	1 1/8 “
-	3/4 (19,1)	1 1/4 (31,8)	-	1 1/4 (31,8)	1 1/4 “	1 1/4 “
1 1/4 (31,8)	-	1 3/8 (34,9)	-	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-RE 500

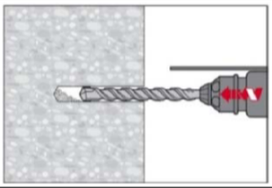
Intended Use
Cleaning and setting tools

Annex B7

Installation instruction

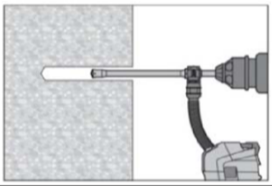
Hole drilling

a) Hammer drilling For dry or wet concrete and in flooded holes (no sea water).



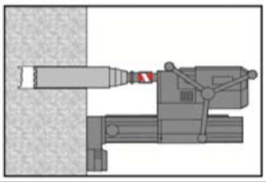
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

b) Hammer drilling with hollow drill bit For dry and wet concrete only.



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.

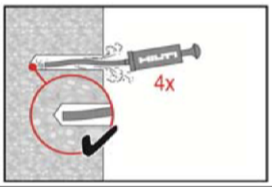
c) Diamond coring For dry and wet concrete only.



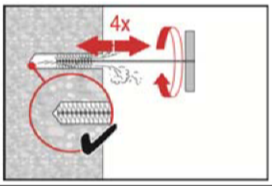
Diamond coring is permissible when suitable diamond core drilling machines and corresponding core bits are used.

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

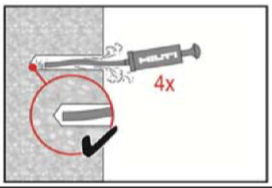
Manual cleaning (MC) For drill hole diameters $d_0 \leq 3/4$ in (19 mm) and drill hole depths $h_0 \leq 10 \cdot d$ (d element diameter), not for flooded holes.



The Hilti hand pump may be used for blowing out drill holes up to diameters $d_0 \leq 3/4$ in (19 mm) and drill hole depths $h_0 \leq 10 \cdot d$.
Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust.

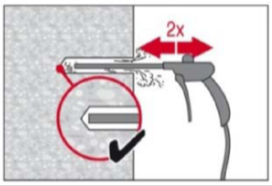
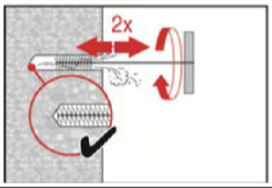
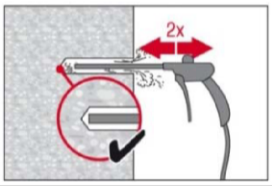


Brush 4 times with the specified brush (see Table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) – if not the brush is too small and must be replaced with the proper brush diameter.



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

Injection system Hilti HIT-RE 500	**Annex B8**
Intended Use Installation instructions	

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 must supply a minimum air flow of 140 m³/h.
	Brush 2 times with the specified brush (see Table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) – if not the brush is too small and must be replaced with the proper brush diameter.
	Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection system Hilti HIT-RE 500	**Annex B9**
Intended Use Installation instructions	

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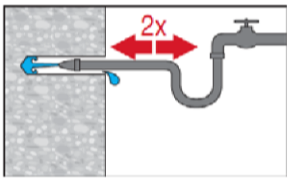
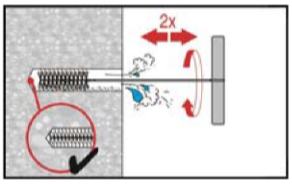
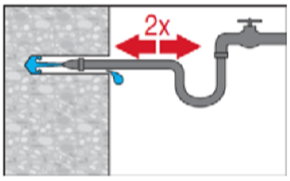
Cleaning of hammer drilled flooded holes and diamond cored holes
For all drill hole diameters d_0 and all drill hole depths h_0.



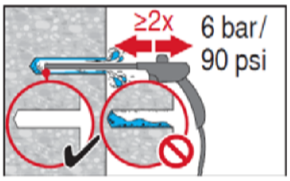
Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



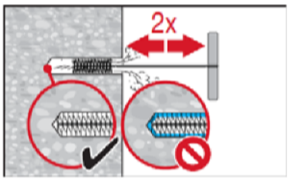
Brush 2 times with the specified brush size (brush Ø ≥ drill hole Ø, see Table B5) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole – if not the brush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



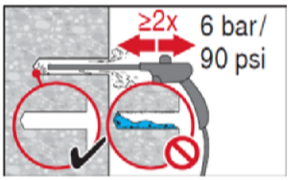
Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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



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



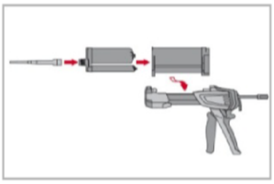
Blow again with compressed air 2 times until return air stream is free of noticeable dust and water.

Injection system Hilti HIT-RE 500

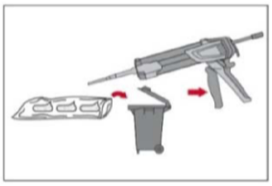
Intended Use
Installation instructions

Annex B10

Injection preparation



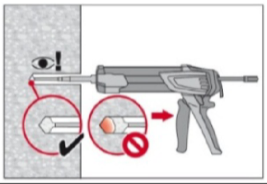
Tightly attach Hilti mixing nozzle HIT-RE-M to foil pack manifold. Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser.
Check foil pack holder for proper function. Insert foil pack into foil pack holder and put holder into the dispenser.



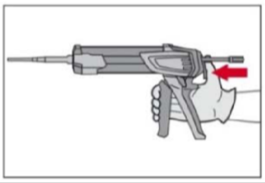
The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discarded quantities are:

3 strokes	for 330 ml foil pack,
4 strokes	for 500 ml foil pack,
65 ml	for 1400 ml foil pack.

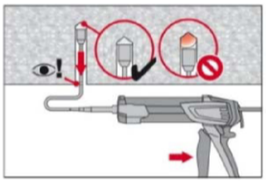
Inject adhesive from the back of the drill hole without forming air voids.



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.

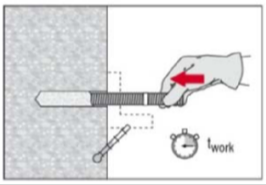


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

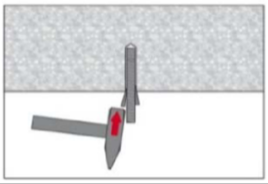


Overhead installation and/or installation with embedment depth h_{ef} > 250mm (9 5/6 in):
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug (see Table B5). Insert piston plug 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.

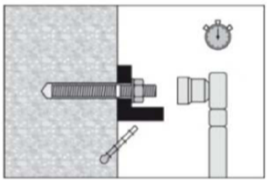
Setting the element



Before use, verify that the element is dry and free of oil and other contaminants.
Mark threaded rod with required embedment depth $h_{ef.}$ Set element to the required embedment depth before working time t_{work} has elapsed. The working time t_{work} is given in Table B4.



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) 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-RE 500	**Annex B11**
Intended Use Installation instructions	

Table C1: Characteristic resistance for threaded rods under tension load in non-cracked 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									
Hammer drilling with hollow drill bit TE-CD or TE-YD	γ_2 [1] = γ_{inst} [2]	[-]	1,4						
Hammer drilling	γ_2 [1] = γ_{inst} [2]	[-]	1,4						
Diamond coring	γ_2 [1] = γ_{inst} [2]	[-]	1,2		1,4				
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 in **hammer drilled holes and hammer drilled holes with hollow drill bit TE-CD or TE-YD**									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	16 (2320)	16 (2320)	15 (2175)	15 (2175)	14 (2030)	14 (2030)	13 (1885)
Temperature range II: 58 °C / 35 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	13 (1885)	13 (1885)	12 (1740)	12 (1740)	11 (1595)	11 (1595)	10 (1450)
Temperature range III: 70 °C / 43 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	8 (1160)	7,5 (1090)	7 (1015)	7 (1015)	7 (1015)	6,5 (945)	6 (870)
Characteristic bond resistance in non-cracked concrete C20/25 in **diamond cored holes**									
Temperature range I: 40 °C / 24 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	13 (1885)	13 (1885)	12 (1740)	11 (1595)	10 (1450)	9,5 (1380)	8 (1160)
Temperature range II: 58 °C / 35 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	11 (1595)	10 (1450)	9,5 (1380)	9 (1305)	8,5 (1235)	7,5 (1090)	6,5 (945)
Temperature range III: 70 °C / 43 °C	$\tau_{Rk,ucr}$	[N/mm²] ([psi])	6,5 (945)	6 (870)	5,5 (800)	5 (725)	5 (725)	4,5 (655)	3,5 (510)
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,04						
		C40/50	1,07						
		C50/60	1,09						
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 [2]	[-]	10,1						

Injection system Hilti HIT-RE 500

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

Annex C1

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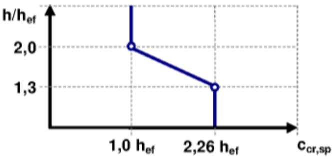
Table C1 continued

Concrete cone failure			
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2]	[-]	10,1
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
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-RE 500

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

Annex C2

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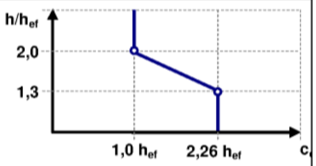
Table C2: Characteristic resistance for internally threaded sleeves HIS-(R)N under tension load in non-cracked concrete

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							
All drilling methods	$\gamma_2^{1)} = \gamma_{inst}^{2)}$		[-]	1,4			
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			1,50
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	1,50		
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	$\gamma_{Ms,N}^{3)}$		[-]	1,40	2,4		
Characteristic 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	$\gamma_{Ms,N}^{3)}$		[-]	1,50	2,4		
Combined pullout and concrete cone failure							
Characteristic tension resistance in non-cracked concrete C20/25 in holes drilled with hammer drill or hollow drill bit TE-CD or TE-YD							
Temperature range I: 40 °C / 24 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	60 (6890)	95 (10905)	170 (19515)	200 (22960)
Temperature range II: 58 °C / 35 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	50 (5740)	75 (8610)	140 (16070)	170 (19515)
Temperature range III: 70 °C / 43 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	30 (3445)	40 (4590)	75 (8610)	95 (10905)
Characteristic tension resistance in non-cracked concrete C20/25 in diamond drilled holes							
Temperature range I: 40 °C / 24 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	60 (6890)	75 (8610)	115 (13200)	140 (16070)
Temperature range II: 58 °C / 35 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	50 (5740)	60 (6890)	95 (10905)	115 (13200)
Temperature range III: 70 °C / 43 °C	$N_{Rk,ucr}^{4)}$		[kN] ([lb])	30 (3445)	40 (4590)	60 (6890)	75 (8610)
Increasing factors for N_{Rk} in concrete	ψ_c	C30/37		1,04			
		C40/50		1,07			
		C50/60		1,09			
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	$k_8^{2)}$		[-]	10,1			

Injection system Hilti HIT-RE 500	Annex C3
Performances Characteristic resistance under tension load in non-cracked concrete Design according to "EOTA Technical Report TR 029, 09/2010" or "CEN/TS 1992-4:2009"	

Table C2 continued

Concrete cone failure			
Factor acc. to section 6.2.3 of CEN/TS 1992-4:2009 part 5	k_{ucr} [2)]	[-]	10,1
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
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.
[4)] For design according to TR 029, the characteristic bond resistance may be calculated from the characteristic tension load values for combined pull-out and concrete cone failure according to: $\tau_{Rk} = N_{Rk} / (h_{ef} \cdot d_1 \cdot \pi)$.

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Table C3: Characteristic resistance for threaded rods under shear load in non-cracked 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)
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						

[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.

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Table C4: Characteristic resistance for internally threaded sleeves HIS-(R)N under shear load in non-cracked 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			

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.

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

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)
Temperature range I: 40 °C / 24 °C										
Displacement	δ_{N0}-factor		[mm/(N/mm²)]	0,02	0,03	0,04	0,04	0,05	0,06	0,07
Displacement	$\delta_{N\infty}$-factor		[mm/(N/mm²)]	0,05	0,07	0,08	0,10	0,12	0,14	0,18
Temperature range II: 58 °C / 35 °C										
Displacement	δ_{N0}-factor		[mm/(N/mm²)]	0,04	0,06	0,07	0,09	0,10	0,12	0,15
Displacement	$\delta_{N\infty}$-factor		[mm/(N/mm²)]	0,08	0,11	0,14	0,17	0,20	0,24	0,30
Temperature range III: 70 °C / 43 °C										
Displacement	δ_{N0}-factor		[mm/(N/mm²)]	0,08	0,11	0,14	0,17	0,20	0,23	0,30
Displacement	$\delta_{N\infty}$-factor		[mm/(N/mm²)]	0,11	0,16	0,20	0,24	0,29	0,33	0,42

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, 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	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).

Table C7: Displacements for internally threaded sleeves 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)
Temperature range I: 40 °C / 24 °C						
Displacement	δ_{N0}-factor	[mm/10kN]	0,06	0,06	0,04	0,04
Displacement	$\delta_{N\infty}$-factor	[mm/10kN]	0,15	0,15	0,10	0,09
Temperature range II: 58 °C / 35 °C						
Displacement	δ_{N0}-factor	[mm/10kN]	0,13	0,12	0,09	0,07
Displacement	$\delta_{N\infty}$-factor	[mm/10kN]	0,26	0,23	0,17	0,15
Temperature range III: 70 °C / 43 °C						
Displacement	δ_{N0}-factor	[mm/10kN]	0,26	0,23	0,17	0,14
Displacement	$\delta_{N\infty}$-factor	[mm/10kN]	0,36	0,33	0,24	0,20

1) Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot N/10$; $\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot N/10$ (N: action tension load).

Table C8: Displacements for internally threaded sleeves 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).