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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-05/0051

English translation prepared by DIBt - Original version in German language

| | |
|---|---|
| Handelsbezeichnung<br>*Trade name* | Injektionssystem Hilti HIT-HY 150<br>*Injection System Hilti HIT-HY 150* |
| Zulassungsinhaber<br>*Holder of approval* | Hilti Aktiengesellschaft<br>Business Unit Anchors<br>9494 Schaan<br>FÜRSTENTUM LIECHTENSTEIN |
| Zulassungsgegenstand und Verwendungszweck<br><br>*Generic type and use of construction product* | Verbunddübel (Injektionssystem) mit Ankerstange oder Innengewindehülse in den Größen M8, M10, M12, M16, M20, M24, M27 und M30 zur Verankerung im ungerissenen Beton<br>*Bonded anchor (injection type) with anchor rod or internal sleeve of sizes M8, M10, M12, M16, M20, M24, M27 and M30 for use in non-cracked concrete* |
| Geltungsdauer: vom<br>*Validity: from*<br>bis<br>*to* | 20 December 2007<br><br>17 March 2010 |
| Herstellwerk<br>*Manufacturing plant* | Hilti Werke |

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|---|---|
| Diese Zulassung umfasst<br>*This Approval contains* | 23 Seiten einschließlich 14 Anhänge<br>*23 pages including 14 annexes* |
| Diese Zulassung ersetzt<br>*This Approval replaces* | ETA-05/0051 mit Geltungsdauer vom 17.03.2005 bis 17.03.2010<br>*ETA-05/0051 with validity from 17.03.2005 to 17.03.2010* |

## 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 construction product and intended use

### 1.1 Definition of the product

The Injection System Hilti HIT-HY 150 for non-cracked concrete is a bonded anchor consisting of a foil pack with injection mortar Hilti HIT-HY 150 and a steel element. The steel element is a threaded rod with washer and nut in the range of M8 to M30 or an internal sleeve in the range of M8 to M20. The steel elements are made of zinc coated steel (HIT-V, HAS-(E) and HIS-N), stainless steel (HIT-V-R, HAS-(E)R and HIS-RN) or high corrosion resistant steel (threaded rods HIT-V-HCR and HAS-(E)HCR).

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

An illustration of the product and intended use is given in Annexes 1 and 2.

### 1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences. Safety in case of fire (Essential Requirement 2) is not covered in this European technical approval. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206:2000-12.

The anchor may be used in non-cracked concrete.

The anchor may be installed in dry or wet concrete; it must not be installed in flooded holes.

The anchor may be used in the following temperature ranges:

| | | |
|---|---|---|
| Temperature range I: | -40 °C to +40 °C | (max long term temperature +24 °C and max short term temperature +40 °C) |
| Temperature range II: | -40 °C to +80 °C | (max long term temperature +50 °C and max short term temperature +80 °C) |
| Temperature range III: | -40 °C to +120 °C | (max long term temperature +72 °C and max short term temperature +120 °C) |

<u>Elements made of zinc coated steel (threaded rods HIT-V and HAS-(E), internal sleeve HIS-N):</u>

The element made of electroplated or hot-dipped galvanised steel may only be used in structures subject to dry internal conditions.

<u>Elements made of stainless steel (threaded rods HIT-V-R and HAS-(E)R, internal sleeve HIS-RN):</u>

The element made of stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439 or 1.4362 may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure to permanently damp internal conditions, if no particular aggressive conditions exist. Such 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 materials are used).

Elements made of high corrosion resistant steel (threaded rods HIT-V-HCR and HAS-(E)HCR):

The element made of high corrosion resistant steel 1.4529 or 1.4565 may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such 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 chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

The provisions made in this European technical approval are based on an assumed working life of the anchor 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 anchor corresponds to the drawings and provisions given in Annexes 3 and 4. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 3 and 4 shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

The characteristic values for the design of anchorages are given in Annexes 8 to 14.

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 2. Each foil pack is marked with the identifying mark "HILTI HIT-HY 150", with the production date and expiry date.

Each threaded rod HIT-V is marked with the marking of steel grade and length in accordance with Annex 3. Each threaded rod made of stainless steel is marked with the additional letter "R". Each threaded rod made of high corrosion resistant steel is marked with the additional letter "HCR".

Each threaded rod HAS-(E) is marked with the identifying mark – "H" and the embossing accordance with Annex 2. Each threaded rod made of zinc coated steel is marked with the additional embossing "1". Each threaded rod made of stainless steel is marked with the additional embossing "=". Each threaded rod made of high corrosion resistant steel is marked with the additional embossing "CR".

Each internal sleeve made of zinc coated steel is marked with "HIS-N" according to Annex 3. Each internal sleeve made of stainless steel is marked with "HIS-RN" according to Annex 3.

Explanations of the markings are given in Annex 4.

The marking of embedment depth may be done on jobsite.

### 2.2 Methods of verification

The assessment of fitness of the anchor 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", on the basis of Option 7.

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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.

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/EG of the European Commission[8] 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;

(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 November 2007 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 at Deutsches Institut für Bautechnik.[9]

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.

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8 Official Journal of the European Communities L 254 of 08.10.1996

9 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.

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.

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 anchor. 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,
- use category (ETAG 001-1, Option 7),
- size

# 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 at 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 Installation

4.2.1 Design of anchorages

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A, for bonded anchors under the responsibility of an engineer experienced in anchorages and concrete work.

For the verifications given below according to Annex C the following shall be observed:

- For the verification 'concrete cone failure' (clause 5.2.2.4, Annex C of the Guideline) $N_{Rk,c}$ shall be determined according to (1) and (2): The smaller of the values according to (1) and (2) is decisive.

  (1) $N_{Rk,c}$ according to equation (5.2), Annex C of the Guideline

  where: $N^0_{Rk,c}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $s_{cr,N}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $c_{cr,N}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $\psi_{ucr,N} = 1,0$

  In special cases according to clause 5.2.2.4 g, Annex C of the Guideline the method given there is valid. However, the value $N^0_{Rk,c}$ shall be calculated according to the following equation:

  $$N^0_{Rk,c} = N^0_{Rk,c} \text{ (Table 9 or Table 11)} \times \frac{h'_{ef}}{h_{ef}}$$

  (2) $N_{Rk,c}$ according to equation (5.2), Annex C of the Guideline

  where: $N^0_{Rk,c} = 0,75 \times 15,5 \times h_{ef}^{1,5} \times f_{ck,cube}^{0,5}$

  $s_{cr,N} = 3\ h_{ef}$

  $c_{cr,N} = 1,5\ h_{ef}$

  $\psi_{ucr,N} = 1,0$

- For the verification 'splitting failure due to loading' (clause 5.2.2.6, Annex C of the Guideline) $N_{Rk,sp}$ shall be determined according to (3).

  (3) $N_{Rk,sp}$ according to equation (5.3), Annex C of the Guideline

  where: $N^0_{Rk,c}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $s_{cr,sp}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $c_{cr,sp}$ according to Annex 9, Table 9, and Annex 11, Table 11 respectively

  $\psi_{ucr,N} = 1,0$

  $\psi_{h,sp} = 1,0$

- For the verification 'concrete pryout failure' (clause 5.2.3.3, Annex C of the Guideline) $N_{Rk,c}$ for equation (5.6), Annex C of the Guideline, shall be determined according to (1).

For the internal sleeve only fastening screws or threaded rods made of galvanised steel with the minimum strength class 8.8 EN ISO 898-1 shall be used. The minimum and maximum thread engagement length $h_s$ of the fastening screw or the threaded rod for installation of the fixture shall be met the requirements according to Annex 8, Table 7 and 8. The length of the fastening screw or the threaded rod shall be determined depending on thickness of fixture, admissible tolerances, available thread length and minimum and maximum thread engagement length $h_s$.

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.).

4.2.2 Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site,
- anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European technical approval,
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor,
- commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
    - material, dimensions and mechanical properties of the metal parts according to the specifications given in Annex 4, Table 4,
    - confirmation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents should be stored,
    - marking of the threaded rod with the envisage embedment depth. This may be done by the manufacturer of the rod or the person on jobsite.
- checks before placing the anchor to ensure that the strength class of the concrete in which the anchor 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,
- marking and keeping the effective anchorage depth,
- edge distance and spacing not less than the specified values without minus tolerances,
- positioning of the drill holes without damaging the reinforcement,
- drilling by hammer-drilling,
- in case of aborted drill hole: the drill hole shall be filled with mortar,
- the anchor must not be installed in flooded holes,
- cleaning the drill hole in accordance with Annexes 5 to 7,
- the anchor component installation temperature shall be at least +5 °C; during curing of the chemical mortar the temperature of the concrete must not fall below -5 °C; observing the curing time according to Annex 7, Table 6 until the anchor may be loaded,
- fastening screws or threaded rods (including nut and washer) for the internal sleeves HIS-(R)N must be made of appropriate steel grade and property class,
- installation torque moments are not required for functioning of the anchor. However, the torque moments given in Annex 8 must not be exceeded.

## 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 1 and 2 including Annexes referred to and 4.2.1 and 4.2.2 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,
- hole depth,
- diameter of anchor rod,
- minimum effective anchorage depth,
- information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- material and property class of metal parts acc. to Annex 4, Table 4,
- anchor component installation temperature,
- ambient temperature of the concrete during installation of the anchor,
- admissible processing time (open time) of the mortar,
- curing time until the anchor may be loaded as a function of the ambient temperature in the concrete during installation,
- maximum torque moment,
- identification of the manufacturing batch,

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

**5.2 Packaging, transport and storage**

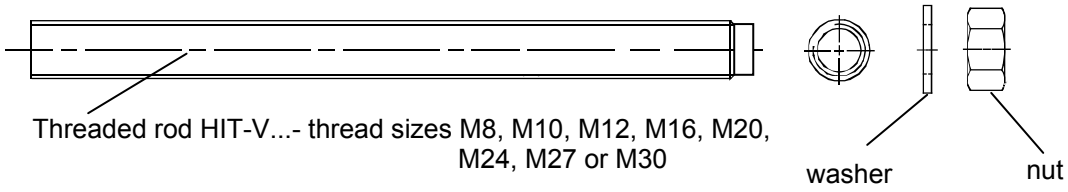
The foil packs shall be protected against sun radiation and shall be stored according to the manufacturer's installation instructions in dry condition at temperatures of at least +5 °C to not more than +25 °C.

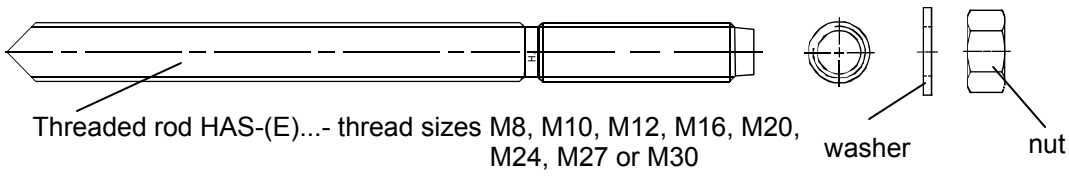
Foil packs with expired shelf life must no longer be used.

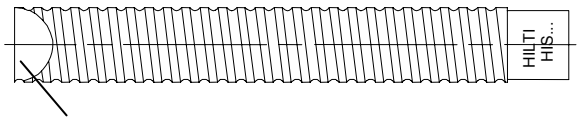
The anchor shall only be packaged and supplied as a complete unit. Foil packs may be packed separately from metal parts.

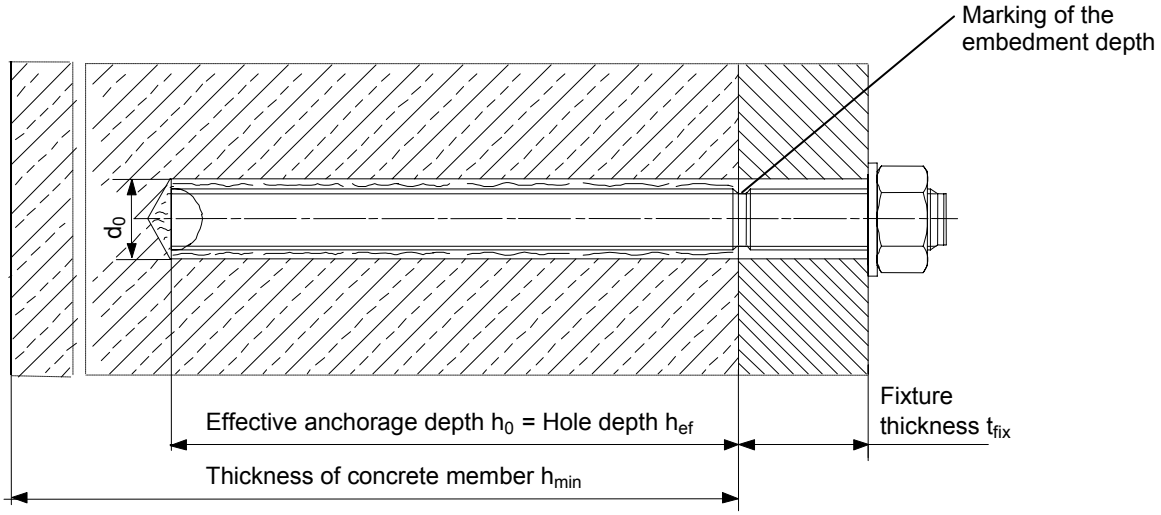
Dipl.-Ing. E. Jasch
President of Deutsches Institut für Bautechnik
Berlin, 20 December 2007

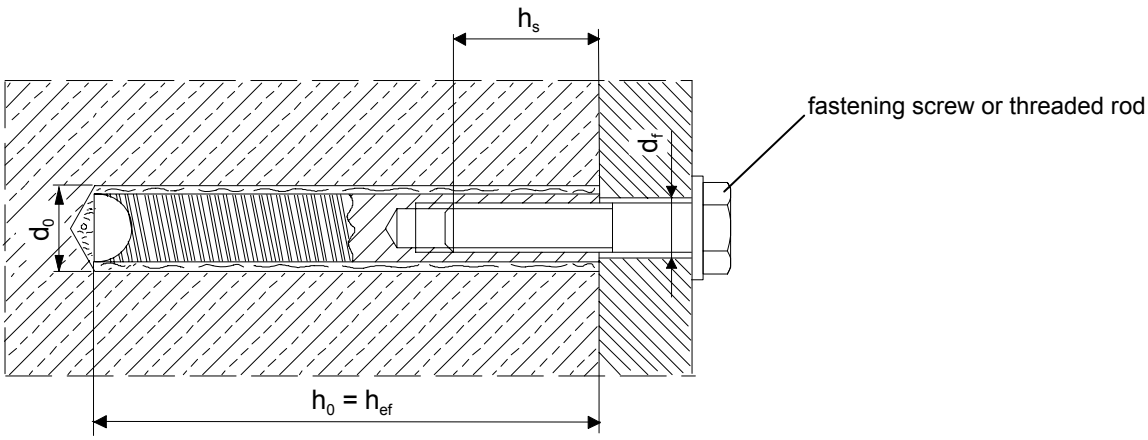
*beglaubigt:*
Giessmann



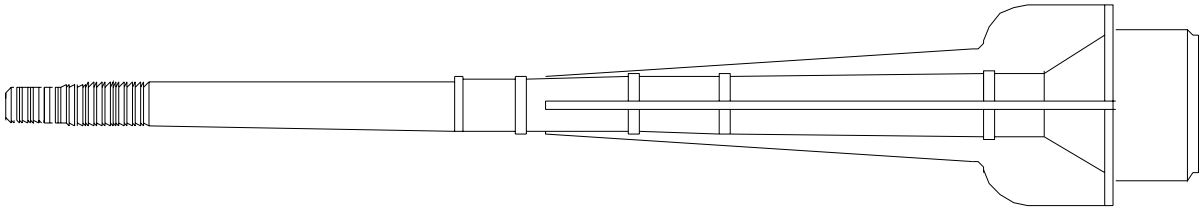

| **Injection System Hilti HIT-HY 150** | **Annex 1** |
|---|---|
| Product and intended use | of European technical approval<br>ETA – 05/0051 |

**Injection mortar:** hybrid system with resin, hardener and cement water component

Foil pack 330ml, 500ml and 1400ml

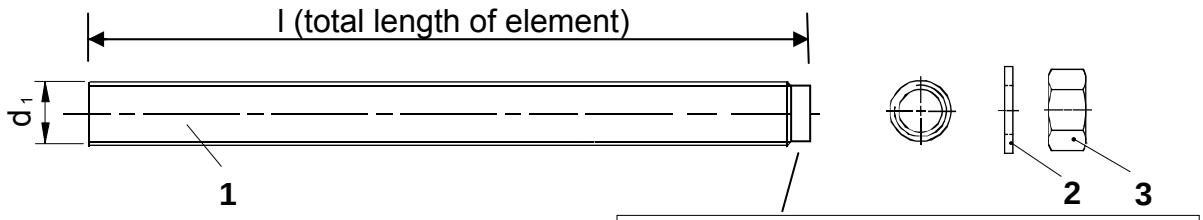
Marking
HILTI HIT
Production time, -day, -line
expiry date


Static Mixer



| | | |
|---|---|---|
| Use category: | Installation in dry or wet concrete, it must not installed in flooded holes | |
| 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) |

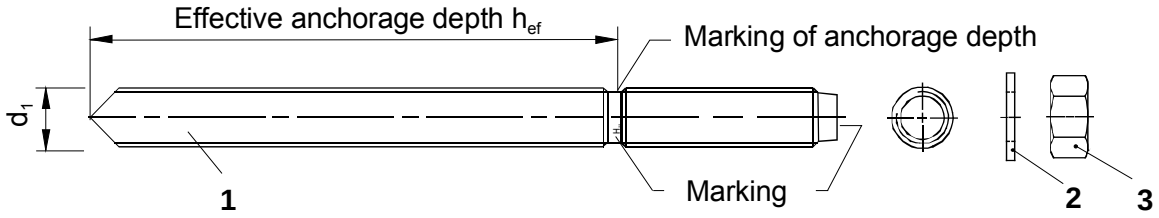
| | |
|---|---|
| **Injection System Hilti HIT-HY 150** | **Annex 2** |
| Product (injection mortar) and Intended Use | of European technical approval<br>ETA – 05/0051 |




Head marking:
5.8 - l = (HIT-V-5.8 M…x l); M8 – M24
5.8F - l = (HIT-V-5.8F M…x l); M8 – M24
8.8 - l = (HIT-V-8.8 M…x l); M27 and M30
8.8F - l = (HIT-V-8.8F M…x l); M27 and M30
R - l = (HIT-V-R M...x l)
HCR - l = (HIT-V-HCR...x l)

**Table 1: Dimensions anchor rods HIT-V-…**

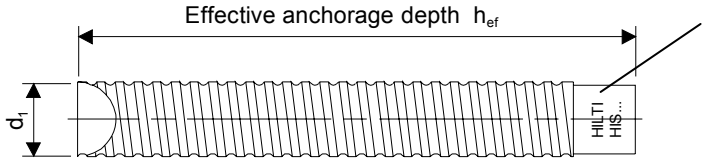
| HIT-V-…. | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|
| Ø$d_1$ [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |




Marking:
HAS-(E) identifying mark - H and embossing "1"
HAS-(E)R identifying mark - H and embossing "="
HAS-(E)HCR identifying mark - H and embossing "CR"

**Table 2: Dimensions and embedment depth $h_{ef}$, anchor rods HAS-(E)...**

| HAS-(E)... | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|
| Ø$d_1$ [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| $h_{ef}$ [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |




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

**Table 3: Dimensions of internal sleeves HIS-(R)N**

| HIS-(R)N | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|
| Ø$d_1$ [mm] | 12,5 | 16,5 | 20,5 | 25,4 | 27,6 |
| $h_{ef}$ [mm] | 90 | 110 | 125 | 170 | 205 |
| $h_s$ [mm] | 20 | 25 | 30 | 40 | 50 |

| **Injection System Hilti HIT-HY 150** | **Annex 3** |
|---|---|
| Embedded Metal Parts<br>HAS-(E)... and HIS-(R)N | of European technical approval<br>ETA – 05/0051 |

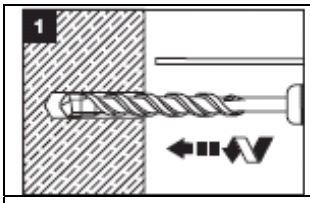
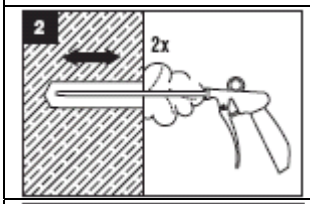
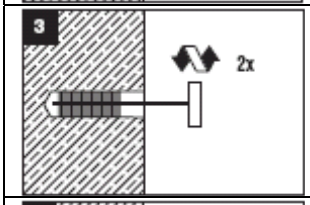
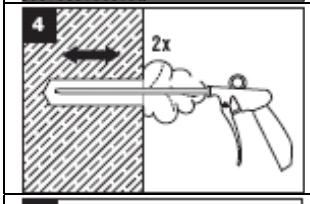
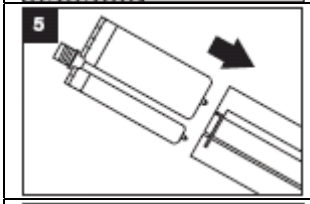
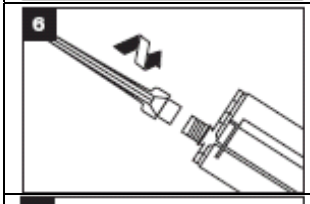
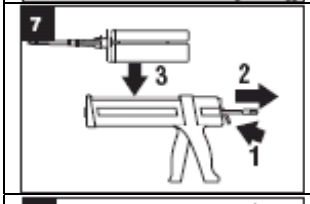
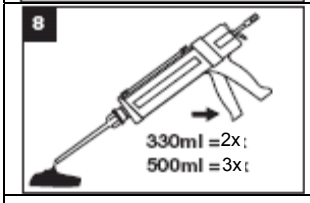
## Table 4: Materials

| Designation | Material |
|---|---|
| **Metal parts made of zinc coated steel** | |
| threaded rod<br>HIT-V-5.8(F)<br>HAS-(E) M8 to M24 | strength class 5.8 EN ISO 898-1, $A_5$ > 8% Ductile<br>steel galvanized ≥ 5μm EN ISO 4042<br>(F) hot dipped galvanized ≥ 45μm EN ISO 10684 |
| threaded rod<br>HIT-V-8.8(F)<br>HAS-(E) M27 and M30 | strength class 8.8 EN ISO 898-1, $A_5$ > 8% Ductile<br>steel galvanized ≥ 5μm EN ISO 4042<br>(F) hot dipped galvanized ≥ 45μm EN ISO 10684 |
| washer<br>ISO 7089 | steel galvanized EN ISO 4042; hot dipped galvanized EN ISO 10684 |
| nut<br>EN ISO 403 | strength class 8 ISO 898-2<br>steel galvanized ≥ 5μm EN ISO 4042<br>hot dipped galvanized ≥ 45μm EN ISO 10684 |
| internally threaded sleeves [1)]<br>HIS-N | C-Stahl 1.0718, EN 10277-3<br>steel galvanized ≥ 5μm EN ISO 4042 |
| **Metal parts made of stainless steel** | |
| threaded rod<br>HIT-V-R<br>HAS-(E)R | for ≤ M24: strength class 70 EN ISO 3506-1; $A_5$ > 8% Ductile<br>for > M24: strength class 50 EN ISO 3506-1; $A_5$ > 8% Ductile<br>stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088 |
| washer<br>ISO 7089 | stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088 |
| nut<br>EN ISO 403 | strength class 70 EN ISO 3506-2<br>stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088 |
| internally threaded sleeves [2)]<br>HIS-RN | stainless steel 1.4401 und 1.4571 EN 10088 |
| **Metal parts made of high corrosion resistant steel** | |
| threaded rod<br>HIT-V-HCR<br>HAS-(E)HCR | for ≤ M20: $R_m$ = 800 N/mm²; $R_{p\,0,2}$ = 640 N/mm², $A_5$ > 8% Ductile<br>for > M20: $R_m$ = 700 N/mm²; $R_{p\,0,2}$ = 400 N/mm², $A_5$ > 8% Ductile<br>high corrosion resistant steel 1.4529, 1.4565 EN 10088 |
| washer<br>ISO 7089 | high corrosion resistant steel 1.4529, 1.4565 EN 10088 |
| nut<br>EN ISO 4032 | strength class 70 EN ISO 3506-2<br>high corrosion resistant steel 1.4529, 1.4565 EN 10088 |

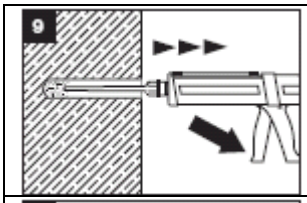
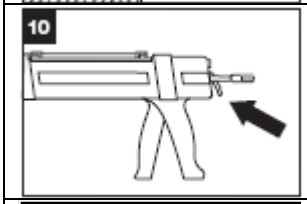
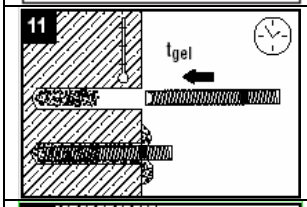
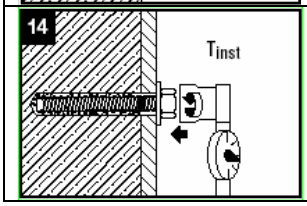
1) related fastening screw: strength class 8.8 EN ISO 898-1, $A_5$ > 8% Ductile; steel galvanized ≥ 5μm EN ISO 4042

2) related fastening screw: strength class 70 EN ISO 3506-1, $A_5$ > 8% Ductile; stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088

## Installation instruction

| | | |
|---|---|---|
|  | 1 | Drill Hole with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill<br>bit, to the required embedment depth. |
| 2 – 4 Clean hole: Just before setting an anchor, the borehole must be free of dust and debris. | | |
|  | 2 | Blow from the back of the hole (if needed with extension) with oil-free compressed air (min. 6 bar at 6 m³/h) fully retracting the air extension 2 times until return air stream is free of noticeable dust. |
|  | 3 | Brush 2 times with the specified brush size (brush Ø ≥ bore hole Ø) by inserting the round steel brush 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 bore hole -- if not, the brush is too small and must be replaced with the proper brush diameter. |
|  | 4 | Blow again with compressed air 2 times until return air stream is free of noticeable dust. |
|  | 5 | Insert foil pack in foil pack holder. Never use damaged foil packs and/or damaged or unclean foil pack holders. Attach new mixer prior to dispensing a new foil pack (snug fit). |
|  | 6 | Tightly attach static mixer to foil pack manifold. Do not modify the mixer in any way.<br>Make sure the mixing element is in the mixer. Use only the mixer supplied with the adhesive or stated in the instruction for use. |
|  | 7 | Insert foil pack holder with foil pack into HIT-dispenser. Push release trigger, retract plunger and insert foil pack holder into the appropriate Hilti dispenser. |
|   | 8 | 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. See pictogram 8 for discard quantities.<br>Quantity for 1400ml foil pack is 45ml. |
| Inject adhesive from the back of the borehole without forming air voids | | |

| | |
|---|---|
| **Injection System Hilti HIT-HY 150** | **Annex 5**<br>of European technical approval<br>ETA – 05/0051 |
| Installation Instruction I | |

| | | |
|---|---|---|
|  | 9 | Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.<br>Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length. |
|  | 10 | After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer. |
|  | 11 | Mark and set Element to the required embedment depth.<br>The minimum curing time is given in Annex 7 Table 6. |
|  | 14 | Fastening of the fixture; the applied installation torque shall not exceed the values given in Annex 8, Table 7 and 8 |

Before use, verify that the element is dry and free of oil and other contaminants.

| | |
|---|---|
| **Injection System Hilti HIT-HY 150** | **Annex 6**<br>of European technical approval<br>ETA – 05/0051 |
| Installation Instruction II | |

## Table 5: Drill hole cleaning – Brush sizes

2xblowing (air gun ≥ 6bar); 2xbrushing; 2xblowing

| | | Premium cleaning set | | |
|---|---|---|---|---|
| | | steel brush; ≥ 6bar compressed air with air gun | | |
| d element | $d_0$ | brush HIT-RB | nominal brush size | gauge ⇒ minimum brush size |
| HIT-V and HAS M8 | 10 | HIT- RB Ø 10 | 11 | 10 |
| HIT-V and HAS M10 | 12 | HIT- RB Ø 12 | 13 | 12 |
| HIT-V and HAS M12 | 14 | HIT- RB Ø 14 | 15 | 14 |
| HIS-N M8 | 14 | HIT- RB Ø 14 | 15 | 14 |
| HIT-V and HAS M16 | 18 | HIT- RB Ø 18 | 20 | 18 |
| HIS-RN M10 | 18 | HIT- RB Ø 18 | 20 | 18 |
| HIS-RN M12 | 22 | HIT- RB Ø 22 | 24 | 22 |
| HIT-V and HAS M20 | 24 | HIT- RB Ø 24 | 26 | 24 |
| HIT-V and HAS M24 | 28 | HIT- RB Ø 28 | 30 | 28,5 |
| HIS-RN M16 | 28 | HIT- RB Ø 28 | 30 | 28,5 |
| HIT-V and HAS M27 | 30 | HIT- RB Ø 30 | 32 | 30,5 |
| HIS-RN M20 | 32 | HIT- RB Ø 32 | 34 | 32,5 |
| HIT-V and HAS M30 | 35 | HIT- RB Ø 35 | 37 | 35,5 |

d = nominal fastening element diameter

$d_0$ = nominal diameter of drill bit

Recommended air gun with an orifice opening of minimum 3.5 mm in diameter

## Table 6: Minimum curing time [1)]

| Temperature in the anchorage base | min. curing time |
|---|---|
| -5 °C to -1 °C | 9 h |
| 0 °C to 4 °C | 4,5 h |
| 5 °C to 9 °C | 2 h |
| 10 °C to 19 °C | 1,5 h |
| 20 °C to 29 °C | 50 min |
| 30 °C to 39 °C | 40 min |

[1)] These data are valid for dry anchorage base only. In wet anchorage base the curing times must be doubled.

**Table 7: Characteristic value of installation; minimum thickness of concrete member, minimum spacing and edge distance of anchor rod HIT-V... and HAS-(E)...**

| HIT-HY 150 with HIT-V... and HAS-(E)... | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Nominal diameter of drill bit | $d_0$ | [mm] | 10 | 12 | 14 | 18 | 24 | 28 | 30 | 35 |
| Cutting diameter of drill bit | $d_{cut} \leq$ | [mm] | 10,45 | 12,5 | 14,5 | 18,5 | 24,55 | 28,55 | 30,55 | 35,7 |
| Depth of drilled hole | $h_0$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Diameter of steel brush | $d_b \geq$ | [mm] | 10 | 12 | 14 | 18 | 24 | 28,5 | 30,5 | 35,5 |
| Diameter of clearance hole in the fixture | $d_f$ | [mm] | 9 | 12 | 14 | 18 | 22 | 26 | 30 | 33 |
| Torque moment | $T_{inst}$ | [Nm] | 10 | 20 | 40 | 80 | 150 | 200 | 270 | 300 |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 110 | 120 | 140 | 170 | 220 | 270 | 300 | 340 |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 55 | 65 | 90 | 120 | 130 | 135 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 45 | 55 | 65 | 90 | 120 | 130 | 135 |

**Table 8: Characteristic value of installation; minimum thickness of concrete member, minimum spacing and edge distance of internal sleeve HIS-(R)N**

| HIT-HY 150 with HIS-(R)N | | | M 8 | M 10 | M 12 | M 16 | M 20 |
|---|---|---|---|---|---|---|---|
| Effective anchorage depth | $h_{ef}$ | [mm] | 90 | 110 | 125 | 170 | 205 |
| Nominal diameter of drill bit | $d_0$ | [mm] | 14 | 18 | 22 | 28 | 32 |
| Cutting diameter of drill bit | $d_{cut} \leq$ | [mm] | 14,5 | 18,5 | 22,55 | 28,55 | 32,7 |
| Depth of drilled hole | $h_0$ | [mm] | 90 | 110 | 125 | 170 | 205 |
| Diameter of steel brush | $d_b \geq$ | [mm] | 14 | 18 | 22 | 28,5 | 32,5 |
| Diameter of clearance hole in the fixture | $d_f$ | [mm] | 9 | 12 | 14 | 18 | 22 |
| Torque moment | $T_{inst}$ | [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 thickness of concrete member | $h_{min}$ | [mm] | 120 | 150 | 170 | 230 | 270 |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 60 | 80 | 125 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | 45 | 60 | 80 | 125 |

## Table 9: Characteristic values of resistance to tension load of for design method A

| HIT-HY 150 with HIT-V... and HAS-(E)... | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Effective anchorage depth | $h_{ef}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| **Steel failure HIT-V... and HAS-(E)...; steel cross section HAS-(E)... is decisive** | | | | | | | | | | |
| Characteristic resistance C-steel; class 5.8 | $N_{Rk,s}$ | [kN] | **17** | **26** | **38** | **72** | **112** | **160** | **-** | **-** |
| Characteristic resistance C-steel; class 8.8 | $N_{Rk,s}$ | [kN] | **-** | **-** | **-** | **-** | **-** | **-** | **347** | **422** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,5 | | | | | | | |
| Characteristic resistance A4 and HCR; class 70 | $N_{Rk,s}$ | [kN] | **23** | **37** | **53** | **101** | **157** | **224** | **217** | **263** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,87 | | | | | | 2,4 | |
| **Pullout and concrete cone failure in non cracked concrete C20/25 [2)]** | | | | | | | | | | |
| Characteristic resistance in concrete Temperature range I **(40°C/24°C)** | $N_{Rk,c}$ = $N_{Rk,p}$ | [kN] | **20** | **30** | **50** | **50** | **95** | **140** | **170** | **200** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 110 | 140 | 210 | 210 | 280 | 370 | 420 | 470 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 320 | 360 | 440 | 500 | 680 | 840 | 960 | 1080 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 160 | 180 | 220 | 250 | 340 | 420 | 480 | 540 |
| Characteristic resistance in concrete Temperature range II **(80°C/50°C)** | $N_{Rk,c}$ = $N_{Rk,p}$ | [kN] | **16** | **20** | **30** | **35** | **60** | **95** | **115** | **140** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 110 | 120 | 140 | 170 | 220 | 270 | 300 | 340 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 200 | 240 | 300 | 360 | 500 | 640 | 760 | 860 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 100 | 120 | 150 | 180 | 250 | 320 | 380 | 430 |
| Characteristic resistance in concrete Temperature range III **(120°C/72°C)** | $N_{Rk,c}$ = $N_{Rk,p}$ | [kN] | **9** | **12** | **20** | **25** | **40** | **60** | **75** | **95** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 110 | 120 | 140 | 170 | 220 | 270 | 300 | 340 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 160 | 180 | 220 | 250 | 340 | 420 | 480 | 540 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Increasing factor for $N_{Rk,p}$ in non-cracked Concrete | $\psi_c$ | C30/37 | 1,06 | | | | | | | |
| | | C40/50 | 1,11 | | | | | | | |
| | | C50/60 | 1,14 | | | | | | | |
| Spacing | $s_{cr,N}$ | [mm] | 2 $h_{ef}$ | | | | | | | |
| Edge distance | $c_{cr,N}$ | [mm] | 1 $h_{ef}$ | | | | | | | |
| Partial safety factor | $\gamma_{Mp} = \gamma_{Msp} = \gamma_{Mc}$ [1)] | [-] | 1,5 [3)] | 1,5 [3)] | 1,5 [3)] | 1,5 [3)] | 1,5 [3)] | 1,5 [3)] | 1,8 [4)] | 1,8 [4)] |

[1)] In absence of national regulations
[2)] Calculation of concrete failure and splitting see paragraph 4.2.1
[3)] The partial safety factor $\gamma_2$ = 1,0 is included
[4)] The partial safety factor $\gamma_2$ = 1,2 is included

| Injection System Hilti HIT-HY 150 | Annex 9 |
|---|---|
| Characteristic values of resistance to tension loads of anchor rod HIT-V... and HAS-(E)... | of European technical approval<br>ETA – 05/0051 |

## Table 10: Displacements under tension load

| HIT-HY 150 with HIT-V... and HAS-(E)... | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Temperature range I[1]: (40°C / 24°C) | | | | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 9,5 | 14,3 | 19,0 | 23,8 | 45,2 | 66,7 | 67,5 | 79,4 |
| Displacement | $\delta_{N0}$ | [mm] | 0,15 | 0,15 | 0,15 | 0,15 | 0,25 | 0,25 | 0,25 | 0,25 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,40 | 0,40 | 0,40 | 0,40 | 0,70 | 0,70 | 0,70 | 0,70 |
| Temperature range II[1]: (80°C / 50°C) | | | | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 7,6 | 9,5 | 14,3 | 16,7 | 28,6 | 45,2 | 45,6 | 55,6 |
| Displacement | $\delta_{N0}$ | [mm] | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,40 | 0,40 | 0,40 | 0,40 | 0,40 | 0,40 | 0,40 | 0,40 |
| Temperature range III[1]: (120°C / 72°C) | | | | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 4,3 | 5,7 | 9,5 | 11,9 | 19,0 | 28,6 | 29,8 | 37,7 |
| Displacement | $\delta_{N0}$ | [mm] | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,30 | 0,30 | 0,30 | 0,30 | 0,30 | 0,30 | 0,30 | 0,30 |

[1] Explanation in section 1.2

## Table 11: Characteristic values of resistance to tension load for design method A

| HIT-HY 150 with HIS-(R)N | | | M 8 | M 10 | M 12 | M 16 | M 20 |
|---|---|---|---|---|---|---|---|
| Effective anchorage depth | $h_{ef}$ | [mm] | 90 | 110 | 125 | 170 | 205 |
| **Steel failure HIS-(R)N** | | | | | | | |
| Characteristic resistance HIS-N with screw class 8.8 | $\mathbf{N_{Rk,s}}$ | [kN] | **25** | **46** | **67** | **118** | **109** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,43 | 1,50 | | 1,47 | |
| Characteristic resistance HIS-RN with screw class 70 | $\mathbf{N_{Rk,s}}$ | [kN] | **26** | **41** | **59** | **110** | **166** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,87 | | | | 2,4 |
| **Pullout and concrete cone failure in non cracked concrete C20/25** [2)] | | | | | | | |
| Characteristic resistance in concrete Temperature range I **(40°C/24°C)** | $\mathbf{N_{Rk,c} = N_{Rk,p}}$ | [kN] | **35** | **40** | **60** | **115** | **140** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 150 | 180 | 200 | 300 | 340 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 360 | 440 | 500 | 680 | 820 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 180 | 220 | 250 | 340 | 410 |
| Characteristic resistance in concrete Temperature range II **(80°C/50°C)** | $\mathbf{N_{Rk,c} = N_{Rk,p}}$ | [kN] | **20** | **30** | **40** | **75** | **95** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 120 | 150 | 170 | 230 | 270 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 240 | 280 | 320 | 440 | 520 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 120 | 140 | 160 | 220 | 260 |
| Characteristic resistance in concrete Temperature range III **(120°C/72°C)** | $\mathbf{N_{Rk,c} = N_{Rk,p}}$ | [kN] | **16** | **20** | **30** | **50** | **60** |
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 120 | 150 | 170 | 230 | 270 |
| Splitting spacing | $s_{cr,sp}$ | [mm] | 180 | 220 | 250 | 340 | 410 |
| Splitting edge | $c_{cr,sp}$ | [mm] | 90 | 110 | 125 | 170 | 205 |
| Increasing factor for $N_{Rk,p}$ in non-cracked Concrete | $\psi_c$ | C30/37 | 1,06 | | | | |
| | | C40/50 | 1,11 | | | | |
| | | C50/60 | 1,14 | | | | |
| Spacing | $s_{cr,N}$ | [mm] | $2\ h_{ef}$ | | | | |
| Edge distance | $c_{cr,N}$ | [mm] | $1\ h_{ef}$ | | | | |
| Partial safety factor | $\gamma_{Mp} = \gamma_{Msp} = \gamma_{Mc}$ [1)] | [-] | 1,5 [3)] | | | 1,8 [4)] | |

[1)] In absence of national regulations
[2)] Calculation of concrete failure and splitting see paragraph 4.2.1
[3)] The partial safety factor $\gamma_2 = 1,0$ is included
[4)] The partial safety factor $\gamma_2 = 1,2$ is included

| Injection System Hilti HIT-HY 150 | Annex 11 |
|---|---|
| Characteristic values of resistance to tension loads of internal sleeve HIS-(R)N | of European technical approval<br>ETA – 05/0051 |

## Table 12: Displacements under tension load

| HIT-HY 150 with HIS-(R)N | | | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|---|
| Temperature range I[1]: (40°C / 24°C) | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 14,3 | 23,8 | 28,6 | 37,7 | 55,6 |
| Displacement | $\delta_{N0}$ | [mm] | 0,25 | 0,30 | 0,30 | 0,30 | 0,30 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,70 | 0,80 | 0,80 | 0,80 | 0,80 |
| Temperature range II[1]: (80°C / 50°C) | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 9,5 | 16,7 | 19,0 | 23,8 | 37,7 |
| Displacement | $\delta_{N0}$ | [mm] | 0,15 | 0,20 | 0,20 | 0,20 | 0,20 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,40 | 0,55 | 0,55 | 0,55 | 0,55 |
| Temperature range III[1]: (120°C / 72°C) | | | | | | | |
| Tension load in non-cracked concrete | | [kN] | 5,7 | 9,5 | 11,9 | 19,8 | 23,8 |
| Displacement | $\delta_{N0}$ | [mm] | 0,10 | 0,15 | 0,15 | 0,15 | 0,15 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,30 | 0,40 | 0,40 | 0,40 | 0,40 |

[1] Explanation in section 1.2

## Table 13: Characteristic resistance to shear load for design method A

| HIT-HY 150 with HIT-V... and HAS-(E)... | | | M 8 | M 10 | M 12 | M 16 | M 20 | M 24 | M 27 | M 30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm; steel cross section HAS-(E)... is decisive** | | | | | | | | | | |
| Characteristic shear resistance C-steel; class 5.8 | $V_{Rk,s}$ | [kN] | **8,5** | **13** | **19** | **36** | **56** | **80** | **-** | **-** |
| Characteristic shear resistance C-steel; class 8.8 | $V_{Rk,s}$ | [kN] | **-** | **-** | **-** | **-** | **-** | **-** | **174** | **211** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,25 | | | | | | | |
| Characteristic shear resistance A4 and HCR; class 70 | $V_{Rk,s}$ | [kN] | **12** | **18** | **27** | **51** | **79** | **112** | **108** | **132** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,56 | | | | | | 2,0 | |
| **Steel failure with lever arm; steel cross section HAS-(E)... is decisive** | | | | | | | | | | |
| Characteristic resistance C-steel; class 5.8 | $M^0_{Rk,s}$ | [Nm] | **16** | **33** | **56** | **147** | **284** | **486** | **-** | **-** |
| Characteristic resistance C-steel; class 8.8 | $M^0_{Rk,s}$ | [Nm] | **-** | **-** | **-** | **-** | **-** | **-** | **1223** | **1637** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,25 | | | | | | | |
| Characteristic resistance A4 und HCR; class 70 | $M^0_{Rk,s}$ | [Nm] | **23** | **46** | **79** | **205** | **398** | **680** | **765** | **1023** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,56 | | | | | | 2,0 | |
| **Concrete edge failure** | | | | | | | | | | |
| Effective length of anchor in shear loading | $l_f$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Effective diameter of anchor | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Partial safety factor | $\gamma_{Mc}$ [1)] | [-] | 1,5 [2)] | | | | | | | |

[1)] In absence of national regulations

[2)] The partial safety factor $\gamma_2$ = 1,0 is included

## Table 14: Displacement under shear load

| HIT-HY 150 with HIT-V... and HAS-(E)... | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| Shear load in non-cracked concrete, C-Steel | | [kN] | 4,7 | 7,5 | 10,9 | 20,6 | 32,0 | 45,8 | 99,1 | 120,4 |
| Displacement | $\delta_{V0}$ | [mm] | 0,4 | 0,6 | 0,7 | 0,9 | 1,1 | 1,3 | 2,8 | 3,4 |
| Displacement | $\delta_{V\infty}$ | [mm] | 0,6 | 0,9 | 1,1 | 1,4 | 1,7 | 2,0 | 4,2 | 5,1 |
| Shear load in non-cracked concrete, A4 | | [kN] | 5,3 | 8,5 | 12,2 | 23,1 | 35,9 | 51,4 | 38,7 | 47,0 |
| Displacement | $\delta_{V0}$ | [mm] | 0,5 | 0,6 | 0,7 | 1,0 | 1,3 | 1,5 | 1,1 | 1,3 |
| Displacement | $\delta_{V\infty}$ | [mm] | 0,8 | 0,9 | 1,1 | 1,5 | 2,0 | 2,3 | 1,7 | 2,0 |

| **Injection System Hilti HIT-HY 150** | **Annex 13** |
|---|---|
| Characteristic values of resistance to shear loads and displacements of anchor rod HIT-V... and HAS-(E)... | of European technical approval<br>ETA – 05/0051 |

## Table 15: Characteristic resistance to shear load for design method A

| HIT-HY 150 with HIS-(R)N | | | M 8 | M 10 | M 12 | M 16 | M20 |
|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | | |
| Characteristic resistance HIS-N with screw class 8.8 | $V_{Rk,s}$ | [kN] | **13** | **23** | **39** | **59** | **55** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,25 | | 1,5 | | |
| Characteristic resistance HIS-RN with screw class 70 | $V_{Rk,s}$ | [kN] | **13** | **20** | **30** | **55** | **83** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,56 | | | | 2,0 |
| **Steel failure with lever arm** | | | | | | | |
| Characteristic resistance HIS-N with screw class 8.8 | $M^0_{Rk,s}$ | [Nm] | **30** | **60** | **105** | **266** | **519** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,25 | | | | |
| Characteristic resistance HIS-RN with screw class 70 | $M^0_{Rk,s}$ | [Nm] | **26** | **52** | **92** | **233** | **454** |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,56 | | | | |
| **Concrete pryout failure** | | | | | | | |
| Factor in equation (5.6) of ETAG 001 Annex C, 5.2.3.3 | k | [-] | 2,0 | | | | |
| Partial safety factor | $\gamma_{Mcp}$ [1)] | [-] | 1,5 [2)] | | | | |
| **Concrete edge failure** | | | | | | | |
| Effective length of anchor in shear loading | $l_f$ | [mm] | 90 | 110 | 125 | 170 | 205 |
| Effective diameter of anchor | $d_{nom}$ | [mm] | 12,5 | 16,5 | 20,5 | 25,4 | 27,6 |
| Partial safety factor | $\gamma_{Mc}$ [1)] | [-] | 1,5 [2)] | | | | |

[1)] In absence of national regulations

[2)] The partial safety factor $\gamma_2$ = 1,0 is included.

## Table 16: Displacement under shear load

| HIT-HY 150 with HIS-(R)N | | | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|---|
| Shear load in non-cracked concrete, HIS-N | | [kN] | 7,5 | 13,3 | 18,5 | 28,0 | 26,0 |
| Displacement | $\delta_{N0}$ | [mm] | 0,7 | 1,0 | 1,1 | 1,6 | 2,0 |
| Displacement | $\delta_{N\infty}$ | [mm] | 1,1 | 1,5 | 1,7 | 2,4 | 3,0 |
| Shear load in non-cracked concrete, HIS-RN | | [kN] | 5,9 | 9,3 | 13,5 | 25,2 | 29,7 |
| Displacement | $\delta_{N0}$ | [mm] | 0,5 | 0,7 | 0,8 | 1,1 | 1,1 |
| Displacement | $\delta_{N\infty}$ | [mm] | 0,8 | 1,1 | 1,2 | 1,7 | 1,7 |