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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-08/0105

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	Injektionssystem Hilti HIT-RE 500 für Bewehrungsanschluss *Injection System Hilti HIT-RE 500 for rebar connection*
Zulassungsinhaber *Holder of approval*	Hilti Aktiengesellschaft Business Unit Anchors 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Nachträglich eingemörtelter Bewehrungsanschluss mit Hilti Injektionsmörtel HIT-RE 500 *Post-installed rebar connections with Hilti injection mortar HIT-RE 500*
Geltungsdauer: vom *Validity: from*	8 May 2008
bis *to*	8 May 2013
Herstellwerk *Manufacturing plant*	Hilti Werke

Diese Zulassung umfasst *This Approval contains*	33 Seiten einschließlich 23 Anhänge *33 pages including 23 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];

Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], zuletzt geändert durch Gesetz vom 06.01.2004[5];

Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];

Guideline for European technical approval of "Metal anchors for use in concrete - Part 5: Bonded anchors", ETAG 001-05.

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11.02.1989, p. 12
2 Official Journal of the European Communities L 220, 30.08.1993, p. 1
3 Official Journal of the European Union L 284, 31.10.2003, p. 25
4 Bundesgesetzblatt I, p. 812
5 Bundesgesetzblatt I, p.2, 15
6 Official Journal of the European Communities L 17, 20.01.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the construction product

The subject of this approval is the post-installed connection, by anchoring or overlap connection joint, of reinforcing bars (rebars) in existing structures made of normal weight concrete, using the Hilti HIT-RE 500 injection mortar in accordance with the regulations for reinforced concrete construction.

Reinforcing bars made of steel with a diameter d_s from 8 to 40 mm according to Annex 4 or the Hilti tension anchor HZA sizes M12, M16 and M20 according to Annex 6 and Hilti HIT-RE 500 injection mortar are used for Hilti rebar connections. The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between embedded element, injection mortar and concrete.

1.2 Intended use

The rebar connection may be used in normal weight concrete of a minimum grade of C12/15 and maximum grade C50/60 according to EN 206-1:2000. It may be used in non-carbonated concrete of use category 2 with the allowable chloride content in concrete of 0.40% (CL 0.40) related to the cement content according to EN 206-1.

Rebar connections with reinforcing bars and Hilti tension anchor HZA may be used for predominantly static loads.

The fire resistance of post-installed rebar connections is not covered by this ETA. Fatigue, dynamic or seismic loading of post-installed rebar connections are not covered by this ETA.

Rebar connections may only be carried out in a manner, which is also possible with cast-in straight reinforcing bars, e.g. those in the following applications (see Annex 2):

- an overlap joint with existing reinforcement in a building component (Figures 1 and 2),
- anchoring of the reinforcement at a slab or beam support, (e.g. according to Figure 3: end support of a slab, designed simply supported, as well as an appropriate general reinforcement for restraint forces),
- anchoring of reinforcement of building components stressed primarily in compression (Figure 4),
- anchoring of reinforcement to cover the envelope line of tensile force in the bending member (Figure 5).

The post-installed rebar connections may be used in the temperature range of -40 °C to +80°C (max short term temperature +80°C and max long term temperature +50 °C).

This ETA covers anchoring in bore holes made with hammer drilling, compressed air drilling or diamond (dry or wet) drilling technique. The post-installed rebar connection may be installed in dry or wet concrete. It must not be installed in flooded holes.

Rebar connections with the Hilti tension anchor HZA may be used for the transmission of tensile forces in the direction of the bar axis only. The transmission of shear forces has to be ensured by appropriate measures. Examples for the application are given in Annex 3, Figures 6 to Figure 8.

The provisions made in this European technical approval are based on an assumed working life of the post-installed rebar connection of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of the product and methods of verification

2.1 Characteristics of the product

The post-installed rebar connection corresponds to the drawings and provisions given in Annexes 1 to 7. The characteristic material values, dimensions and tolerances not indicated in Annexes 1 to 7 shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

The two components of the injection mortar are delivered in unmixed condition in foil packs of sizes 330 ml, 500 ml or 1400 ml according to Annex 14. Each foil pack is marked with the identifying mark "HILTI HIT-RE 500" with the production date and expiry date.

The rebar shall comply with the specifications given in Annex 4. The Hilti tension anchor HZA shall comply with the specifications given in Annex 6. Each tension anchor with connecting thread made of stainless steel is marked with "HZA-R" and each tension anchor with connecting thread made of high corrosion resistant steel is marked with "HZA-HCR" according to Annex 6.

2.2 Methods of verification

The assessment of fitness of the post-installed rebar connection for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Part 1 "Anchors in general" and Part 5 "Bonded anchors" and EOTA Technical Report TR 023 "Assessment of post-installed rebar connections"[8].

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the Decision 96/582/EC of the European Commission[9] system 2(i) (referred to as System 1) of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(a) Tasks for the manufacturer:
  (1) factory production control;
  (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

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7 The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

8 The Technical Report TR 023 "Assessment of post-installed rebar connections" is published on EOTA website www.EOTA.eu.

9 Official Journal of the European Communities L 254 of 08.10.1996

(b) Tasks for the approved body:

(3) initial type–testing of the product;

(4) initial inspection of factory and of factory production control;

(5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial/raw/constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan of May 2008 which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.[10]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2 For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

10 The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the injection mortar. The letters ”CE” shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Drafting

Rebar connections must be designed in keeping with good engineering practice. Considering the loads to be anchored, design calculations and design drawings must be produced which can be checked. At least the following items must be stated in the design drawings:

- grade of concrete strength,
- diameter, drilling technique, concrete cover, spacing and embedment depth of the rebar,
- length for markings ℓ_m and ℓ_v respectively $\ell_{e,ges}$ on the injection extension according to Annex 18,
- use of a guide device (drilling aid) for drilling holes close to edges (if necessary),
- kind of preparation of the joint between building component being connected including the diameter and thickness of concrete layer that has to be removed.

4.3 Design

4.3.1 General

The actual position of the reinforcement in the existing structure shall be determined on the basis of the construction documentation and taken into account when designing.

The design of post-installed rebar connections according to Annex 2 and determination of the internal section forces to be transferred in the construction joint shall be verified in accordance with EN 1992-1-1. When ascertaining the tensile force in the rebar, allowance shall be made for the statically effective height of the bonded-in reinforcement.

Hilti tension anchor HZA according to Annexes 6 and 7 shall be designed for the welded-on reinforcement steel BSt 500S. The length of the bonded-in smooth shaft made of stainless steel may not be accounted as anchorage.

The verification of the immediate local force transfer to the concrete has been provided.

The verification of the transfer of the loads to be anchored to the building component shall be provided.

The spacing between post-installed rebars respectively Hilti tension anchor HZA shall be greater than the minimum of 5 d_s and 50 mm (according to Annex 5 respectively Annex 7).

4.3.2 Determination of the basic anchorage length

The required basic anchorage length $\ell_{b,rqd}$ shall be determined in accordance with EN 1992-1-1, Section 8.4.3:

$$\ell_{b,rqd} = (d_s / 4) (\sigma_{sd} / f_{bd})$$

with: d_s = diameter of the rebar

σ_{sd} = calculated design stress of the rebar

f_{bd} = design value of bond strength according to Annex 9, Table 5 or 6
in consideration of the coefficient related to the quality of bond conditions and of the coefficient related to the bar diameter and of the drilling technique

4.3.3 Determination of the design anchorage length

The required design anchorage length ℓ_{bd} shall be determined in accordance with EN 1992-1-1, Section 8.4.4:

$$\ell_{bd} = \alpha_1 \alpha_2 \alpha_3 \alpha_4 \alpha_5 \ell_{b,rqd} \geq \ell_{b,min}$$

with: $\ell_{b,rqd}$ = according to section 4.3.2

α_1 = 1.0 for straight bars

α_2 = 0.7…1.0 calculated acc. to EN 1992-1-1, Table 8.2

α_3 = 1.0 because of no transverse reinforcement

α_4 = 1.0 because of no welded transverse reinforcement

α_5 = 0.7…1.0 for influence of transverse pressure acc. to EN 1992-1-1, Table 8.2

$\ell_{b,min}$ = minimum anchorage length acc. to EN 1992-1-1

= max {0.3 $\ell_{b,rqd}$; 10d_s; 100 mm} under tension

= max {0.6 $\ell_{b,rqd}$; 10d_s; 100 mm} under compression

In case of diamond wet drilling multiply the values by 1.5.

The maximum permissible anchorage depth is given in Annex 17 in relation to the dispenser to be used.

4.3.4 Overlap joints

The required design lap length ℓ_0 shall be determined in accordance with EN 1992-1-1, Section 8.7.3:

$\ell_0 = \alpha_1 \alpha_2 \alpha_3 \alpha_5 \alpha_6 \ell_{b,rqd} \geq \ell_{0,min}$

with: $\ell_{b,rqd}$ = according to Section 4.3.2

α_1 = 1.0 for straight bars

α_2 = 0.7…1.0 calculated acc. to EN 1992-1-1, Table 8.2

α_3 = 1.0 because of no transverse reinforcement

α_5 = 0.7…1.0 for influence of transverse pressure acc. to EN 1992-1-1, Table 8.2

α_6 = 1.0…1.5 for influence of percentage of lapped bars relative to the total cross-section area acc. to EN 1992-1-1, Table 8.3

$\ell_{0,min}$ = minimum lap length acc. to EN 1992-1-1

= max {0.3 α_6 $\ell_{b,rqd}$; 15d_s; 200 mm}

In case of diamond wet drilling multiply the values by 1.5.

The maximum permissible anchorage depth is given in Annex 17 in relation to the dispenser to be used.

4.3.5 Embedment depth for overlap joints

Overlap joint for rebars:

For calculation of the effective embedment depth of overlap joints the concrete cover at end-face of bonded-in rebar c_1 shall be considered (see Annex 5, Figure 10):

$\ell_v \geq \ell_0 + c_1$

with: ℓ_0 = required lap length acc. to Section 4.3.4 and to EN 1992-1-1

c_1 = concrete cover at end-face of bonded-in rebar (see also Annex 5)

If the clear distance between the overlapping rebars is greater than 4 d_s the lap length shall be enlarged by the difference between the clear distance and 4 d_s.

Overlap joint for Hilti tension anchor HZA:

The effective embedment depth is the same like the lap length $\ell_v = \ell_0$ (see Annex 7, Figure 12).

The total embedment depth $\ell_{e.ges}$ shall be determined as follows (see Annex 7, Figure 12):

$\ell_{e.ges} \geq \ell_0 + \ell_e$

with: ℓ_0 = required lap length acc. to Section 4.3.4 and to EN 1992-1-1

ℓ_e = length of the smooth shaft (see also Annex 7), $\ell_e > c_1$

If the clear distance between overlapping rods exceeds 4 d_s, the overlap length shall be increased by the difference between the actual clear distance and 4 d_s.

4.3.6 Concrete cover

The concrete cover required for bonded-in rebars and Hilti tension anchor HZA is shown in Annex 8, Table 3, in relation to the drilling method and the hole tolerance.

Furthermore the minimum concrete cover given in EN 1992-1-1, Section 4.4.1.2 shall be observed.

4.3.7 Transverse reinforcement

The requirements of transverse reinforcement in the area of the post-installed rebar connection or of the Hilti tension anchor HZA connection shall comply with EN 1992-1-1, Section 8.7.4.

4.3.8 Connection joint

The transfer of shear forces between new concrete and existing structure shall be designed according to EN 1992-1-1. The joints for concreting must be roughened to at least such an extent that aggregate protrude.

In case of a carbonated surface of the existing concrete structure the carbonated layer shall be removed in the area of the post-installed rebar connection with a diameter of d_s + 60 mm prior to the installation of the new rebar.

The depth of concrete to be removed shall correspond to at least the minimum concrete cover for the respective environmental conditions in accordance with EN 1992-1-1:2004.

The foregoing may be neglected if building components are new and not carbonated and if building components are in dry conditions.

4.4 Installation

The fitness for use of the post-installed rebar connection can only be assumed if the rebar respectively the Hilti tension anchor HZA is installed as follows:

- the installation of post-installed rebar respectively Hilti tension anchor HZA shall be done only by suitable trained installer and under supervision on site; the conditions under which an installer may be considered as suitable trained and the conditions for supervision on site are up to the Member States in which the installation is done,
- use of the injection system only as supplied by the manufacturer without exchanging the components of the Injection system,
- installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European technical approval,
- checks before rebar installation to ensure that the strength class of the concrete in which the post-installed rebar connection is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply,
- check of concrete being well compacted, e.g. without significant voids,
- check the position of the existing rebars (if the position of existing rebars is not known, it shall be determined using a rebar detector suitable for this purpose as well as on the basis of the construction documentation and then marked on the building component for the overlap joint),
- keeping the anchorage depth as specified in the design drawings,
- keeping of concrete cover and spacing as specified in the design drawings,
- positioning of the drill holes without damaging the reinforcement,
- in case of aborted drill hole the drill hole shall be filled with mortar,
- the post-installed rebar connection must not be installed in flooded holes,
- the drilling and cleaning of the hole and the installation shall be performed only with the equipment specified by the manufacturer according to the manufacturer's installation instructions (see Annexes 10-19), it shall be ensured that this equipment is available on site and it is used,
- during curing of the injection mortar the temperature of the building component must not be less than +5°C and no more than +40 °C; observing the curing time given in Annex 19.

5 Recommendations concerning packaging, transport and storage

5.1 Responsibility of the manufacturer

It is in the responsibility of the manufacturer to ensure that the information on the specific conditions according to sections 1 and 2 including Annexes referred to and section 4 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

- drill bit diameter,
- diameter of rebar,
- admissible service temperature range,
- curing time of the injection mortar,
- Installation instructions including cleaning of the drill hole,
- reference to any special installation equipment needed,
- identification of the manufacturing batch,

All data shall be presented in a clear and explicit form.

5.2 Packaging, transport and storage

The mortar foil packs shall be protected against sun radiation and shall be stored according to the manufacture's installation instructions in dry condition at temperatures of at least +5 °C to not more than +25 °C.

Mortar foil packs with expired shelf life must no longer be used.

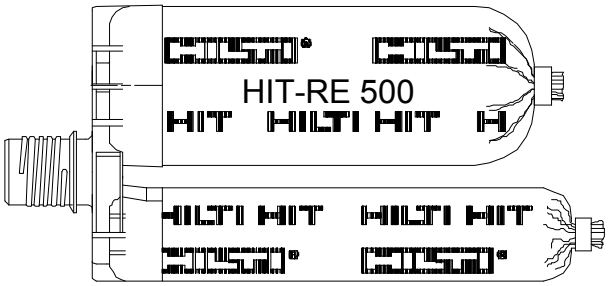
i. V. Dipl.-Ing. Seyfert
Vice-president of Deutsches Institut für Bautechnik
Berlin, 8 May 2008

beglaubigt:
Wittstock

Product description and intended use

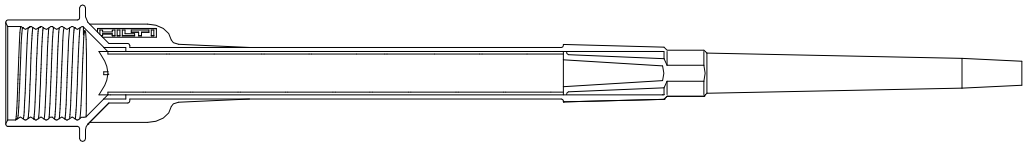
The post-installed rebar connection consists of injection mortar Hilti HIT-RE 500 and an embedded straight deformed reinforcing bar with properties of class B and C according to Annex C of EC2 or the Hilti tension anchor HZA.

Injection mortar HIT-RE 500:

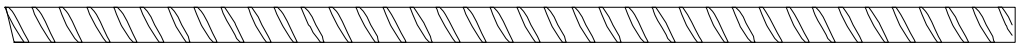


Foil pack:
330 ml, 500 ml and 1400 ml

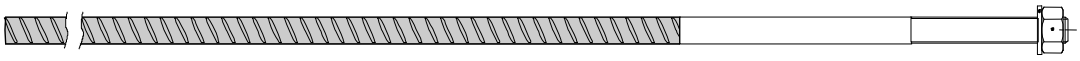
Static mixer Hilti HIT-RE-M:



Reinforcing bar (see Annex 4):



Hilti Tension anchor HZA (see Annex 6):



Covered are post-installed rebar connections in non-carbonated concrete on the assumption only that the design of post-installed rebar connections is done in accordance to EC2.

Installation in dry or wet concrete, it must not installed in flooded holes

Temperature range: -40 °C to +80 °C
(maximum long term temperature +50 °C and maximum short term temperature +80 °C)

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 1**
Product description and intended use	**of European technical approval** **ETA - 08/0105**

Figure 1: Overlap joint for rebar connections of slabs and beams

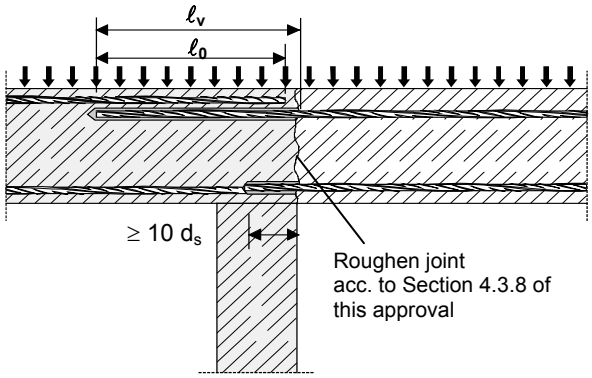


Figure 2: Overlap joint at a foundation of a column or wall where the rebars are stressed in tension

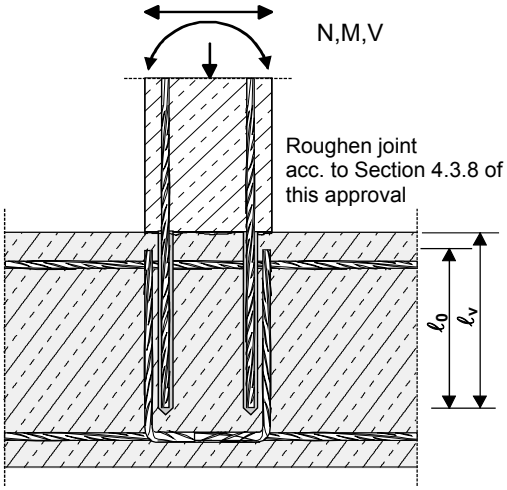


Figure 3: End anchoring of slabs or beams, designed as simply supported

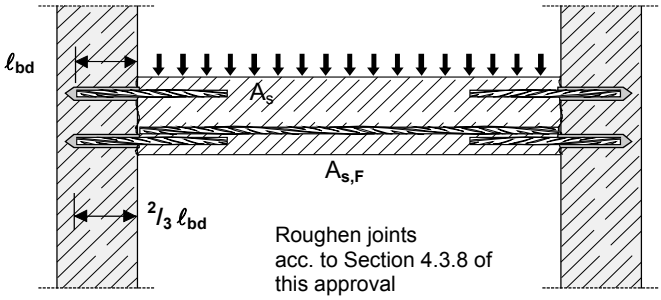


Figure 4: Rebar connection for components stressed primarily in compression. The rebars are stressed in compression.

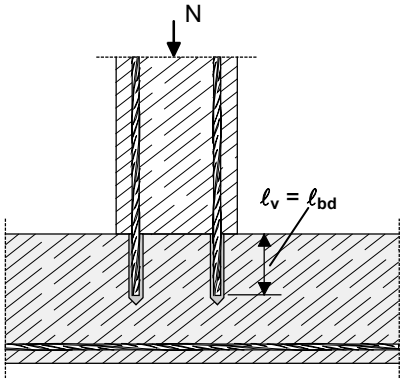
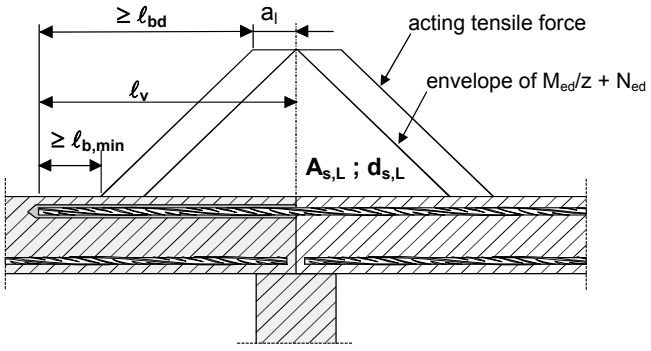


Figure 5: Anchoring of reinforcement to cover the line of acting tensile force



Note to Figure 1 to 5:

In the Figures no transverse reinforcement is plotted, the transverse reinforcement as required by EC 2 shall be present.

The shear transfer between old and new concrete shall be designed according to EC 2.

Description of the bonded-in rebars and overlap joints see Annex 4 and 5.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 2** **of European technical approval** **ETA - 08/0105**
Examples of use for rebars	

Figure 6: Overlap joint of a column stressed in bending to a foundation

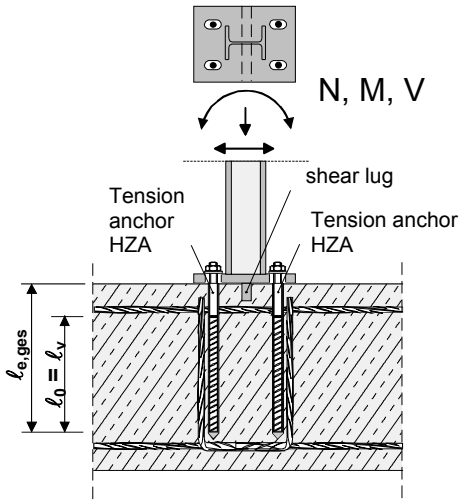


Figure 7: Overlap joint for the anchorage of barrier posts

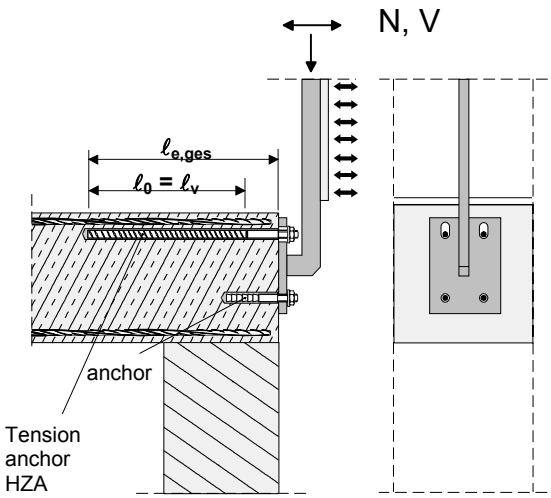
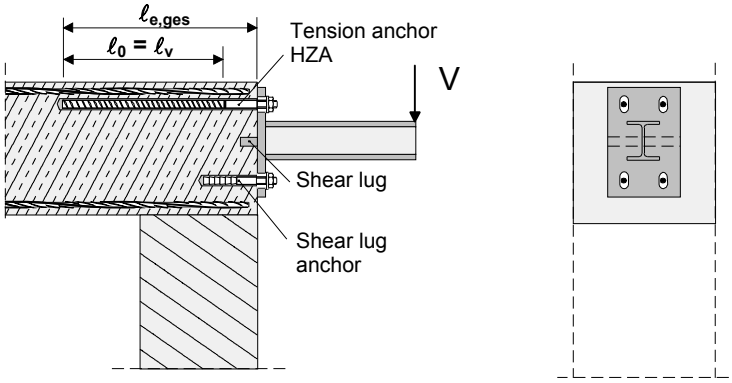


Figure 8: Overlap joint for the anchorage of cantilever members



Note to Figure 6 to 8:

In the Figures no transverse reinforcement is plotted, the transverse reinforcement as required by EC 2 shall be present.

Only tension forces in the direction of the bar axis may be transmitted by the tension anchor HZA.

The tension force must be transferred via an overlap joint to the reinforcement in the building part.

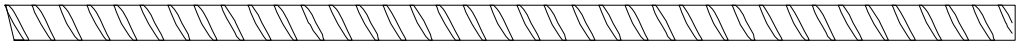
The transmission of the shear load shall be ensured by appropriate additional measures, e.g. by shear lugs or by anchors with a European technical approval (ETA).

In the anchor plate, the holes for the tension anchor shall be executed as elongated holes with the axis in the direction of the shear force.

Description of anchorages and overlap joints see Annex 6 and 7.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 3** **of European technical approval** **ETA - 08/0105**
Examples of use for tension anchor HZA	

Figure 9: Properties of reinforcing bars “rebars”



Refer to EC2 Annex C Table C.1 and C.2N Properties of reinforcement:

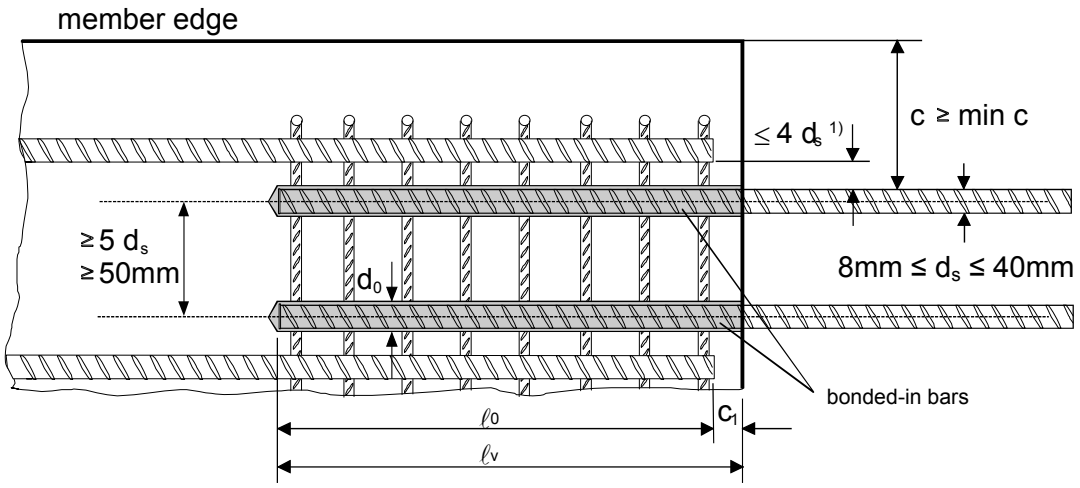
Product form		**Bars and de-coiled rods**	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t/f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force, ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$ (determination according to EN 15630)	Nominal bar size (mm) 8 to 12 > 12	0,040 0,056	

Rip height h:

The maximum outer rebar diameter over the rips shall be:
nominal diameter of the bar: $d + 2 * h$ ($h \leq 0{,}07 * d$)

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 4** **of European technical approval** **ETA - 08/0105**
Description of rebars	

Figure 10: General design rules of construction for bonded-in rebars



[1] If the clear distance between lapped bars exceeds $4d_s$, then the lap length shall be increased by the difference between the clear bar distance and $4d_s$.

The following applies to Figure 10:

- ℓ_v resp. ℓ_0 are in accordance with Section 4.3.5 respectively with Section 4.3.4 of the approval
- The provision of sufficient transverse reinforcement according to section 4.3.7 of this approval must be verified.

c	concrete cover of bonded-in bar
c_1	concrete cover at end-face of bonded-in bar
min c	minimum concrete cover acc. to Section 4.3.6 of this approval
d_s	diameter of bonded-in bar
ℓ_0	lap length
ℓ_v	effective embedment depth
d_0	nominal drill bit diameter, see Annex 10

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 5** **of European technical approval** **ETA - 08/0105**
Rebars Spacing and edge distances General design rules	

Figure 11: Tension anchor HZA

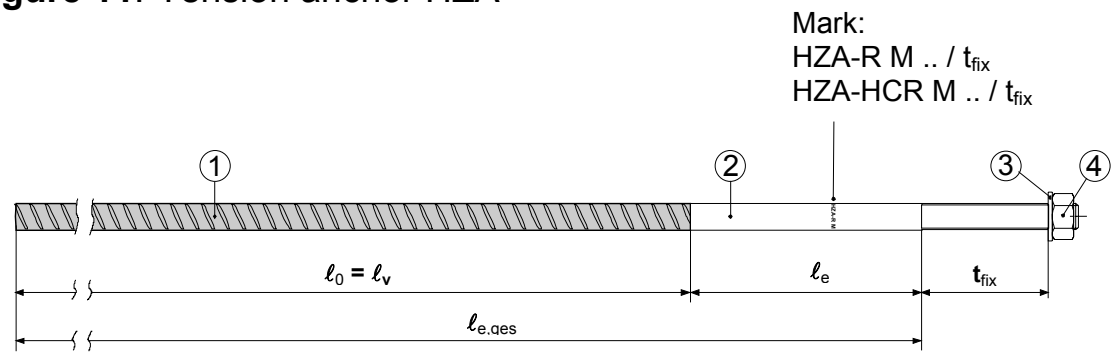


Table 1: Tension anchor HZA materials

Part	Designation	Material	
		HZA-R	HZA-HCR
1	BSt 500 S	not galvanised reinforcement steel acc. DIN 488	
2	Round steel smooth with thread	Stainless steel 1.4404, 1.4571 EN 10088	High corrosion resistant steel 1.4529 EN 10088
3	Washer		
4	Hex nut	Stainless steel 1.4401, 1.4571 EN 10088 Strength class 80 EN ISO 3506	High corrosion resistant steel 1.4529 EN 10088 Strength class 80 EN ISO 3506

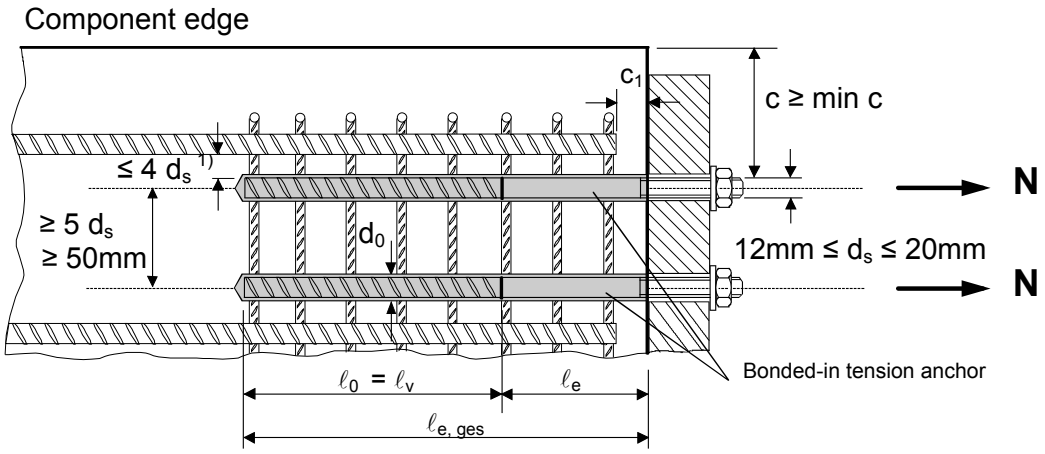
Table 2: Tension anchor HZA dimensions

Size		HZA M12 / t_{fix}	HZA M16 / t_{fix}	HZA M20 / t_{fix}
Thread diameter	[mm]	12	16	20
Width across nut flats SW	[mm]	19	24	30
Effective embedment depth $\ell_v \leq$ [1)]	[mm]	800	1000	1300
Length of smooth shaft $\ell_e \geq$	[mm]	100	100	100
Max torque moment T_{max}	[Nm]	60	100	150
Minimum thickness of fixture t_{fix}	[mm]	5	5	5
Maximum thickness of fixture t_{fix}	[mm]	400	400	400

[1)] may be shortened according to static calculation

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 6**
Hilti tension anchor HZA Dimensions and materials	**of European technical approval** **ETA - 08/0105**

Figure 12: General design rules for the Hilti tension anchor HZA



[1] If the clear distance between spliced bars exceeds $4d_s$, then the lap length shall be increased by the difference between the clear bar distance and $4d_s$.

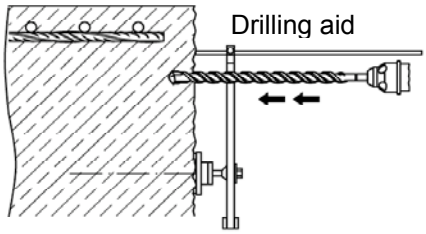
The following applies to Figure 12:

- With the tension anchor HZA, only tensile forces in the direction of the bar axis may be transmitted.
- ℓ_v resp. ℓ_0 are in accordance with Section 4.3.5 respectively Section 4.3.4 of the approval
- The provision of sufficient transverse reinforcement according to Section 4.3.7 of this approval must be verified.

c	concrete cover of bonded-in bar
c_1	concrete cover at end-face of bonded-in bar
min c	minimum concrete cover acc. to Section 4.3.6 of this approval
d_s	diameter of bonded-in bar
ℓ_0	lap length
ℓ_v	effective embedment depth
ℓ_e	length of the smooth shaft; $\ell_e \geq 100$ mm
$\ell_{e,ges}$	total embedment depth
d_0	nominal drill bit diameter, see Annex 10

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 7**
Hilti tension anchor HZA Spacing and edge distances general design rules	**of European technical approval** **ETA - 08/0105**

Table 3: Minimum concrete cover min c[1)] of the bonded-in rebar or tension anchor HZA depending on drilling method and drilling tolerance



Drilling method	Bar diameter d_s	Without drilling aid	With drilling aid
Hammer drilling **(HD)**	< 25 mm	30mm + 0,06 $\ell_v \geq 2\ d_s$	30mm + 0,02 $\ell_v \geq 2\ d_s$
	≥ 25 mm	40mm + 0,06 $\ell_v \geq 2\ d_s$	40mm + 0,02 $\ell_v \geq 2\ d_s$
Compressed air drilling **(CA)**	< 25 mm	50mm + 0,08 ℓ_v	50mm + 0,02 ℓ_v
	≥ 25 mm	60mm + 0,08 $\ell_v \geq 2\ d_s$	60mm + 0,02 $\ell_v \geq 2\ d_s$
Diamond drilling dry and wet **(PCC)** and **(DD)**	< 25 mm	Drilling support corresponds to drilling aid	30mm + 0,02 $\ell_v \geq 2\ d_s$
	≥ 25 mm		40mm + 0,02 $\ell_v \geq 2\ d_s$

[1)] see Annexes 5 and 7, Figures 10 and 12
Comments: The minimum concrete cover acc. EC2 must be observed

Table 4: Minimum anchorage lengths and lap lengths for C20/25
according to EC2: $l_{b,min}$ (8.6) and $l_{0,min}$ (8.11) for good bond conditions and α_6 = 1,0
with maximum yield stress for rebar BSt 500S and γ_M = 1,15
and maximum installation length

Longitud máxima de anclaje

Rebar		Drilling method **HD, CA, PCC**		Drilling method **DD** wet		
Ø d_s	$f_{y,k}$ [N/mm²]	$l_{b,min}$ [mm]	$l_{0,min}$ [mm]	$l_{b,min}$ [mm]	$l_{0,min}$ [mm]	l_{max} [mm]
8 mm	500	113	200	170	300	1000
10 mm	500	142	200	213	300	1000
12 mm	500	170	200	255	300	1200
14 mm	500	198	210	298	315	1400
16 mm	500	227	240	340	360	1600
18 mm	500	255	270	383	405	1800
20 mm	500	284	300	425	450	2000
22 mm	500	312	330	468	495	2200
24 mm	500	340	360	510	540	2400
25 mm	500	354	375	532	563	2500
26 mm	500	369	390	553	585	2600
28 mm	500	397	420	595	630	2800
30 mm	500	425	450	638	675	3000
32 mm	500	454	480	681	720	3200
34 mm	500	482	510	723	765	3200
36 mm	500	534	540	800	810	3200
40 mm	500	621	621	932	932	3200

Longitudes mínimas de anclaje

Table 5: Design values of the ultimate bond resistance f_{bd} in N/mm²
Hammer drilling, Compressed air drilling, Diamond drilling dry
according to EC2 for good bond conditions
(for all other bond conditions multiply the values by 0.7)

Rebar-Ø	Concrete class								
d_s	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 to 32 mm	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
34 mm	1,6	2,0	2,3	2,6	2,9	3,3	3,6	3,9	4,2
36 mm	1,5	1,9	2,2	2,6	2,9	3,3	3,6	3,8	4,1
40 mm	1,5	1,8	2,1	2,5	2,8	3,1	3,4	3,7	4,0

Table 6: Design values of the ultimate bond resistance f_{bd} in N/mm²
Diamond drilling wet according to EC2 for good bond conditions
(for all other bond conditions multiply the values by 0.7)

Rebar-Ø	Concrete class								
d_s	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 to 25 mm	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
26 to 32 mm	1,6	2,0	2,3	2,7					
34 mm	1,6	2,0	2,3	2,6					
36 mm	1,5	1,9	2,2	2,6					
40 mm	1,5	1,8	2,1	2,5					

Safety Regulations:

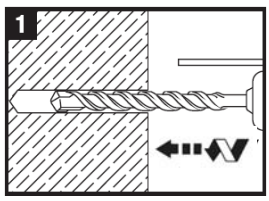
Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling!

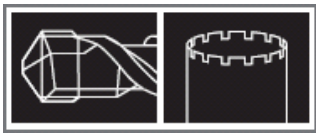
Wear well-fitting protective goggles, protective gloves and suitable protective clothing when working with Hilti HIT-RE 500.

Important: Observe the Instructions for use provided with each foil pack.

1. Drill hole

Note: Before drilling, remove Carbonized Concrete; Clean contact areas (see section 4.3.8 in ETA)

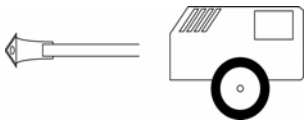




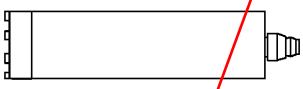
Drill hole to the required embedment depth using a hammer-drill with carbide drill bit set in rotation hammer mode, a compressed air drill, a diamond core drilling system wet or diamond core system PCC dry.
For wet diamond coring please observe the following steps in addition to the compressed air cleaning:
Remove all core fragments from the anchor hole. Flush the anchor hole with clear running water until water runs clear. Brush the anchor hole at least 2 x with the appropriately sized steel brush over the entire depth of the anchor hole. Repeat the flushing process until clear water runs out of the anchor hole.

Hammer drill (HD)

Compressed air drill (CA)



Diamond Core wet (DD) and dry (PCC)

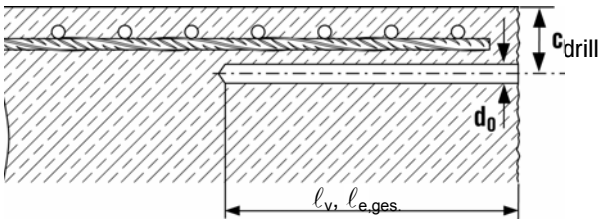


Rebar-Ø	Drill bit diameters d_0 [mm]			
d_s	Hammer drill (HD)	Comp. air drill (CA)	Diamond coring	
			wet (DD)	dry (PCC)
8 mm	12	-	12	-
10 mm	14	-	14	-
12 mm	16	17	16	-
14 mm	18	17	18	-
16 mm	20	20	20	-
18 mm	22	22	22	-
20 mm	25	26	25	-
22 mm	28	28	28	-
24 mm	32	32	32	35
25 mm	32	32	32	35
26 mm	35	35	35	35
28 mm	35	35	35	35
30 mm	37	35	37	35
32 mm	40	40	40	47
34 mm	45	42	42	47
36 mm	45	45	47	47
40 mm	55	57	52	52

Diámetros de broca utilizados en función del método de taladrado utilizado.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 10**
Installation instruction I Drill hole	**of European technical approval** **ETA - 08/0105**

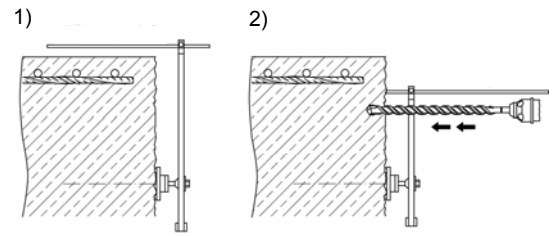
Splicing applications:



- Measure and control concrete cover c
- $c_{drill} = c + d_s/2$
- Drill parallel to surface edge and to existing rebar
- Where applicable use Hilti drilling aid HIT-BH.

Drilling aid

Example: HIT-BH



For holes ℓ_b > 20 cm use drilling aid. Three different options can be considered:

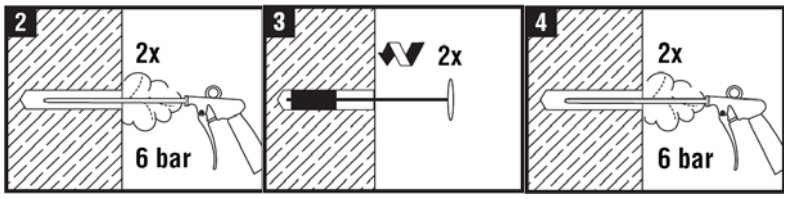
A) Hilti drilling aid HIT-BH
B) Slat or spirit level
C) Visual check

2. Clean hole

The borehole must be free of dust, debris, water, ice, oil, grease and other contaminants prior to mortar injection.

Just before setting an rebar the hole must be cleaned of dust and debris by one of the two cleaning methods described below:

2.1 Compressed air cleaning:

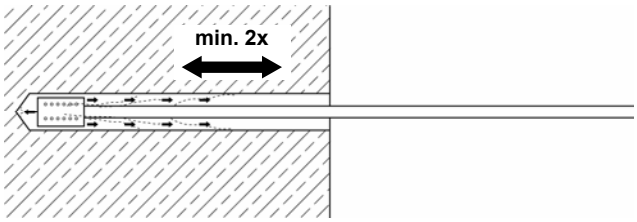


- **Blowing 2 times** from the back of the hole with oil-free compressed air (min. 6 bar at 100 litres per minute (LPM)) until return air stream is free of noticeable dust.
- **Brushing 2 times** with the specified brush size (brush Ø ≥ borehole Ø) by inserting the round steel brush to the back of the hole in a twisting motion. The brush shall produce natural resistance as it enters the anchor hole. If this is not the case, please use a new brush or a brush with a larger diameter.
- **Blowing 2 times** again with compressed air until return air stream is free of noticeable dust.

If required use additional accessories and extensions for air nozzle and brush to reach back of hole.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 11**
Installation instruction II Clean bore hole	**of European technical approval** **ETA - 08/0105**

Deep Boreholes – Blowing



For boreholes deeper than 250mm (for d_s=8mm-12mm) resp. deeper than 20xd_s (for d_s>12mm) use the appropriate air nozzle Hilti HIT-DL (see table below).

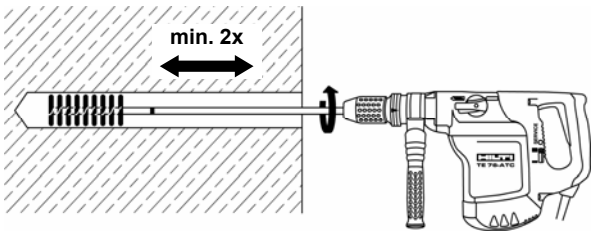
Safety tips:
Do not inhale concrete dust. The application of a dust collector is recommended.

Rebar-Ø	Drill bit and Core bit diameters d_0 [mm]				Air Nozzle Hilti HIT-DL	Extension
d_s	Hammer-drill HD	Comp. air drill CA	Diamond Core wet DD	Diamond Core dry PCC		
8 mm	12	-	12	During dry coring the dust will sucked out of the anchor hole. Blowing is not required with dry coring.	HIT-DL 12	HIT-DL 10/0,8 or HIT-DL V10/1
10 mm	14	-	14		HIT-DL 14	
12 mm	16	17	16		HIT-DL 16	
14 mm	18	17	18		HIT-DL 18	
16 mm	20	20	20		HIT-DL 20	HIT-DL 16/0,8 or HIT-DL B and/or HIT-VL 16/0,7 and/or HIT-VL 16
18 mm	22	22	22		HIT-DL 20	
20 mm	25	26	25		HIT-DL 25	
22 mm	28	28	28		HIT-DL 25	
24 mm	32	32	32		HIT-DL 32	
25 mm	32	32	32		HIT-DL 32	
26 mm	35	35	35		HIT-DL 32	
28 mm	35	35	35		HIT-DL 32	
30 mm	37	35	37		HIT-DL 32	
32 mm	40	40	40		HIT-DL 32	
34 mm	45	42	42		HIT-DL 32	
36 mm	45	45	47		HIT-DL 32	
40 mm	55	57	52		HIT-DL 32	

Assemble extension HIT-VL 16/0.7 with coupler HIT-DL K for deeper anchor holes.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 12**
Installation instruction III Blow out bore hole	**of European technical approval** **ETA - 08/0105**

Deep boreholes – brushing



For boreholes deeper than 250mm (for d_s=8mm-12mm) resp. deeper than 20xd_s (for d_s>12mm) use machine brushing and brush extensions HIT-RBS.

Safety Tips:
- Start machine brushing operation slowly.
- Start brushing operation once brush is inserted in borehole.

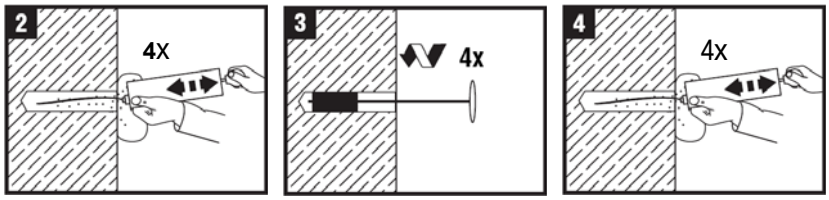
Rebar-Ø	Drill bit and Core bit diameters d_0 [mm] / steel brush							
d_s	Hammer drill HD		Comp. air drill CA		Diamond Core wet DD		Diamond Core dry PCC	
	d_0	HIT-RB	d_0	HIT-RB	d_0	HIT-RB	d_0	HIT-RB
8 mm	12	HIT-RB 12	-	-	12	HIT-RB 12	During dry coring the dust will sucked out of the anchor hole. Brushing is not required with dry coring.	
10 mm	14	HIT-RB 14	-	-	14	HIT-RB 14		
12 mm	16	HIT-RB 16	17	HIT-RB 18	16	HIT-RB 16		
14 mm	18	HIT-RB 18	17	HIT-RB 18	18	HIT-RB 18		
16 mm	20	HIT-RB 20	20	HIT-RB 22	20	HIT-RB 20		
18 mm	22	HIT-RB 22	22	HIT-RB 22	22	HIT-RB 22		
20 mm	25	HIT-RB 25	26	HIT-RB 28	25	HIT-RB 25		
22 mm	28	HIT-RB 28	28	HIT-RB 28	28	HIT-RB 28		
24 mm	32	HIT-RB 32	32	HIT-RB 32	32	HIT-RB 32		
25 mm	32	HIT-RB 32	32	HIT-RB 32	32	HIT-RB 32		
26 mm	35	HIT-RB 35	35	HIT-RB 35	35	HIT-RB 35		
28 mm	35	HIT-RB 35	35	HIT-RB 35	35	HIT-RB 35		
30 mm	37	HIT-RB 37	35	HIT-RB 35	37	HIT-RB 37		
32 mm	40	HIT-RB 40	40	HIT-RB 40	40	HIT-RB 40		
34 mm	45	HIT-RB 45	42	HIT-RB 42	42	HIT-RB 42		
36 mm	45	HIT-RB 45	45	HIT-RB 45	47	HIT-RB 47		
40 mm	55	HIT-RB 55	57	HIT-RB 55	52	HIT-RB 52		

Machine brushing: Screw the round steel brush HIT-RB in one end of the brush extension(s) HIT-RBS, so that the overall length of the brush is sufficient to reach the base of the borehole. Attach the other end of the extension to the TE-C/TE-Y chuck.

The diameter of the round steel brush shall be checked before use. The minimum brush diameter has to be at least equal to the borehole diameter d_0. The round steel brush shall produce natural resistance as it enters the drill hole. If this is not the case, please use a new brush or a brush with a larger diameter.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 13**
Installation instruction IV Brush bore hole	**of European technical approval** **ETA - 08/0105**

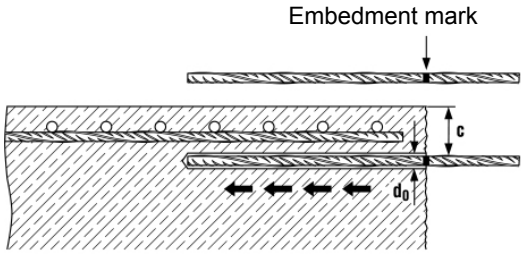
2.2 Manual cleaning: The borehole must be free of dust, debris, water, ice, oil, grease and other contaminants prior to mortar injection.



As an alternative to compressed air cleaning, a manual cleaning is permitted for hammer drilled boreholes up to hole diameters $d_0 \leq 20$mm and depths ℓ_v resp. $\ell_{e,ges.} \leq 250$mm.

- **Blowing** - 4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.
- **Brushing** - 4 times with the specified brush size (brush diameter ≥ borehole diameter d_0) by inserting the round steel wire brush to the back of the hole with a twisting motion.
- **Blowing** - 4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.

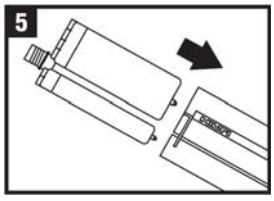
3. Rebar preparation and foil pack preparation



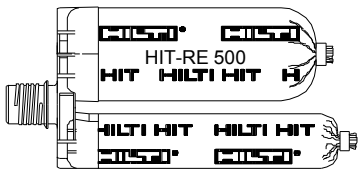
Before use, make sure the rebar is dry and free of oil or other residue.

Mark the embedment depth on the rebar (e.g. with tape) → ℓ_v

Insert Rebar in borehole, to verify hole and setting depth ℓ_v resp. $\ell_{e,ges}$



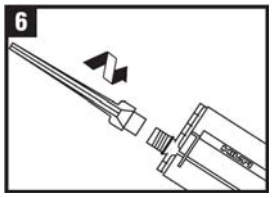
Insert foil pack into the foil pack holder.
- Observe the Instruction for Use of the dispenser
- Check foil pack holder for proper function.
- Put foil pack into foil pack holder.
- Do not use damaged foil packs / holders.



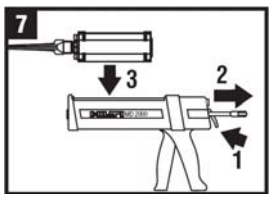
Poil pack :
Hilti HIT-RE 500 (330 ml)
Hilti HIT-RE 500 (500 ml)
Hilti HIT-RE 500 (1400 ml)

- **Check Expiration date**: See imprint on manifold (Month/Year). Do not use an expired product!
- **Foil pack temperature**: Must be between +5°C and +40°C when in use.
- **Base material temperature at time of installation**: Must be between +5°C and +40°C.
- **Instructions for transport and storage**: Keep in a cool, dry and dark place. +5˚C to +25˚C.
- **Review the MSDS before use.**

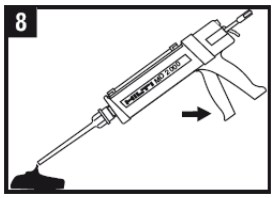
Injection System Hilti HIT-RE 500 for rebar connection	**Annex 14** **of European technical approval** **ETA - 08/0105**
Installation instruction V Manual cleaning Rebar preparation and foil pack preparation	



Tightly attach Hilti HIT-RE-M mixing nozzle to foil pack manifold. Do not modify the mixing nozzle.



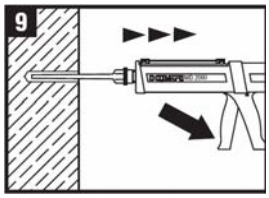
Insert foil pack holder with foil pack into dispenser. Push release trigger, retract plunger and insert foil pack holder with foil pack into the appropriate Hilti dispenser.

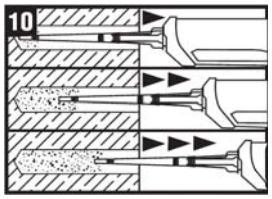


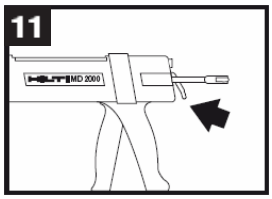
330ml	3 trigger pulls
500ml	4 trigger pulls
1400ml	65ml

Discard initial mortar. The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of mortar has to be discarded.
After changing a mixing nozzle, the first few trigger pulls must be discarded as described above. For each new foil pack a new mixing nozzle must be used.

4. Inject mortar into borehole without forming air pockets.



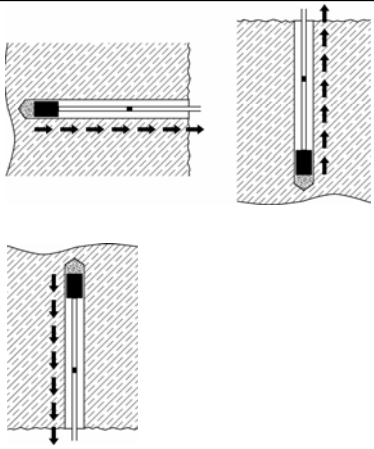




- **Injection method for borehole depth ≤ 250 mm:**
  Inject the mortar from the back of the hole towards the front and slowly withdraw the mixing nozzle step by step after each trigger pull.
  Important! Use extensions for deep holes (> 250 mm). Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the rebar and the concrete is completely filled with adhesive over the embedment length. After injecting, depressurize the dispenser by pressing the release trigger. This will prevent further mortar discharge from the mixing nozzle.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 15**
Installation instruction VI Foil pack preparation Mortar injection	**of European technical approval** **ETA - 08/0105**

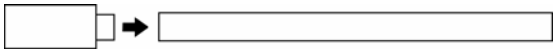
Sistema homologado de inyección de resina para profundidades de empotramiento superiores a 250mm



Piston plug injection for borehole depth > 250 mm or overhead applications: Assemble mixing nozzle, extension(s) and appropriately sized piston plug. Insert piston plug to back of the hole. Begin injection allowing the pressure of the injected adhesive mortar to push the piston plug towards the front of the hole. After injecting, depressurize the dispenser by pressing the release trigger. This will prevent further mortar discharge from the mixing nozzle.

The proper injection of mortar using a piston plug HIT-SZ prevents the creation of air pockets. The piston plug must be insertable to the back of the borehole without resistance. During injection the piston plug will be pressed towards the front of the borehole slowly by mortar pressure. Attention! Pulling the injection or when changing the foil pack, the piston plug is rendered inactive and air pockets may occur.

Piston plug HIT-SZ Injection extension



Connect the selected piston plug with the appropriate injection extension.
HIT-SZ 12 – HIT-SZ 18 with HIT-VL 9/1.0
≥ HIT-SZ 20 with HIT-VL 16 or HIT-VL 16/0,7

Please use injection extensions HIT-VL and piston plug HIT-SZ as required.
Deeper embedment depths: For combinations of several injection extensions use coupler HIT-VL K.

A substitution of the injection extension for a plastic hose or a combination of both is permitted.

Rebar-Ø	Drill bit and Core bit diameters d_0 [mm] / piston plug							
d_s	Hammer drill HD		Comp. air drill CA		Diamond Core wet DD		Diamond Core dry PCC	
	d_0	HIT-SZ	d_0	HIT-SZ	d_0	HIT-SZ	d_0	HIT-SZ
8 mm	12	HIT-SZ 12	-	-	12	HIT-SZ 12	-	-
10 mm	14	HIT-SZ 14	-	-	14	HIT-SZ 14	-	-
12 mm	16	HIT-SZ 16	17	HIT-SZ 18	16	HIT-SZ 16	-	-
14 mm	18	HIT-SZ 18	17	HIT-SZ 18	18	HIT-SZ 18	-	-
16 mm	20	HIT-SZ 20	20	HIT-SZ 22	20	HIT-SZ 20	-	-
18 mm	22	HIT-SZ 22	22	HIT-SZ 22	22	HIT-SZ 22	-	-
20 mm	25	HIT-SZ 25	26	HIT-SZ 28	25	HIT-SZ 25	-	-
22 mm	28	HIT-SZ 28	28	HIT-SZ 28	28	HIT-SZ 28	-	-
24 mm	32	HIT-SZ 32	32	HIT-SZ 32	32	HIT-SZ 32	35	HIT-SZ 35
25 mm	32	HIT-SZ 32	32	HIT-SZ 32	32	HIT-SZ 32	35	HIT-SZ 35
26 mm	35	HIT-SZ 35	35	HIT-SZ 35	35	HIT-SZ 35	35	HIT-SZ 35
28 mm	35	HIT-SZ 35	35	HIT-SZ 35	35	HIT-SZ 35	35	HIT-SZ 35
30 mm	37	HIT-SZ 37	35	HIT-SZ 35	37	HIT-SZ 37	35	HIT-SZ 35
32 mm	40	HIT-SZ 40	40	HIT-SZ 40	40	HIT-SZ 40	47	HIT-SZ 45
34 mm	45	HIT-SZ 45	42	HIT-SZ 42	42	HIT-SZ 42	47	HIT-SZ 47
36 mm	45	HIT-SZ 45	45	HIT-SZ 45	47	HIT-SZ 47	47	HIT-SZ 47
40 mm	55	HIT-SZ 55	57	HIT-SZ 55	52	HIT-SZ 52	52	HIT-SZ 52

Injection System Hilti HIT-RE 500 for rebar connection

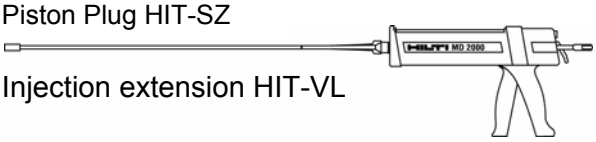
Installation instruction VII
Piston plug injection

Annex 16

of European technical approval

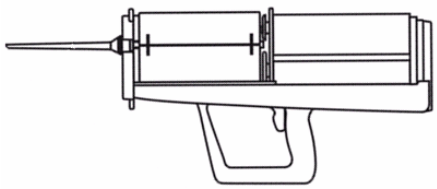
ETA - 08/0105

Piston Plug HIT-SZ



Injection extension HIT-VL

Hilti HIT-MD 2000 Manual dispenser (330 ml)
Hilti HIT-MD 2500 Manual dispenser (500 ml)
Hilti HIT-ED 3500 Electric dispenser (330 / 500 ml)
Hilti HIT-P3000HY Pneumatic dispenser (330 ml)
Hilti HIT-P3500F Pneumatic dispenser (500 ml)



Hilti HIT-P8000D Pneumatic dispenser (1400 ml)

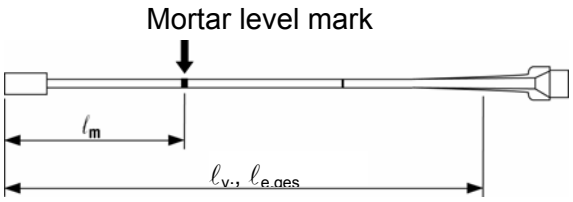
Profundidad de empotramiento máxima en función al sistema de inyección seleccionado.

Maximum permissible embedment depth corresponding to dispenser

Rebar-Ø	Dispenser		
d_s	HIT-MD 2000 HIT-MD 2500	HIT-ED 3500 HIT-P3000HY, HIT-P3500F	HIT-P8000D
8 mm	100 cm	100 cm	-
10 mm			
12 mm		120 cm	120 cm
14 mm			140 cm
16 mm		150 cm	160 cm
18 mm	70 cm	130 cm	180 cm
20 mm			200 cm
22 mm		100 cm	220 cm
24 mm			240 cm
25 mm			250 cm
26 mm	50 cm	70 cm	260 cm
28 mm			280 cm
30 mm	-		300 cm
32 mm			320 cm
34 mm		50 cm	
36 mm			
40 mm			

Remark:
Injection of mortar at low temperatures is easier and faster when the mortar is heated up slowly to 20°C

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 17** **of European technical approval** **ETA - 08/0105**
Installation instruction VIII Dispenser and embedment depth	



Mark the required mortar level ℓ_m and embedment depth ℓ_v resp. $\ell_{e,ges}$ with tape or marker on the injection extension.

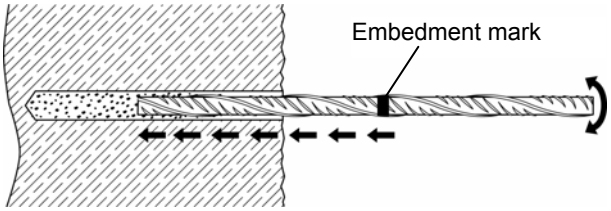
Quick estimation: ℓ_m = 1/3 ℓ_v resp. ℓ_m = 1/3 $\ell_{e,ges}$

When using a piston plug HIT-SZ continue injection until the mortar level mark ℓ_m becomes visible.

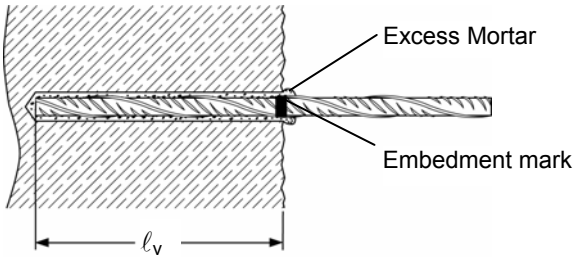
Precise formula for optimum mortar volume:

$$\ell_m = \ell_v \; resp. \; \ell_{e,ges} \cdot \left(1{,}2 \cdot \frac{d_s^2}{d_0^2} - 0{,}2 \right) \; [mm]$$

5. Insert rebar into borehole to the required embedment depth



To ease installation insert the rebar slowly twisted into the borehole until the embedment mark is at the concrete surface level.

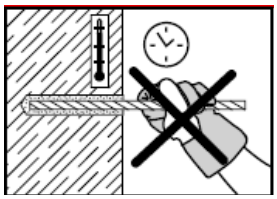


After installing the rebar the annular gap must be completely filled with mortar.

Proper installation

- Desired anchoring embedment is reached ℓ_v: Embedment mark at concrete surface.
- Excess mortar flows out of the borehole after the rebar has been fully inserted until the embedment mark.
- Overhead application: Support the rebar and secure it from falling till mortar started to harden.

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 18**
Installation instruction IX Insert rebar	**of European technical approval** **ETA - 08/0105**



Observe the gel time "t_{gel}", which varies according to temperature of base material. Minor adjustments to the rebar position may be performed during the gel time. See table below.
Do not disturb the rebar once the working time **"t_{gel}"** has elapsed till "$t_{cure,ini}$".

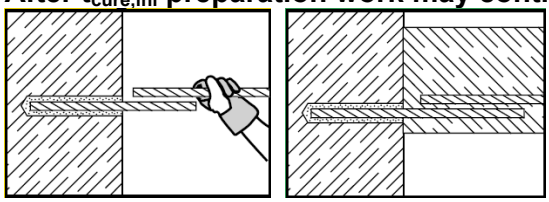
"tcureini" hace referencia al tiempo de curado inicial durante el cual no se puede continuar con los trabajos sobre la barra.

Base material temperature	working time "t_{gel}",	"$t_{cure,ini}$"
+5°C to +9°C	120 min	18 h
+10°C to +14°C	90 min	12 h
+15°C to +19°C	30 min	9 h
+20°C to +24°C	20 min	6 h
+25°C to +29°C	20 min	5 h
+30°C to +40°C	12 min	4 h

Maximum gel time "t_{gel}"
Maximum time from the beginning of injection to rebar setting and positioning.

"tgel" hace referencia al tiempo durante el cual se puede "mover" la barra una vez introducida dentro de la resina

After $t_{cure,ini}$ preparation work may continue.



Full load may be applied only after the curing time "t_{cure}" has elapsed. See table below.

Base material temperature	Minimum curing time "t_{cure}"
+5°C to +9°C	72 h
+10°C to +14°C	48 h
+15°C to +19°C	24 h
+20°C to +29°C	12 h
+30°C to +39°C	8 h
+40°C	4 h

Curing time "t_{cure}"
Before the minimum curing time has elapsed, the rebar may not be loaded.

Este dato no aparece en la homologación de la resina Fischer.

Después de pasado este tiempo, se puede someter el anclaje a las solicitaciones de trabajo

Injection System Hilti HIT-RE 500 for rebar connection	**Annex 19**
Installation instruction X Working time, curing time	**of European technical approval** **ETA - 08/0105**

Values for pre-calculation of anchoring with Hilti HIT-RE 500
Example for C20/25, good bond conditions, Rebar yield strength 500 N/mm²,
For all drilling procedures, excluding diamond wet (DD)

Rebar Ø	$\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_4 = 1,0$		
	Anchorage length l_{bd}	Design value N_{Rd}	Mortar volume	Anchorage length l_{bd}	Design value N_{Rd}	Mortar volume
[mm]	[mm]	[kN]	[ml]	[mm]	[kN]	[ml]
8	113*	6,56	9	113*	9,37	9
	200	11,57	15	200	16,53	15
	320	18,51	24	-	-	-
	378	21,87	**29**	**265**	21,87	**20**
10	142*	10,24	13	142*	14,63	13
	200	14,44	18	200	20,63	18
	300	21,67	27	300	30,95	27
	400	28,89	36	-	-	-
	473	34,13	**43**	**331**	**34,13**	**30**
12	170*	14,74	18	170*	21,06	18
	240	20,79	25	240	29,70	25
	360	31,19	38	360	44,55	38
	480	41,58	51			
	567	**49,13**	**60**	**397**	**49,13**	**42**
14	198*	20,09	24	198*	28,70	24
	280	28,34	34	280	40,48	34
	420	42,50	51	420	60,72	51
	560	56,67	68	-	-	-
	662	**66,96**	**80**	**463**	**66,96**	**56**
16	227*	26,22	31	227*	37,45	31
	320	36,98	43	320	52,83	43
	480	55,48	65	480	79,25	65
	640	73,97	87	-	-	-
	756	**87,39**	**103**	**529**	**87,39**	**72**
18	255*	33,13	38	255*	47,33	38
	360	46,74	54	360	66,77	54
	540	70,10	81	540	100,15	81
	720	93,47	109	-	-	-
	851	**110,48**	**128**	**595**	**110,35**	**90**
20	284*	40,96	60	284*	58,51	60
	400	57,78	85	400	82,54	85
	600	86,66	127	600	123,81	127
	800	115,55	170	-	-	-
	945	**136,52**	**200**	**662**	**136,52**	**140**
22	312*	49,57	88	312*	70,81	88
	440	69,92	124	440	99,89	124
	660	104,88	187	660	149,83	187
	880	139,84	249	-	-	-
	1040	**165,27**	**294**	**728**	**165,27**	**206**
24	340*	58,96	144	340*	84,22	144
	480	83,17	203	480	118,81	203
	720	124,75	304	720	178,22	304
	960	166,34	405	-	-	-
	1134	**196,48**	**479**	**794**	**196,53**	**335**

* Values corresponding to the minimum anchorage length.

The design value is valid for “good bond conditions” as described in EN 1992-1-1. For all other conditions multiply by the value by 0.7.

The volume of mortar correspond to the formula “$1,2*(d_0^2-d_S^2)*\pi*lb/4$”

Injection System Hilti HIT-RE 500 for rebar connection

Values for pre-calculation of anchoring with Hilti HIT-RE 500
Example for C20/25, good bond conditions,
Rebar yield strength 500 N/mm²,
for all drilling procedures, excluding diamond wet (DD)

Annex 20

of European technical approval

ETA - 08/0105

Values for pre-calculation of anchoring with Hilti HIT-RE 500
Example for C20/25, good bond conditions, Rebar yield strength 500 N/mm²,
For all drilling procedures, excluding diamond wet (DD)

Rebar Ø	$\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_4 = 1,0$		
	Anchorage length l_{bd}	Design value N_{Rd}	Mortar volume	Anchorage length l_{bd}	Design value N_{Rd}	Mortar volume
[mm]	[mm]	[kN]	[ml]	[mm]	[kN]	[ml]
25	354*	64,04	133	354*	91,49	133
	500	90,34	188	500	129,06	188
	750	135,52	282	750	193,59	282
	1000	180,69	376	-	-	-
	1181	**213,48**	**444**	**827**	**213,48**	**311**
26	369*	69,33	191	369*	99,05	191
	520	97,70	269	520	139,58	269
	780	146,56	404	780	209,37	404
	1040	195,41	538	-	-	-
	1229	**230,92**	**636**	**860**	**230,84**	**445**
28	397	80,35	165	397	114,78	165
	600	121,44	249	600	173,49	249
	840	170,02	349	840	242,88	349
	1120	226,69	466	-	-	-
	1323	**267,78**	**550**	**926**	**267,75**	**385**
30	425	92,22	188	425	131,74	188
	600	130,09	265	600	185,84	265
	900	195,13	398	900	278,76	398
	1200	260,18	530	-	-	-
	1418	**307,44**	**627**	**992**	**307,26**	**438**
32	454	104,87	246	454	149,81	246
	640	147,94	347	640	211,34	347
	960	221,90	521	960	317,01	521
	1280	295,87	695	-	-	-
	1512	**349,50**	**821**	**1059**	**349,70**	**575**
34	482*	118,43	395	482*	169,19	395
	680	167,07	557	680	238,67	557
	1020	250,61	835	1020	358,01	835
	1360	334,14	1114	-	-	-
	1607	**394,83**	**1316**	**1125**	**394,87**	**921**
36	534*	132,78	367	534*	189,69	367
	720	179,17	495	720	255,95	495
	1080	268,75	742	1080	383,93	742
	1440	358,34	989	-	-	-
	1701	**423,28**	**1169**	**1191**	**423,39**	**818**
40	621*	163,96	834	621*	234,22	834
	800	211,18	1074	800	301,68	1074
	1200	316,76	1612	1200	452,52	1612
	1600	422,35	2149	-	-	-
	1890	**498,90**	**2538**	**1323**	**498,90**	**1777**

* Values corresponding to the minimum anchorage length.

The design value is valid for “good bond conditions” as described in EN 1992-1-1. For all other conditions multiply by the value by 0.7.

The volume of mortar correspond to the formula “$1,2*(d_0^2-d_S^2)*\pi*lb/4$”

Injection System Hilti HIT-RE 500 for rebar connection

Values for pre-calculation of anchoring with Hilti HIT-RE 500
Example for C20/25, good bond conditions,
Rebar yield strength 500 N/mm²,
for all drilling procedures, excluding diamond wet (DD)

Annex 21

of European technical approval

ETA - 08/0105

Values for pre-calculation of overlap joints with Hilti HIT-RE 500
Example for C20/25, good bond conditions, Rebar yield strength 500 N/mm²,
For all drilling procedures, excluding diamond wet (DD)

Rebar Ø	$\alpha_1=\alpha_2=\alpha_3=\alpha_5=\alpha_6=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_6 = 1,0$		
	Lap length l_0	Design value N_{Rd}	Mortar volume	Lap length l_0	Design value N_{Rd}	Mortar volume
[mm]	[mm]	[kN]	[ml]	[mm]	[kN]	[ml]
8	200*	11,57	15	200*	16,53	15
	200	11,57	15	200	16,53	15
	320	18,51	24	-	-	-
	378	**21,87**	**29**	**265**	**21,90**	**20**
10	200*	14,44	18	200*	20,63	18
	200	14,44	18	200	20,63	18
	300	21,67	27	300	30,95	27
	400	28,89	36	-	-	-
	473	**34,16**	**43**	**331**	**34,15**	**30**
12	200*	17,33	21	200*	24,75	21
	240	20,79	25	240	29,70	25
	360	31,19	38	360	44,55	38
	480	41,58	51			
	567	**49,12**	**60**	**397**	**49,13**	**42**
14	210*	21,25	25	210*	30,36	25
	280	28,34	34	280	40,48	34
	420	42,50	51	420	60,72	51
	560	56,67	68	-	-	-
	662	**66,99**	**80**	**463**	**66,94**	**56**
16	240*	27,74	33	240*	39,63	33
	320	36,98	43	320	52,83	43
	480	55,48	65	480	79,25	65
	640	73,97	87	-	-	-
	756	**87,37**	**103**	**529**	**87,34**	**72**
18	270*	35,05	41	270*	50,07	41
	360	46,74	54	360	66,77	54
	540	70,10	81	540	100,15	81
	720	93,47	109	-	-	-
	851	**110,48**	**128**	**595**	**110,35**	**90**
20	300*	43,33	64	300*	61,90	64
	400	57,78	85	400	82,54	85
	600	86,66	127	600	123,81	127
	800	115,55	170	-	-	-
	945	**136,50**	**200**	**662**	**136,60**	**140**
22	330*	52,44	93	330*	74,91	93
	440	69,92	124	440	99,89	124
	660	104,88	187	660	149,83	187
	880	139,84	249	-	-	-
	1040	**165,27**	**294**	**728**	**165,27**	**206**
24	360*	62,38	152	360*	89,11	152
	480	83,17	203	480	118,81	203
	720	124,75	304	720	178,22	304
	960	166,34	405	-	-	-
	1134	**196,48**	**479**	**794**	**196,53**	**335**

* Values corresponding to the minimum anchorage length.

The design value is valid for “good bond conditions” as described in EN 1992-1-1. For all other conditions multiply by the value by 0.7.

The volume of mortar correspond to the formula “$1,2*(d_0^2-d_S^2)*\pi*lb/4$”

Injection System Hilti HIT-RE 500 for rebar connection

Values for pre-calculation of overlap joints with Hilti HIT-RE 500,
Example for C20/25, good bond conditions,
Rebar yield strength 500 N/mm²,
for all drilling procedures, excluding diamond wet (DD)

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Values for pre-calculation of overlap joints with Hilti HIT-RE 500
Example for C20/25, good bond conditions, Rebar yield strength 500 N/mm²,
For all drilling procedures, excluding diamond wet (DD)

Rebar Ø	$\alpha_1=\alpha_2=\alpha_3=\alpha_5=\alpha_6=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_6 = 1,0$		
	Lap length l_0	Design value N_{Rd}	Mortar volume	Lap length l_0	Design value N_{Rd}	Mortar volume
[mm]	[mm]	[kN]	[ml]	[mm]	[kN]	[ml]
25	375*	67,76	141	375*	96,80	141
	500	90,34	188	500	129,06	188
	750	135,52	282	750	193,59	282
	1000	180,69	376	-	-	-
	1181	**213,39**	**444**	**827**	**213,47**	**311**
26	390*	73,28	202	390*	104,68	202
	520	97,70	269	520	139,58	269
	780	146,56	404	780	209,37	404
	1040	195,41	538	-	-	-
	1229	**230,92**	**636**	**860**	**230,84**	**445**
28	420*	85,01	175	420*	121,44	175
	600	121,44	249	600	173,49	249
	840	170,02	349	840	242,88	349
	1120	226,69	466	-	-	-
	1323	**267,78**	**550**	**926**	**267,75**	**385**
30	450*	97,57	199	450*	139,38	199
	600	130,09	265	600	185,84	265
	900	195,13	398	900	278,76	398
	1200	260,18	530	-	-	-
	1418	**307,44**	**627**	**992**	**307,26**	**438**
32	480*	110,95	261	480*	158,50	261
	640	147,94	347	640	211,34	347
	960	221,90	521	960	317,01	521
	1280	295,87	695	-	-	-
	1512	**349,50**	**821**	**1059**	**349,70**	**575**
34	510*	125,30	418	510*	179,01	418
	680	167,07	557	680	238,67	557
	1020	250,61	835	1020	358,01	835
	1360	334,14	1114	-	-	-
	1607	**394,83**	**1316**	**1125**	**394,87**	**921**
36	540*	134,38	371	540*	191,97	371
	720	179,17	495	720	255,95	495
	1080	268,75	742	1080	383,93	742
	1440	358,34	989	-	-	-
	1701	**423,28**	**1169**	**1191**	**423,39**	**818**
40	621*	163,93	834	621*	234,18	834
	800	211,18	1074	800	301,68	1074
	1200	316,76	1612	1200	452,52	1612
	1600	422,35	2149	-	-	-
	1890	**498,90**	**2538**	**1323**	**498,90**	**1777**

* Values corresponding to the minimum anchorage length.

The design value is valid for “good bond conditions” as described in EN 1992-1-1. For all other conditions multiply by the value by 0.7.

The volume of mortar correspond to the formula “$1,2*(d_0^2-d_S^2)*\pi*lb/4$”

Injection System Hilti HIT-RE 500 for rebar connection

Values for pre-calculation of overlap joints with Hilti HIT-RE 500,
Example for C20/25, good bond conditions,
Rebar yield strength 500 N/mm²,
for all drilling procedures, excluding diamond wet (DD)

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