

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments

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★ Designated
according to
Article 29 of Regula-
tion (EU) No 305/2011
and member of EOTA
(European Organi-
sation for Technical
Assessment)
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★ ★

European Technical Assessment

ETA-07/0260
of 10 May 2016

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-SD

Product family
to which the construction product belongs

Bonded anchor for use in concrete

Manufacturer

Hilti Aktiengesellschaft
9494 SCHAAN
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

Hilti Werke

This European Technical Assessment
contains

33 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.

**European Technical Assessment
ETA-07/0260**

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Specific Part**1 Technical description of the product**

The "Injection System Hilti HIT-RE 500-SD for cracked concrete" is a bonded anchor consisting of a foil pack with injection mortar Hilti HIT-RE 500-SD and a steel element. The elements are made of zinc coated steel (threaded rods HIT-V, internal sleeve HIS-N), reinforcing bar, stainless steel (threaded rods HIT-V-R, internal sleeve HIS-RN, tension anchor HZA-R) or high corrosion resistant steel (threaded rods HIT-V-HCR).

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between steel element, 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 – C12
Characteristic resistance for seismic performance category C1, Displacements	See Annex C13 – C16

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 10 May 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Installed condition

Figure A1:

Threaded rod, HIT-V-...

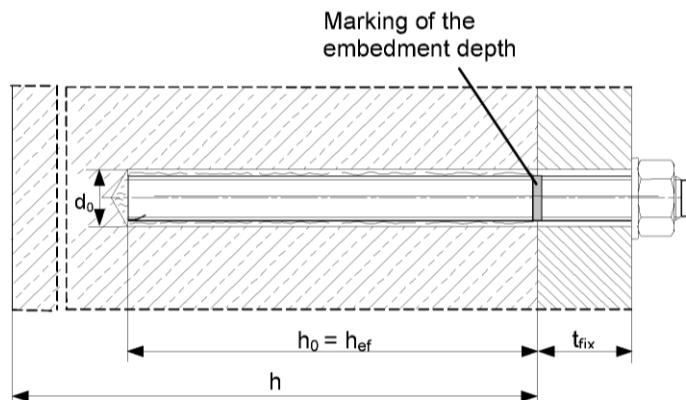


Figure A2:

Internally threaded sleeve HIS-(R)N

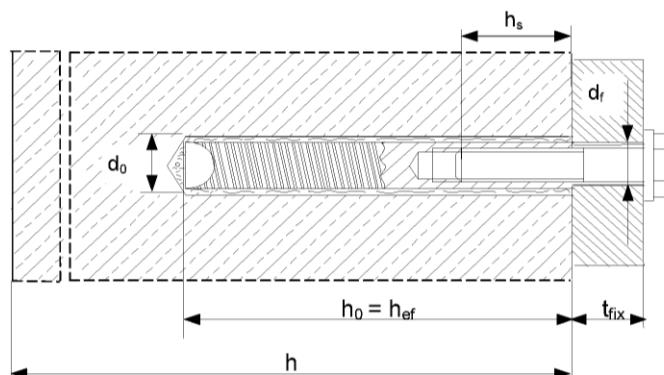
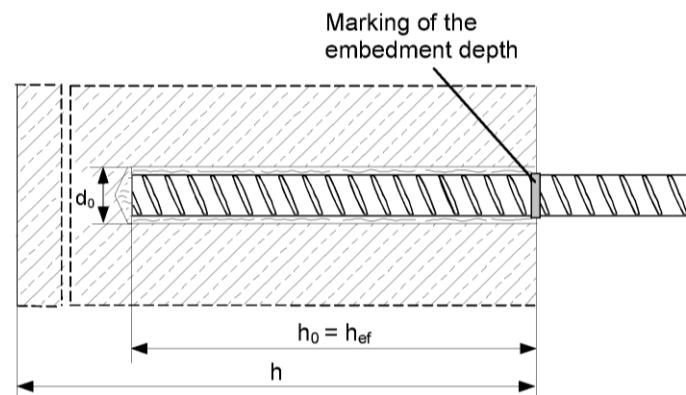


Figure A3:

Reinforcing bar (rebar)



Injection system Hilti HIT-RE 500-SD

Product description
Installed condition

Annex A1

Product description: Injection mortar and steel elements

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

330 ml, 500 ml and 1400 ml

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

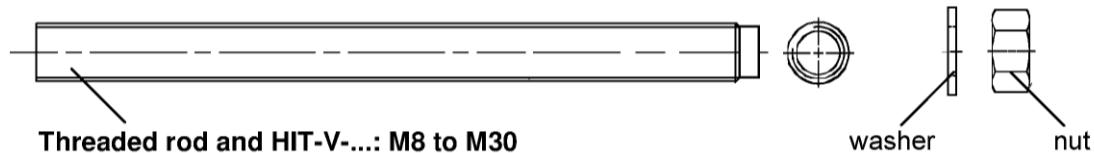


Product name: "Hilti HIT-RE 500-SD"

Static mixer Hilti HIT-RE-M



Steel elements

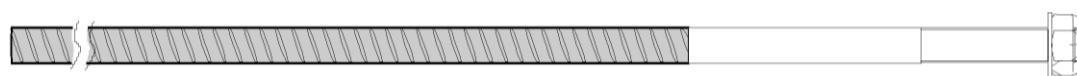


Commercial standard threaded rod with:

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



Internally threaded sleeve HIS-(R)N: M8 to M20



Hilti Tension Anchor: HZA-R M12 to M24



Reinforcing bar (rebar): ϕ 8 to ϕ 32

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

Injection system Hilti HIT-RE 500-SD

Product description

Injection mortar / Static mixer / Steel elements

Annex A2

Table A1: Materials

Designation	Material
Reinforcing bars (rebars)	
Rebar EN 1992-1-1:2004 and AC:2010, Annex C	Bars and de-coiled rods class B or C II with f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$
Metal parts made of zinc coated steel	
Threaded rod, HIT-V-5.8(F)	Strength class 5.8, $f_{uk} = 500 \text{ N/mm}^2$, $f_{yk} = 400 \text{ N/mm}^2$ Elongation at fracture ($l_0 = 5d$) > 8% ductile Electroplated zinc coated $\geq 5 \mu\text{m}$, (F) hot dip galvanized $\geq 45 \mu\text{m}$
Threaded rod, HIT-V-8.8(F)	Strength class 8.8, $f_{uk} = 800 \text{ N/mm}^2$, $f_{yk} = 640 \text{ N/mm}^2$ Elongation at fracture ($l_0 = 5d$) > 12% ductile Electroplated zinc coated $\geq 5 \mu\text{m}$, (F) hot dip galvanized $\geq 45 \mu\text{m}$
Internally threaded sleeve HIS-N	Electroplated zinc coated $\geq 5 \mu\text{m}$
Washer	Electroplated zinc coated $\geq 5 \mu\text{m}$, hot dip galvanized $\geq 45 \mu\text{m}$
Nut	Strength class of nut adapted to strength class of threaded rod Electroplated zinc coated $\geq 5 \mu\text{m}$, hot dip galvanized $\geq 45 \mu\text{m}$
Metal parts made of stainless steel	
Threaded rod, HIT-V-R	For $\leq M24$: strength class 70, $f_{uk} = 700 \text{ N/mm}^2$, $f_{yk} = 450 \text{ N/mm}^2$ For $> M24$: strength class 50, $f_{uk} = 500 \text{ N/mm}^2$, $f_{yk} = 210 \text{ N/mm}^2$ 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:2013
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
Metal parts made of high corrosion resistant steel	
Threaded rod, HIT-V-HCR	For $\leq M20$: $f_{uk} = 800 \text{ N/mm}^2$, $f_{yk} = 640 \text{ N/mm}^2$ For $> M20$: $f_{uk} = 700 \text{ N/mm}^2$, $f_{yk} = 400 \text{ N/mm}^2$, 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

Injection system Hilti HIT-RE 500-SD

Product description
Materials

Annex A3

Specifications of intended use

Anchorage subject to:

- Static and quasi static loading.
- Seismic performance category C1

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

+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

Elements	HIT-RE 500-SD with ...			
	HIT-V-...	HIS-(R)N	HZA-R	Rebar
Hammer drilling with hollow drill bit TE-CD or TE-YD 	✓	✓	✓	✓
Hammer drilling 	✓	✓	✓	✓
Use category: dry or wet concrete (not in flooded holes)	✓	✓	✓	✓
Static and quasi static loading in cracked and non-cracked concrete	M8 to M30	M8 to M20	M12 to M24	Ø 8 to Ø 32
Seismic performance category C1	M8 to M30	M8 to M20	M12 to M24	Ø 8 to Ø 32

Injection system Hilti HIT-RE 500-SD

Intended Use Specifications

Annex B1

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.).
- 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-RE 500-SD	
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Intended Use Specifications	
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Annex B2

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

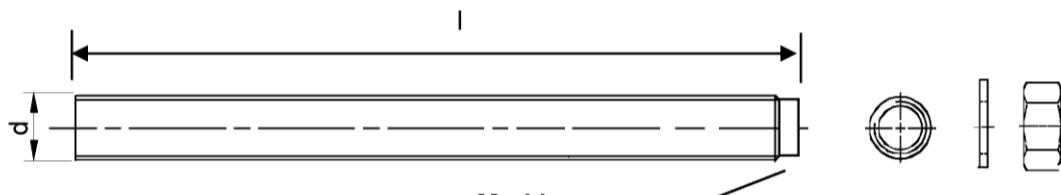
Threaded rod, HIT-V-...		M8	M10	M12	M16	M20	M24	M27	M30
Diameter of element	$d^1) = d_{\text{nom}}^2)$ [mm]	8	10	12	16	20	24	27	30
Nominal diameter of drill bit	d_0 [mm]	10	12	14	18	22	28	30	35
Effective embedment depth and drill hole depth	$h_{\text{ef}} = h_0$ [mm]	40 to 160	40 to 200	48 to 240	64 to 320	80 to 400	96 to 480	108 to 540	120 to 600
Maximum diameter of clearance hole in the fixture ³⁾	d_f [mm]	9	12	14	18	22	26	30	33
Minimum thickness of concrete member	h_{min} [mm]	$h_{\text{ef}} + 30$ ≥ 100 mm			$h_{\text{ef}} + 2 \cdot d_0$				
Maximum torque moment	T_{max} [Nm]	10	20	40	80	150	200	270	300
Minimum spacing	s_{min} [mm]	40	50	60	80	100	120	135	150
Minimum edge distance	c_{min} [mm]	40	50	60	80	100	120	135	150

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.

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

Injection system Hilti HIT-RE 500-SD

Intended Use

Installation parameters of threaded rod, HIT-V-...

Annex B3

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

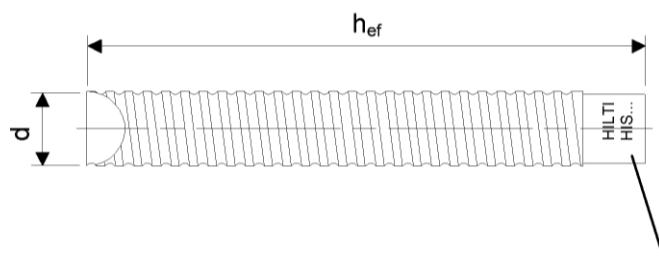
Internally threaded sleeve HIS-(R)N	M8	M10	M12	M16	M20
Outer diameter of sleeve $d^1) = d_{nom}^{2)}$ [mm]	12,5	16,5	20,5	25,4	27,6
Nominal diameter of drill bit d_0 [mm]	14	18	22	28	32
Effective embedment depth and drill hole depth $h_{ef} = h_0$ [mm]	90	110	125	170	205
Maximum diameter of clearance hole in the fixture ³⁾ d_f [mm]	9	12	14	18	22
Minimum thickness of concrete member h_{min} [mm]	120	150	170	230	270
Maximum torque moment T_{max} [Nm]	10	20	40	80	150
Thread engagement length min-max h_s [mm]	8-20	10-25	12-30	16-40	20-50
Minimum spacing s_{min} [mm]	60	75	90	115	130
Minimum edge distance c_{min} [mm]	40	45	55	65	90

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)

related fastening screw HIS-N: strength class 8.8 EN ISO 898-1, A5 > 8% Ductile, steel galvanized

$\geq 5\mu m$ EN ISO 4042

related fastening screw HIS-RN: strength class 70 EN ISO 3506-1, A5 > 8% Ductile, stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088

Injection system Hilti HIT-RE 500-SD

Intended Use

Installation parameters of internally threaded sleeve, HIS-(R)N...

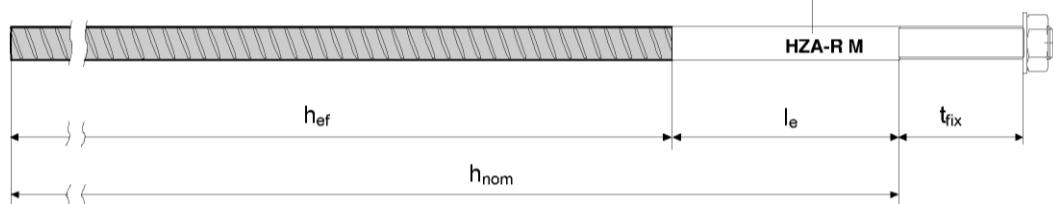
Annex B4

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

Hilti tension anchor HZA-R ...		M12	M16	M20	M24
Rebar diameter	ϕ [mm]	12	16	20	25
Nominal embedment depth and drill hole depth	$h_{\text{nom}} = h_0$ [mm]	170 to 240	180 to 320	190 to 400	200 to 500
Effective embedment depth ($h_{\text{ef}} = h_{\text{nom}} - l_e$)	h_{ef} [mm]			$h_{\text{nom}} - 100$	
Length of smooth shaft	l_e [mm]			100	
Nominal diameter of drill bit	d_0 [mm]	16	20	25	32
Maximum diameter of clearance hole in the fixture ¹⁾	d_f [mm]	14	18	22	26
Maximum torque moment	T_{max} [Nm]	40	80	150	200
Minimum thickness of concrete member	h_{min} [mm]			$h_{\text{nom}} + 2 \cdot d_0$	
Minimum spacing	s_{min} [mm]	65	80	100	130
Minimum edge distance	c_{min} [mm]	45	50	55	60

¹⁾ For larger clearance hole see TR 029, section 1.1.

Marking:
embossing "HZA-R" M .. / t_{fix}



Injection system Hilti HIT-RE 500-SD

Intended Use

Installation parameters of Hilti tension anchor HZA-R

Annex B5

Table B5: Installation parameters of reinforcing bar (rebar)

Reinforcing bar (rebar)	$\phi 8$	$\phi 10$	$\phi 12$	$\phi 14$	$\phi 16$	$\phi 20$	$\phi 25$	$\phi 26$	$\phi 28$	$\phi 30$	$\phi 32$	
Diameter ϕ [mm]	8	10	12	14	16	20	25	26	28	30	32	
Effective embedment depth $h_{ef} = h_0$ [mm] and drill hole depth	60 to 160	60 to 200	70 to 240	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]	10 / 12 ¹⁾	12 / 14 ¹⁾	14 / 16 ¹⁾	18	20	25	32	32	35	37	40	
Minimum thickness of concrete member h_{min} [mm]	$h_{ef} + 30$ ≥ 100 mm			$h_{ef} + 2 \cdot d_0$								
Minimum spacing s_{min} [mm]	40	50	60	70	80	100	125	130	140	150	160	
Minimum edge distance c_{min} [mm]	40	45	45	50	50	65	70	75	75	80	80	

¹⁾ Each of the two given values can be used.

Reinforcing bar (rebar)



For Rebar bolt

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

Injection system Hilti HIT-RE 500-SD

Intended Use
Installation parameters of reinforcing bar (rebar)

Annex B6

Table B6: Maximum working time and minimum curing time¹⁾

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
5 °C to 9 °C	2 hours	72 hours
10 °C to 14°C	1,5 hours	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

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

Table B7: Parameters of cleaning and setting tools

Elements				Drill and clean			Installation
Threaded rod, HIT-V-...	HIS-(R)N	HZA-R	Rebar	Hammer drilling	Hollow drill bit TE-CD, TE-YD	Brush	Piston plug
size	size	size	size	d_0 [mm]	d_0 [mm]	HIT-RB	HIT-SZ
M8	-	-	ϕ 8	10	-	10	-
M10	-	-	ϕ 8, ϕ 10	12	12	12	12
M12	M8	-	ϕ 10, ϕ 12	14	14	14	14
-	-	M12	ϕ 12	16	16	16	16
M16	M10	-	ϕ 14	18	18	18	18
-	-	M16	ϕ 16	20	20	20	20
M20	M12	-	-	22	22	22	22
-	-	M20	ϕ 20	25	25	25	25
M24	M16	-	-	28	28	28	28
M27	-	-	-	30	-	30	30
-	M20	M24	ϕ 25, ϕ 26	32	32	32	32
M30	-	-	ϕ 28	35	-	35	35
-	-	-	ϕ 30	37	-	37	37
-	-	-	ϕ 32	40	-	40	40

Injection system Hilti HIT-RE 500-SD

Intended Use

Maximum working time and minimum curing time.

Parameters of cleaning and setting tools.

Annex B7

Cleaning alternatives

Compressed Air Cleaning (CAC):

Air nozzle with an orifice opening of minimum 3,5 mm in diameter.



Automatic Cleaning (AC):

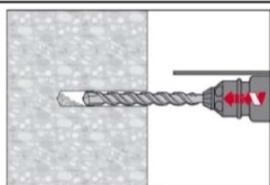
Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.



Installation instruction

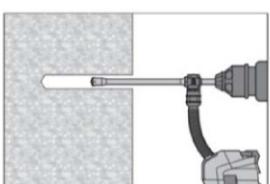
Hole drilling

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: For dry and wet concrete only.



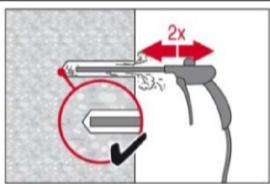
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user's manual. After drilling is completed, proceed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

Drill hole cleaning

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

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 hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.

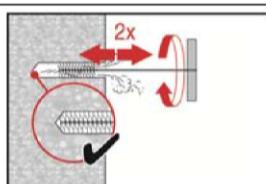
For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m³/h.

Injection system Hilti HIT-RE 500-SD

Intended Use

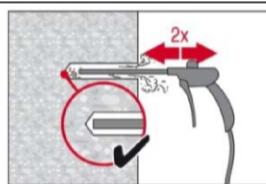
Cleaning and setting tools
Installation instructions

Annex B8



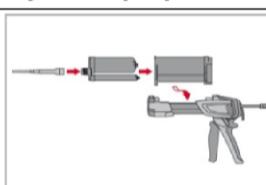
Brush 2 times with the specified brush (see Table B7) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.

The brush must produce natural resistance as it enters the drill hole (brush $\varnothing \geq$ drill hole \varnothing) - 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

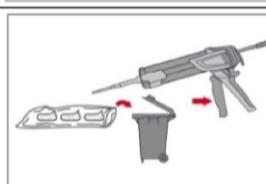


Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle.

Observe the instruction for use of the dispenser.

Check foil pack holder for proper function. Do not use damaged foil packs / holders.

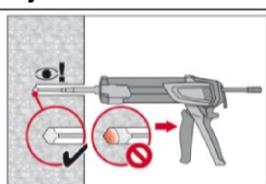
Insert foil pack into foil pack holder and put holder into HIT-dispenser.



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

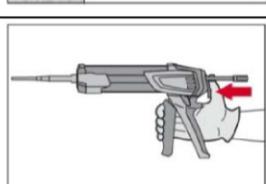
3 strokes	for 330 ml foil pack,
4 strokes	for 500 ml foil pack,
65 ml	for 1400 ml foil pack.

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

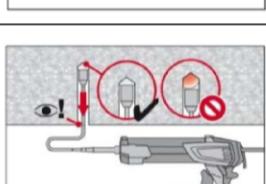


Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.

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 $h_{ef} > 250\text{mm}$.

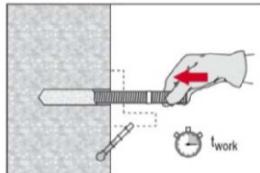
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug (see Table B7). Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.

Injection system Hilti HIT-RE 500-SD

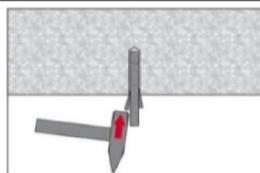
Intended Use
Installation instructions

Annex B9

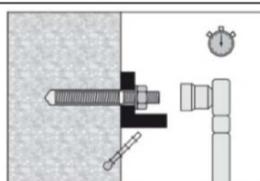
Setting the element



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 B6.



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 B6) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2, Table B3 and Table B4

Injection system Hilti HIT-RE 500-SD

Intended Use
Installation instructions

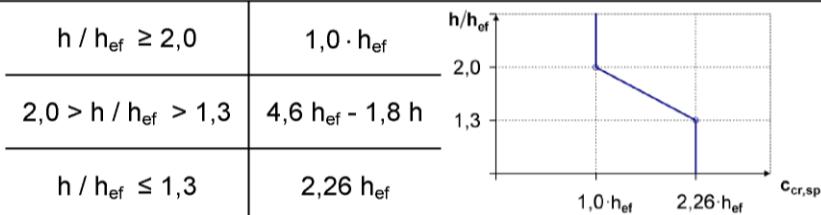
Annex B10

Table C1: Characteristic values of resistance for threaded rod, HIT-V-... under tension load in concrete

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30
Installation safety factor $\gamma_2^{1)} = \gamma_{\text{inst}}^{2)}$ [-]	1,2			1,4				
Steel failure								
Characteristic steel resistance $N_{Rk,s}$ [kN]								$A_s \cdot f_{uk}$
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/mm ²]	16		15		14		13	
Temperature range II: 58 °C/35 °C $\tau_{Rk,ucr}$ [N/mm ²]	13		12		11			
Temperature range III: 70 °C/43 °C $\tau_{Rk,ucr}$ [N/mm ²]	8		7,5		7		6,5	
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5 $k_8 = k_{ucr}^{2)}$ [-]					10,1			
Characteristic bond resistance in cracked concrete C20/25								
Temperature range I: 40 °C/24 °C $\tau_{Rk,cr}$ [N/mm ²]	8	7,5	7		6,5		6	
Temperature range II: 58 °C/35 °C $\tau_{Rk,cr}$ [N/mm ²]	6,5	6	5,5		5			
Temperature range III: 70 °C/43 °C $\tau_{Rk,cr}$ [N/mm ²]	4	3,5			3			
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5 $k_8 = k_{cr}^{2)}$ [-]					7,2			
	C30/37				1,04			
Increasing factors for τ_{Rk} in concrete ψ_c	C40/50				1,07			
	C50/60				1,09			
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⁾ Parameter for design according to EOTA Technical Report TR 029.

²⁾ Parameter for design according to CEN/TS 1992-4:2009.



Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under tension loads in concrete

Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C1

**Table C2: Characteristic values of resistance for threaded rod, HIT-V-...
under shear loads**

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm								
Factor according to section 6.3.2.1 of CEN/TS 1992-4: 2009 part 5								
Characteristic steel resistance	$V_{Rk,s}$	[kN]						$0,5 \cdot A_s \cdot f_{uk}$
Steel failure with lever arm								
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]						$1,2 \cdot W_{el} \cdot f_{uk}$
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.

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under shear loads in concrete.

Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C2

Table C3: Displacements under tension load for threaded rod, HIT-V-...¹⁾

HIT-RE 500-SD with threaded rod, HIT-V-...		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete temperature range I : 40°C / 24°C									
Displacement	δ_{N0} [mm/(N/mm ²)]		0,02	0,03	0,04	0,05	0,06	0,07	
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,04	0,05	0,06	0,08	0,11	0,13	0,15	0,17
Non-cracked concrete temperature range II : 58°C / 35°C									
Displacement	δ_{N0} [mm/(N/mm ²)]	0,03	0,04	0,05	0,07	0,09	0,11	0,13	0,14
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,07	0,09	0,10	0,14	0,18	0,22	0,25	0,28
Non-cracked concrete temperature range III : 70°C / 43°C									
Displacement	δ_{N0} [mm/(N/mm ²)]	0,07	0,09	0,10	0,14	0,18	0,22	0,25	0,28
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,09	0,12	0,15	0,20	0,26	0,31	0,35	0,40
Cracked concrete temperature range I : 40°C / 24°C									
Displacement	δ_{N0} [mm/(N/mm ²)]	0,03	0,04		0,05	0,06	0,07		0,08
	$\delta_{N\infty}$ [mm/(N/mm ²)]					0,23			
Cracked concrete temperature range II : 58°C / 35°C									
Displacement	δ_{N0} [mm/(N/mm ²)]	0,07	0,08	0,09	0,11	0,13	0,14	0,15	0,17
	$\delta_{N\infty}$ [mm/(N/mm ²)]					0,38			
Cracked concrete temperature range III : 70°C / 43°C									
Displacement	δ_{N0} [mm/(N/mm ²)]	0,14	0,16	0,18	0,22	0,25	0,28	0,31	0,33
	$\delta_{N\infty}$ [mm/(N/mm ²)]					0,54			

¹⁾ Calculation of the displacement

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

Table C4: Displacements under shear load for threaded rod, HIT-V-...¹⁾

HIT-RE 500-SD with threaded rod, HIT-V-...		M8	M10	M12	M16	M20	M24	M27	M30
Displacement	δ_{V0} [mm/kN]		0,06	0,05	0,04		0,03		
	$\delta_{V\infty}$ [mm/kN]	0,09	0,08		0,06		0,05		

¹⁾ Calculation of the displacement

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

Injection system Hilti HIT-RE 500-SD

Performances
Displacements

Annex C3

Table C5: Characteristic resistance for internally threaded sleeve HIS-(R)N under tension load in concrete

HIT-RE 500-SD with HIS-(R)N			M8	M10	M12	M16	M20			
Installation safety factor	$\gamma_2^{1)} = \gamma_{\text{inst}}^{2)}$	[-]	1,2	1,4						
Steel failure										
Characteristic resistance HIS-N with screw grade 8.8	$N_{Rk,s}$	[kN]	25	46	67	125	116			
Partial safety factor	$\gamma_{Ms,N}^{3)}$	[-]	1,5							
Characteristic resistance HIS-RN with screw grade 70	$N_{Rk,s}$	[kN]	26	41	59	110	166			
Partial safety factor	$\gamma_{Ms,N}^{3)}$	[-]	1,87				2,4			
Factor for cracked concrete	$k_{cr}^{2)}$	[-]	7,2							
Factor for non-cracked concrete	$k_{ucr}^{2)}$	[-]	10,1							
Combined pullout and concrete cone failure										
Characteristic bond resistance in non-cracked concrete C20/25										
Temperature range I: 40 °C / 24 °C	$N_{Rk,ucr}^{4)}$	[kN]	40	60	95	170	200			
Temperature range I: 58 °C / 35 °C	$N_{Rk,ucr}^{4)}$	[kN]	35	50	75	140	170			
Temperature range I: 70 °C / 43 °C	$N_{Rk,ucr}^{4)}$	[kN]	20	30	40	75	95			
Characteristic bond resistance in cracked concrete C20/25										
Temperature range I: 40 °C / 24 °C	$N_{Rk,cr}^{4)}$	[kN]	25	40	60	95	115			
Temperature range I: 58 °C / 35 °C	$N_{Rk,cr}^{4)}$	[kN]	20	35	40	75	95			
Temperature range I: 70 °C / 43 °C	$N_{Rk,cr}^{4)}$	[kN]	12	20	25	40	50			
Increasing factors for $N_{Rk,p}$ in concrete	ψ_c		C30/37	1,04						
			C40/50	1,07						
			C50/60	1,09						
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⁾ 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: $\tau_{Rk} = N_{Rk} / (h_{ef} \cdot d_1 \cdot \pi)$.

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under tension loads in concrete

Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C4

Table C6: Characteristic values of resistance for internally threaded sleeve HIS-(R)N under shear loads

HIT-RE 500-SD with HIS-(R)N	M8	M10	M12	M16	M20
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 steel resistance HIS-N with screw grade 8.8 $V_{Rk,s}$ [kN]	13	23	34	63	58
Partial safety factor $\gamma_{Ms,V}^{3)}$ [-]			1,25		
Characteristic steel resistance HIS-RN with screw grade 70 $V_{Rk,s}$ [kN]	13	20	30	55	83
Partial safety factor $\gamma_{Ms,V}^{3)}$ [-]			1,56		2,0
Steel failure with lever arm					
Characteristic bending moment HIS-N with screw grade 8.8 $M_{Rk,s}^0$ [Nm]	30	60	105	266	519
Partial safety factor $\gamma_{Ms,V}^{3)}$ [-]			1,25		
Characteristic bending moment HIS-RN with screw grade 70 $M_{Rk,s}^0$ [Nm]	26	52	92	233	454
Partial safety factor $\gamma_{Ms,V}^{3)}$ [-]			1,56		
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 $k_3^{2)} = k_3^{2)}$ [-]				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.

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under shear loads in concrete
Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C5

Table C7: Displacements for internally threaded sleeves HIS-(R)N under tension load¹⁾

HIT-RE 500-SD with HIS-(R)N		M8	M10	M12	M16	M20
Non-cracked concrete temperature range I : 40°C / 24°C						
Displacement	δ_{N0} [mm/kN]	0,08	0,06	0,04		
	$\delta_{N\infty}$ [mm/kN]	0,18	0,15	0,14	0,10	0,09
Non-cracked concrete temperature range II : 58°C / 35°C						
Displacement	δ_{N0} [mm/kN]	0,15	0,13	0,12	0,09	0,07
	$\delta_{N\infty}$ [mm/kN]	0,31	0,26	0,23	0,17	0,15
Non-cracked concrete temperature range III : 70°C / 43°C						
Displacement	δ_{N0} [mm/kN]	0,31	0,26	0,23	0,17	0,14
	$\delta_{N\infty}$ [mm/kN]	0,43	0,36	0,33	0,24	0,20
Cracked concrete temperature range I : 40°C / 24°C						
Displacement	δ_{N0} [mm/kN]	0,13	0,10	0,08	0,05	0,04
	$\delta_{N\infty}$ [mm/kN]	0,64	0,40	0,28	0,17	0,13
Cracked concrete temperature range II : 58°C / 35°C						
Displacement	δ_{N0} [mm/kN]	0,26	0,19	0,16	0,11	0,09
	$\delta_{N\infty}$ [mm/kN]	1,08	0,67	0,48	0,28	0,22
Cracked concrete temperature range III : 70°C / 43°C						
Displacement	δ_{N0} [mm/kN]	0,52	0,39	0,32	0,22	0,18
	$\delta_{N\infty}$ [mm/kN]	1,53	0,95	0,67	0,40	0,30

¹⁾ Calculation of the displacement

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

Table C8: Displacements for internally threaded sleeves HIS-(R)N under shear load¹⁾

HIT-RE 500-SD with HIS-(R)N		M8	M10	M12	M16	M20
Displacement	δ_{V0} [mm/kN]		0,06	0,05	0,04	
Displacement	$\delta_{V\infty}$ [mm/kN]	0,09	0,08	0,07	0,06	

¹⁾ Calculation of the displacement

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

Injection system Hilti HIT-RE 500-SD

Performances
Displacements

Annex C6

Table C9: Characteristic values of resistance for Hilti tension anchor HZA-R under tension loads in concrete

HIT-RE 500-SD with HZA-R		M12	M16	M20	M24
Installation safety factor	$\gamma_2^{2)} = \gamma_{inst}^{3)}$ [-]	1,2		1,4	
Steel failure					
Characteristic resistance HZA-R	$N_{Rk,s}$ [kN]	62	111	173	248
Partial safety factor	$\gamma_{Ms}^{1)}$ [-]			1,4	
Combined pull-out and concrete cone failure					
Diameter of rebar	d [mm]	12	16	20	25
Characteristic bond resistance in non-cracked concrete C20/25					
Temperature range I: 40 °C/24 °C	$\tau_{Rk,ucr}$ [N/mm ²]	15	14		13
Temperature range II: 58 °C/35 °C	$\tau_{Rk,ucr}$ [N/mm ²]	12		11	
Temperature range III: 70 °C/43 °C	$\tau_{Rk,ucr}$ [N/mm ²]		7		6,5
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	$k_8 = k_{ucr}^{3)}$ [-]			10,1	
Characteristic bond resistance in cracked concrete C20/25					
Temperature range I: 40 °C/24 °C	$\tau_{Rk,cr}$ [N/mm ²]	7,5	7		
Temperature range II: 58 °C/35 °C	$\tau_{Rk,cr}$ [N/mm ²]		6		5,5
Temperature range III: 70 °C/43 °C	$\tau_{Rk,cr}$ [N/mm ²]		3,5		3
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	$k_8 = k_{cr}^{3)}$ [-]			7,2	
Increasing factor for τ_{Rk} in concrete	C30/37			1,04	
	C40/50			1,07	
	C50/60			1,09	

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under tension loads in concrete
Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C7

Table C9 continued

Effective anchorage depth for calculation of $N_{Rk,p}^0$ acc. Eq. 5.2a (TR 029, 5.2.2.3 Combined pull - out and concrete cone failure)	HZA-R h_{ef} [mm]	$h_{nom} - 100$
Concrete cone failure		
Effective anchorage depth for calculation of $N_{Rk,c}^0$ acc. Eq. 5.3a (TR 029, 5.2.2.4 Concrete cone failure)	HZA-R h_{ef} [mm]	h_{nom}
Splitting failure relevant for non-cracked concrete		
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$ $2,0 > h / h_{ef} > 1,3$ $h / h_{ef} \leq 1,3$	$1,0 \cdot h_{ef}$ $4,6 \cdot h_{ef} - 1,8 \cdot h$ $2,26 \cdot h_{ef}$
Spacing	$s_{cr,sp}$ [mm]	$2 \cdot c_{cr,sp}$

¹⁾ In absence of national regulations.

²⁾ Parameter for design according to EOTA Technical Report TR 029.

³⁾ Parameter for design according to CEN/TS 1992-4:2009.

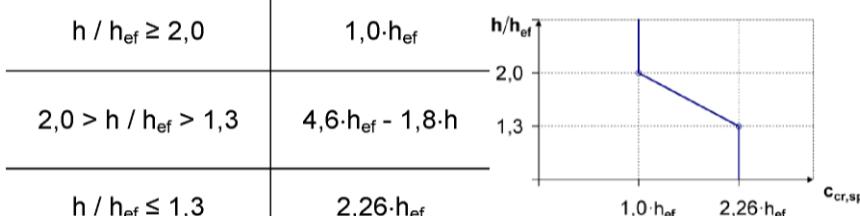


Table C10: Characteristic values of resistance for Hilti tension anchor HZA-R under shear loads in concrete

HIT-RE 500-SD with HZA-R	M12	M16	M20	M24
Steel failure without lever arm				
Factor according to section 6.3.2.1 of CEN/TS 1992-4: 2009 part 5 k_2 ³⁾ [-]				1,0
Characteristic resistance HZA-R $V_{Rk,s}$ [kN]	31	55	86	124
Partial safety factor γ_{Ms} ¹⁾ [-]				1,25
Steel failure with lever arm				
Characteristic resistance HZA-R $M_{Rk,s}^0$ [Nm]	97	235	457	790
Partial safety factor γ_{Ms} ¹⁾ [-]				1,25
Concrete pry-out failure				
Factor acc. to equation (5.7) of TR 029 or acc. to equation (27) of CEN/TS 1992-4: $k^2) = k_3$ ³⁾ [-]				2,0

¹⁾ In absence of national regulations.

²⁾ Parameter for design according to EOTA Technical Report TR 029.

³⁾ Parameter for design according to CEN/TS 1992-4:2009.

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under tension loads and under shear loads in concrete.
Design according to „EOTA Technical Report TR 029, 09/2010“or “CEN/TS 1992-4:2009”

Annex C8

Table C11: Displacements for Hilti tension anchor HZA-R under tension load¹⁾

HIT-RE 500-SD with HZA-R	M12	M16	M20	M24	
Non-cracked concrete temperature range I : 40°C / 24°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,03	0,04	0,05	0,06
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,06	0,08	0,11	0,14
Non-cracked concrete temperature range II : 58°C / 35°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,05	0,07	0,09	0,12
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,10	0,14	0,18	0,23
Non-cracked concrete temperature range III : 70°C / 43°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,10	0,14	0,18	0,23
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,15	0,20	0,26	0,33
Cracked concrete temperature range I : 40°C / 24°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,05		0,06	0,07
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,23			
Cracked concrete temperature range II : 58°C / 35°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,09	0,11	0,13	0,15
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,38			
Cracked concrete temperature range III : 70°C / 43°C					
Displacement	δ_{N0} [mm/(N/mm ²)]	0,18	0,22	0,25	0,29
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,54			

¹⁾ Calculation of the displacement

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

Table C12: Displacements for Hilti tension anchor HZA-R under shear load¹⁾

HIT-RE 500-SD with HZA-R	M12	M16	M20	M24
Displacement	δ_{V0} [mm/kN]	0,05	0,04	0,03
	$\delta_{V\infty}$ [mm/kN]	0,08	0,06	0,05

¹⁾ Calculation of the displacement

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

Injection system Hilti HIT-RE 500-SD

Performances
Displacements

Annex C9

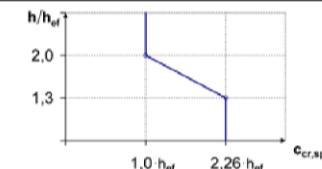
Table C13: Characteristic values of resistance for rebar under tension loads in concrete

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32													
Installation safety factor $\gamma_2^{2)} = \gamma_{inst}^{3)} [-]$	1,2				1,4																			
Steel failure																								
Characteristic resistance for rebar N _{Rk,s} [kN] B500B acc. to DIN 488:2009-08 ¹⁾																								
Characteristic bond resistance in non-cracked concrete C20/25	28	43	62	85	111	173	270	-	339	-	442													
Combined pull-out and Concrete cone failure																								
Diameter of rebar d [mm]	8	10	12	14	16	20	25	26	28	30	32													
Characteristic bond resistance in cracked concrete C20/25																								
Temperature range I: 40°C/24°C τ _{Rk,ucr} [N/mm ²]	15			14			13																	
Temperature range II: 58°C/35°C τ _{Rk,ucr} [N/mm ²]	12			11			10																	
Temperature range III: 70°C/43°C τ _{Rk,ucr} [N/mm ²]	7			6,5			6																	
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5 k ₈ = k _{ucr} ³⁾ [-]	10,1																							
Characteristic bond resistance in cracked concrete C20/25																								
Temperature range I: 40°C/24°C τ _{Rk,cr} [N/mm ²]	8		7,5		7			6,5		6														
Temperature range II: 58°C/35°C τ _{Rk,cr} [N/mm ²]	6,5		6		5,5			5																
Temperature range III: 70°C/43°C τ _{Rk,cr} [N/mm ²]	4		3,5			3																		
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5 k ₈ = k _{cr} ³⁾ [-]	7,2																							
Increasing factor for τ _{Rk} in concrete ψ _c	C30/37		1,04																					
	C40/45		1,07																					
	C50/60		1,09																					
Splitting failure relevant for non-cracked concrete																								
Edge distance c _{cr,sp} [mm] for	$h / h_{ef} \geq 2,0$		1,0 · 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 · c _{cr,sp}																							

¹⁾ The characteristic tension resistance N_{Rk,s} for rebars that do not fulfil the requirements acc. DIN 488 shall be calculated acc. Technical Report TR 029, Equation (5.1).

²⁾ Parameter for design according to EOTA Technical Report TR 029.

³⁾ Parameter for design according to CEN/TS 1992-4:2009.



Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under tension loads in concrete.

Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C10

Table C14: Characteristic values of resistance for rebar under shear loads

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Steel failure without lever arm											
Factor according to section 6.3.2.1 of CEN/TS 1992-4: 2009 part 5 $k_2^{(4)}$ [-]											
Characteristic resistance for rebar B500B acc. to DIN 488:2009-08 ¹⁾ $V_{Rk,s}$ [kN]	14	22	31	42	55	86	135	-	169	-	221
Steel failure with lever arm											
Characteristic resistance for rebar B500B acc. to DIN 488:2009-08 ²⁾ $M_{Rk,s}^0$ [Nm]	33	65	112	178	265	518	1012	-	1422	-	2123
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 $k^{(3)} = k_3^{(4)}$ [-]	2,0										

¹⁾ The characteristic shear resistance $V_{Rk,s}$ for rebars that do not fulfil the requirements acc. DIN 488 shall be calculated acc. Technical Report TR 029, Equation (5.5).

²⁾ The characteristic bending resistance $M_{Rk,s}^0$ for rebars that do not fulfil the requirements acc. DIN 488 shall be calculated acc. Technical Report TR 029, Equation (5.6b).

³⁾ Parameter for design according to EOTA Technical Report TR 029.

⁴⁾ Parameter for design according to CEN/TS 1992-4:2009.

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic values of resistance under shear loads in concrete.

Design according to „EOTA Technical Report TR 029, 09/2010“or “CEN/TS 1992-4:2009”

Annex C11

Table C15: Displacements under tension load¹⁾

HIT-RE 500-SD with rebar		φ 8	φ 10	φ 12	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/mm ²)]	0,02		0,03		0,04	0,05	0,06	0,07		0,08	
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,04	0,05	0,06	0,07	0,08	0,11		0,14	0,15	0,17	0,18
Non-cracked concrete temperature range II : 58°C / 35°C												
Displacement	δ_{N0} [mm/(N/mm ²)]	0,03	0,04	0,05	0,06	0,07	0,09		0,12	0,13	0,14	0,15
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,07	0,09	0,10	0,12	0,14	0,18	0,23	0,24	0,26	0,28	0,30
Non-cracked concrete temperature range III : 70°C / 43°C												
Displacement	δ_{N0} [mm/(N/mm ²)]	0,07	0,09	0,10	0,12	0,14	0,18	0,23	0,24	0,26	0,28	0,30
	$\delta_{N\infty}$ [mm/(N/mm ²)]	0,09	0,12	0,15	0,17	0,20	0,26	0,33	0,34	0,37	0,40	0,43
Cracked concrete temperature range I : 40°C / 24°C												
Displacement	δ_{N0} [mm/(N/mm ²)]	0,03	0,04		0,05		0,06		0,07	0,08		0,09
	$\delta_{N\infty}$ [mm/(N/mm ²)]							0,23				
Cracked concrete temperature range II : 58°C / 35°C												
Displacement	δ_{N0} [mm/(N/mm ²)]	0,07	0,08	0,09	0,10	0,11	0,13		0,15	0,16		0,17
	$\delta_{N\infty}$ [mm/(N/mm ²)]							0,38				
Cracked concrete temperature range III : 70°C / 43°C												
Displacement	δ_{N0} [mm/(N/mm ²)]	0,14	0,16	0,18	0,20	0,22	0,25	0,29	0,30	0,32	0,34	0,35
	$\delta_{N\infty}$ [mm/(N/mm ²)]							0,54				

¹⁾ Calculation of the displacement

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

Table C16: Displacements under shear load¹⁾

HIT-RE 500-SD with rebar		φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Displacement	δ_{V0} [mm/kN]	0,06		0,05		0,04				0,03		
	$\delta_{V\infty}$ [mm/kN]	0,09	0,08	0,07		0,06		0,05		0,04		

¹⁾ Calculation of the displacement

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

Injection system Hilti HIT-RE 500-SD

Performances
Displacements.

Annex C12

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

Table C17: Characteristic resistance for threaded rods under tension load for seismic performance category C1

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30								
Installation safety factor γ_2 [-]		1,2				1,4										
Steel failure																
Char. Resistance HIT-V $N_{Rk,s,seis}$ [kN]							$A_s \cdot f_{uk}$									
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/mm ²]	6,4		6	5,3	5	4,6	4,1	3,6								
Temperature range II: 58 °C/35 °C $\tau_{Rk,seis}$ [N/mm ²]	5,2		4,8	4,5	3,9	3,6	3,1	3								
Temperature range III: 70 °C/43 °C $\tau_{Rk,seis}$ [N/mm ²]	3,2		2,8	2,6	2,1	2	1,9	1,8								

Table C18: Characteristic resistance for threaded rods under shear loads for seismic performance category C1

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm								
Char. Resistance HIT-V-5.8 (F) $V_{Rk,s,seis}$ [kN]	6	11	15	27	43	62	81	98
Char. Resistance HIT-V-8.8 (F) $V_{Rk,s,seis}$ [kN]	11	16	24	44	69	99	129	157
Char. Resistance HIT-V-R $V_{Rk,s,seis}$ [kN]	9	14	21	39	60	87	81	98
Char. Resistance HIT-V-HCR $V_{Rk,s,seis}$ [kN]	11	16	24	44	69	87	113	137

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

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30
Displacement ¹⁾ $\delta_{N,seis}$ [mm]	1,5	1,7	1,9	2,3	2,7	3,1	3,4	3,7

¹⁾ Maximum displacement during cycling (seismic event).

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

HIT-RE 500-SD with threaded rod, HIT-V-...	M8	M10	M12	M16	M20	M24	M27	M30
Displacement ¹⁾ $\delta_{V,seis}$ [mm]	3,2	3,5	3,8	4,4	5,0	5,6	6,1	6,5

¹⁾ Maximum displacement during cycling (seismic event).

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic resistances and displacements - seismic performance category C1
Design according to "EOTA Technical Report TR045, 02/2013"

Annex C13

Table C21: Characteristic resistance for internal threaded sleeves under tension load for seismic performance category C1

HIT-RE 500-SD with HIS-(R)N	M8	M10	M12	M16	M20
Steel failure					
Characteristic resistance HIS-N with screw grade 8.8	N _{Rk,s,seis} [kN]	25	46	67	125
Partial safety factor	γ _{Ms,N} [-]			1,5	
Characteristic resistance HIS-RN with screw grade 70	N _{Rk,s,seis} [kN]	26	41	59	110
Partial safety factor	γ _{Ms,N} [-]			1,87	2,4
Combined pullout and concrete cone failure					
Characteristic bond resistance in cracked concrete C20/25					
Temperature range I: 40 °C / 24 °C	N _{Rk,seis} [kN]	20	30	42	61
Temperature range I: 58 °C / 35 °C	N _{Rk,seis} [kN]	16	26	28	48
Temperature range I: 70 °C / 43 °C	N _{Rk,seis} [kN]	9,5	15	17	25
					31

Table C22: Characteristic resistance for internal threaded sleeves under shear loads for seismic performance category C1

HIT-RE 500-SD with HIS-(R)N	M8	M10	M12	M16	M20
Steel failure without lever arm					
Characteristic steel resistance HIS-N with screw grade 8.8	V _{Rk,s,seis} [kN]	9	16	27	41
Partial safety factor	γ _{Ms,V} [-]			1,25	
Characteristic steel resistance HIS-RN with screw grade 70	V _{Rk,s,seis} [kN]	9	14	21	39
Partial safety factor	γ _{Ms,V} [-]			1,56	2,0

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

HIT-RE 500-SD with HIS-(R)N	M8	M10	M12	M16	M20
Displacement ¹⁾	δ _{N,seis} [mm]	1,5	1,7	1,9	2,3

¹⁾ Maximum displacement during cycling (seismic event).

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

HIT-RE 500-SD with HIS-(R)N	M8	M10	M12	M16	M20
Displacement ¹⁾	δ _{V,seis} [mm]	3,2	3,5	3,8	4,4

¹⁾ Maximum displacement during cycling (seismic event).

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic resistances and displacements - seismic performance category C1
Design according to "EOTA Technical Report TR045, 02/2013"

Annex C14

Table C25: Characteristic resistance for Hilti tension anchors under tension load for seismic performance category C1

HIT-RE 500-SD with HZA-R	M12	M16	M20	M24
Steel failure				
Characteristic resistance HZA-R $N_{Rk,s,seis}$ [kN]	62	111	173	248
Partial safety factor γ_{Ms} [-]			1,4	
Combined pull-out and concrete cone failure				
Characteristic bond resistance in cracked concrete C20/25				
Temperature range I: 40 °C/24 °C $\tau_{Rk,seis}$ [N/mm ²]	6	5,3	5	4,6
Temperature range II: 58 °C/35 °C $\tau_{Rk,seis}$ [N/mm ²]	4,8	4,5	3,9	3,6
Temperature range III: 70 °C/43 °C $\tau_{Rk,seis}$ [N/mm ²]	2,8	2,6	2,1	2

Table C26: Characteristic resistance for Hilti tension anchors under shear loads for seismic performance category C1

HIT-RE 500-SD with HZA-R	M12	M16	M20	M24
Steel failure without lever arm				
Characteristic resistance HZA-R $V_{Rk,s,seis}$ [kN]	22	39	60	87
Partial safety factor γ_{Ms} [-]			1,25	

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

HIT-RE 500-SD with HZA-R	M8	M10	M12	M20
Displacement ¹⁾ $\delta_{N,seis}$ [mm]	1,9	2,3	2,7	3,2

¹⁾ Maximum displacement during cycling (seismic event).

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

HIT-RE 500-SD with HZA-R	M8	M10	M12	M20
Displacement ¹⁾ $\delta_{V,seis}$ [mm]	3,8	4,4	5,0	5,8

¹⁾ Maximum displacement during cycling (seismic event).

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic resistances and displacements - seismic performance category C1
Design according to "EOTA Technical Report TR045, 02/2013"

Annex C15

Table C29: Characteristic resistance for rebars under tension load for seismic performance category C1

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Steel failure											
Characteristic resistance for rebar $N_{Rk,s,seis}$ [kN] B500B acc. to DIN 488:2009-08											
Temperature range I: 40°C/24°C	$\tau_{Rk,seis}$ [N/mm ²]	28	43	62	85	111	173	270	-	339	-
Combined pull-out and Concrete cone failure											
Characteristic bond resistance in cracked concrete C20/25											
Temperature range II: 58°C/35°C	$\tau_{Rk,seis}$ [N/mm ²]	5,2	6,4	4,8	4,7	4,5	3,9	3,6	3,5	3,1	2,9
Temperature range III: 70°C/43°C	$\tau_{Rk,seis}$ [N/mm ²]	3,2	2,8	2,7	2,6	2,1	2	1,9	1,8	1,7	1,4

Table C30: Characteristic resistance for rebars under shear loads for seismic performance category C1

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Steel failure without lever arm											
Characteristic resistance for rebar $V_{Rk,s,seis}$ [kN] B500B acc. to DIN 488:2009-08											
Displacement ¹⁾	$\delta_{N,seis}$ [mm]	10	15	22	29	39	60	95	-	118	-

Table C31: Displacements under tension load for rebars for seismic performance category C1

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Displacement ¹⁾	$\delta_{N,seis}$ [mm]	1,5	1,7	1,9	2,1	2,3	2,7	3,2	3,3	3,5	3,7

¹⁾ Maximum displacement during cycling (seismic event).

Table C32: Displacements under shear load for rebars for seismic performance category C1

HIT-RE 500-SD with rebar	φ 8	φ 10	φ 12	φ 14	φ 16	φ 20	φ 25	φ 26	φ 28	φ 30	φ 32
Displacement ¹⁾	$\delta_{V,seis}$ [mm]	3,2	3,5	3,8	4,1	4,4	5,0	5,8	5,9	6,2	6,5

¹⁾ Maximum displacement during cycling (seismic event).

Injection system Hilti HIT-RE 500-SD

Performances

Characteristic resistances and displacements - seismic performance category C1
Design according to "EOTA Technical Report TR045, 02/2013"

Annex C16