



## European Technical Approval ETA-03/0032

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	Hilti Verbundanker HVZ / HVZ R / HVZ HCR <i>Hilti bonded anchor HVZ / HVZ R / HVZ HCR</i>
Zulassungsinhaber <i>Holder of approval</i>	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Kraftkontrolliert spreizender Verbunddübel in den Größen M10/75, M12/95, M16/105, M16/125 und M20/170 zur Verankerung im Beton <i>Torque controlled bonded anchor of sizes M10/75, M12/95, M16/105, M16/125 und M20/170 for use in concrete</i>
Geltungsdauer: <i>Validity:</i>	vom <i>from</i> bis <i>to</i> 4 June 2013 4 June 2018
Herstellwerke <i>Manufacturing plants</i>	Hilti Werk 1, Schweiz Hilti Werk 2, Germany

Diese Zulassung umfasst  
*This Approval contains*

16 Seiten einschließlich 8 Anhänge  
*16 pages including 8 annexes*

Diese Zulassung ersetzt  
*This Approval replaces*

ETA-03/0032 mit Geltungsdauer vom 29.09.2008 bis 01.10.2013  
*ETA-03/0032 with validity from 29.09.2008 to 01.10.2013*

## 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<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - *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<sup>4</sup>, as amended by Article 2 of the law of 8 November 2011<sup>5</sup>;*
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>;
  - 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.

<sup>1</sup> Official Journal of the European Communities L 40, 11 February 1989, p. 12  
<sup>2</sup> Official Journal of the European Communities L 220, 30 August 1993, p. 1  
<sup>3</sup> Official Journal of the European Union L 284, 31 October 2003, p. 25  
<sup>4</sup> *Bundesgesetzblatt Teil I 1998*, p. 812  
<sup>5</sup> *Bundesgesetzblatt Teil I 2011*, p. 2178  
<sup>6</sup> Official Journal of the European Communities L 17, 20 January 1994, p. 34

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of product and intended use

#### 1.1 Definition of product

The Hilti adhesive anchor HVZ / HVZ R / HVZ HCR is a torque controlled bonded anchor consisting of a foil capsule with mortar Hilti HVU-TZ and an anchor rod (including nut and washer) in the sizes of M10/75, M12/95, M16/105, M16/125 and M20/170. The anchor rod (including nut and washer) is made of galvanised steel (HAS-TZ), stainless steel (HAS-RTZ) or high corrosion resistant steel (HAS-HCR-TZ). The foil capsule is set into a drilled hole in the concrete. The special formed anchor rod is driven into the foil capsule by machine with simultaneous hammering and turning. The load transfer is realised by mechanical interlock of several cones in the bonding mortar and then via a combination of bonding and friction forces in the anchorage ground (concrete).

For the installed anchor see Figure given in Annex 1

#### 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 C 20/25 at minimum and C 50/60 at most according to EN 206: 2000-12.

It may be anchored in cracked and 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 range:

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

##### Anchor rods HAS-TZ made of galvanised steel:

The anchor rod (including nut and washer) made of galvanised steel may only be used in structures subject to dry internal conditions.

##### Anchor rods HAS-RTZ made of stainless steel:

The anchor rod (including nut and washer) made of stainless steel 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 in 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).

Anchor rods HAS-HCR-TZ made of high corrosion resistant steel:

The anchor rod (including nut and washer) made of high corrosion resistant steel 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 extreme 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 product and methods of verification

### 2.1 Characteristics of product

The anchor corresponds to the drawings and provisions given in Annexes 2 and 3. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 2 and 3 shall correspond to the respective values laid down in the technical documentation<sup>7</sup> of this European technical approval.

The characteristic anchor values for the design of anchorages are given in Annexes 7 and 8.

Each anchor rod is marked according to Annex 3 with the identifying mark of the manufacturer, with the anchor size, with the anchorage depth, with the maximum fixture thickness and with the marking "HAS-TZ" for galvanised steel, "HAS-RTZ" for stainless steel or "HAS-HCR-TZ" for high corrosion resistant steel respectively.

Each foil capsule shall be marked with the identifying mark of the producer and with the trade name.

The anchor shall only be packaged and supplied as a complete unit. Foil capsules may be packed separately from anchor rods (including nut and washer).

### 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 1.

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.

<sup>7</sup> 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.

### 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<sup>8</sup> the system 2(i) (referred to as System 1) of 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 of 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 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.<sup>9</sup>

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 of 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.

<sup>8</sup> Official Journal of the European Communities L 254 of 08.10.1996

<sup>9</sup> The control plan is a confidential part of the documentation of the European technical approval, but not published together with 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.

### 3.2.2 Tasks of approved bodies

The approved body shall perform the following tasks in accordance with the provisions laid down in the control plan:

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

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 anchors. 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 manufacturer),
- 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 1),
- 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 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 European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

### 4.2 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, under the responsibility of an engineer experienced in anchorages and concrete work.

Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.

The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

#### 4.3 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;
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor;
- anchor 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 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;
- keeping of the edge distance and spacing to the specified values without minus tolerances;
- positioning of the drill holes without damaging the reinforcement;
- keeping the effective anchorage depth;
- in case of aborted drill hole: the drill hole shall be filled with mortar;
- the anchor must not be installed in flooded holes; before installation of the anchor the hole shall be cleaned, and possibly existing water in the hole shall be completely removed; the hole shall be cleaned by at least blowing out twice with a hand pump;
- the foil capsule is set into the drilled hole; connecting the anchor rod with the percussion drill by using a corresponding adapter; driving the anchor rod into the foil capsule by simultaneous hammering and turning of the drill; if the anchorage depth is achieved the drill must stopped immediately by using some pressure; if the anchor is proper installed mortar must be visible at the member surface;
- the anchor component installation temperature shall be at least +5 °C;
- the temperature of the concrete during installation and curing of the mortar must not fall below +0 °C;
- the curing time according to Annex 5 shall be observed before the anchor may be loaded (for wet concrete the curing time according to Annex 5 must be doubled);
- after the curing time fixing the member to be anchored by using a calibrated torque wrench by not exceeding the torque moments given in Annex 6.

### 5 Indications to the manufacturer

#### 5.1 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to as well as sections 4.2 and 4.3 as well as 5 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,
- maximum thickness of the fixture;
- information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- anchor component installation temperature,
- ambient temperature of the concrete during installation of the anchor,
- 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 Recommendations concerning packaging, transport and storage

The foil capsules 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 capsules with expired shelf life must no longer be used.

The anchor shall only be packaged and supplied as a complete unit. Foil capsules may be packed separately from anchor rods (including nut and washer).

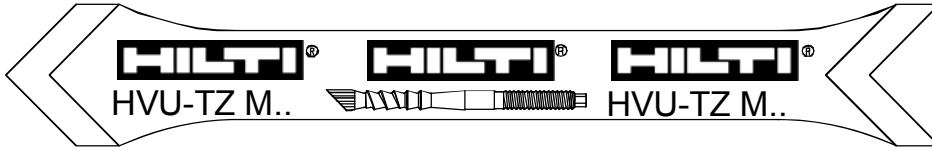
The manufacturer's installation instruction shall indicate that the mortar Hilti HVU-TZ shall be used only with the corresponding anchor rods of the manufacturer according to Annex 3.

Andreas Kummerow  
p. p. Head of Department

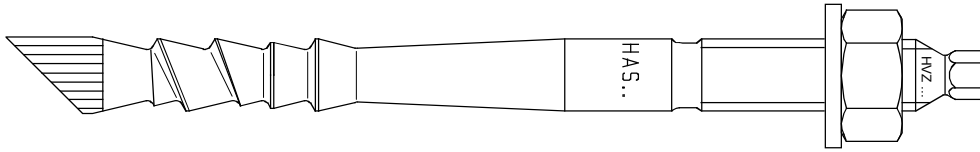
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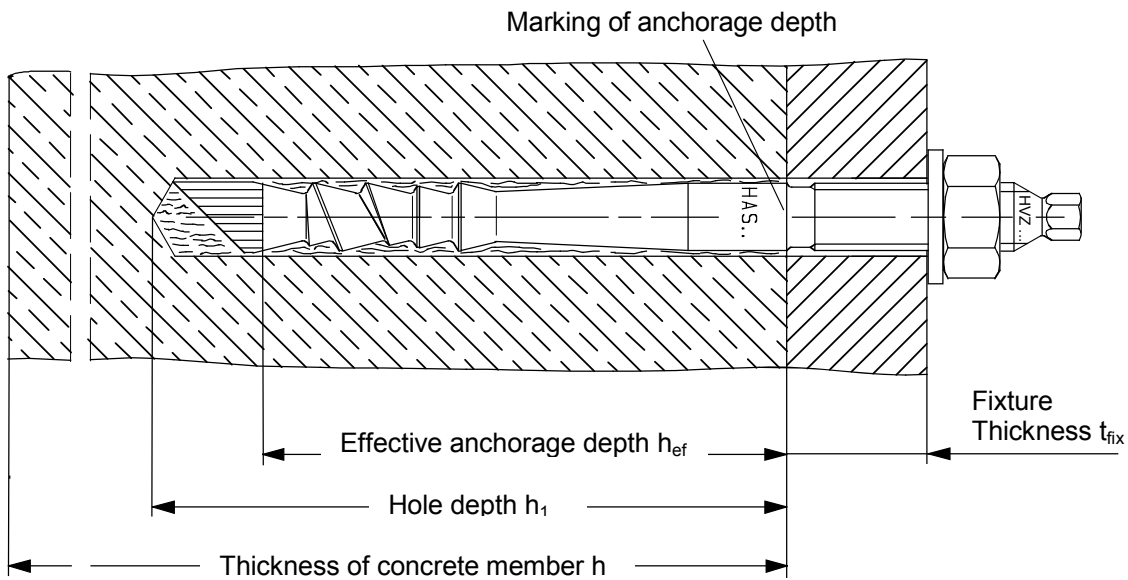
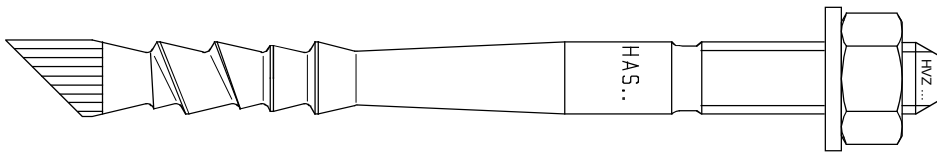
**Foil capsule HVU-TZ**



**Anchor rod HAS-TZ / HAS-RTZ / HAS-HCR-TZ**



**Anchor rod HAS-E-TZ / HAS-E-RTZ / HAS-E-HCR-TZ**



Use category: Installation in dry or water saturated concrete, it must not be installed in flooded holes

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

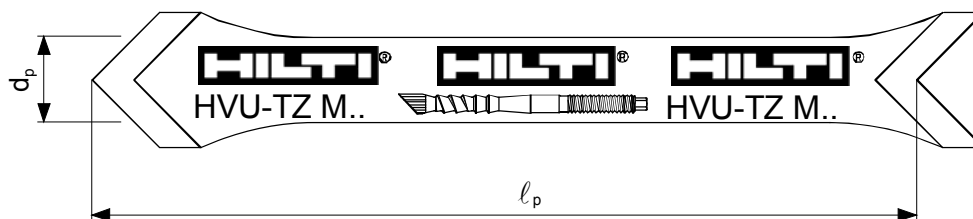
**Hilti bonded anchor HVZ / HVZ R / HVZ HCR**

Product and intended use

Annex 1

### Foil capsule HVU-TZ

imprint: HVU-TZ M ..  
back: expiry date e.g. 03/04



**Table 1: Material of foil capsule HVU-TZ**

Designation	Marking	Material
Foil capsule	HVU-TZ M ..	Foil tube: Composite foil Aggregate: Quartz sand Binder: Reaction resin Hardener: Dibenzoylperoxid

**Table 2: Dimensions of foil capsules HVU-TZ**

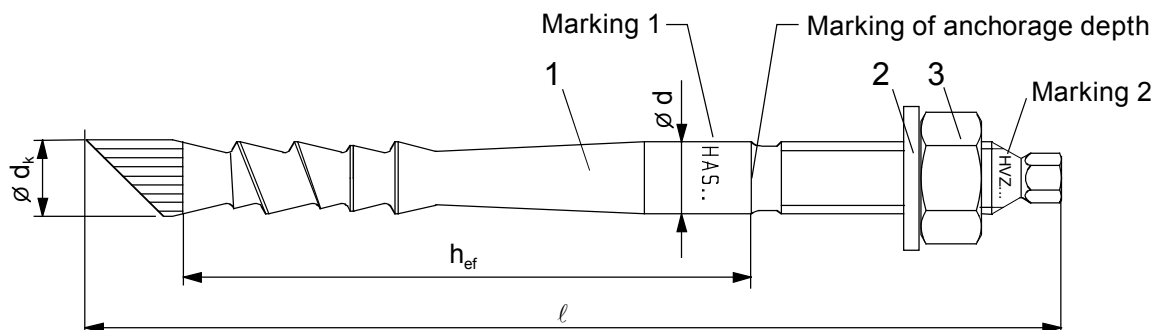
Foil capsule HVU-TZ		M10	M12	M16	M20	
Diameter	$d_p$ [mm]	11	13	17	23	
Length	$l_p$ [mm]	110	127	140	200	
for Anchor rods: HAS-(E-)TZ / HAS-(E-)RTZ / HAS-(E-)HCR-TZ		M10x75	M12x95	M16x105	M16x125	M20x170

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

dimensions and materials  
of foil capsule

Annex 2

### Anchor rod HAS-(E)-TZ / HAS-(E)-RTZ / HAS-(E)-HCR-TZ

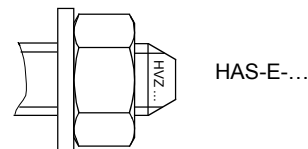


Marking 1: anchor type HAS-(E)-TZ / HAS-(E)-RTZ / HAS-(E)-HCR-TZ  
 anchor size M..  
 Fixture thickness  $t_{fix}$

e.g.: HAS-TZ M12/50

Marking 2: anchor type and anchorage depth HVZ  $h_{ef}$

e.g.: HVZ 95



**Table 3: Designation and Materials**

Part	Designation	HAS-(E)-TZ	HAS-(E)-RTZ	HAS-(E)-HCR-TZ
1	Anchor rod	Class 8.8, coated	Stainless steel A4-70, electropolished	High corrosion resistant steel, electropolished,
2	washer DIN 125	Steel galvanised <sup>1)</sup>	Stainless steel A4-70	High corrosion steel
3	Hexagon nut DIN EN 24032	Class 8, EN 20898-2, galvanised <sup>1)</sup>	Stainless steel A4-70	High corrosion steel

<sup>1)</sup> galvanised A2 according DIN EN ISO 4042

**Table 4: Dimensions of anchor rod**

Anchor rod	M10x75 / $t_{fix}$	M12x95 / $t_{fix}$	M16x105 / $t_{fix}$	M16x125 / $t_{fix}$	M20x170 / $t_{fix}$
Embedment depth $h_{ef}$ [mm]	75	95	105	125	170
Fixture thickness $t_{fix}$ <sup>1)</sup> [mm]	15 / 30 / 50	25 / 50 / 100	30 / 60 / 100	30 / 60 / 100	40
total length $\ell$ <sup>1)</sup> [mm]	124 / 139 / 159	158 / 183 / 233	181 / 211 / 251	201 / 231 / 271	269
Diameter $\varnothing d$ [mm]	10	12	16		21
Diameter $\varnothing d_k$ [mm]	10,8	12,8	16,8		22,7

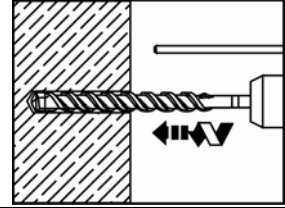
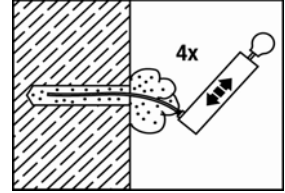
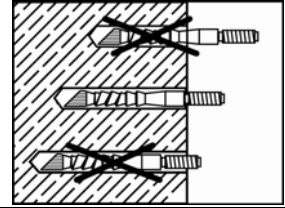
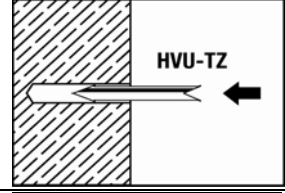
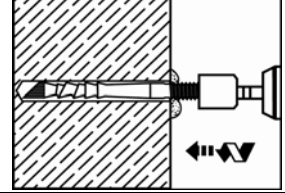
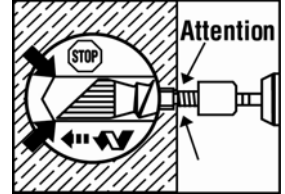
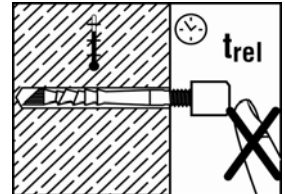
<sup>1)</sup> Other fixture thickness' and lengths are possible; max.  $\ell$  = 1500 mm

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

dimensions and material  
of anchor rod

Annex 3

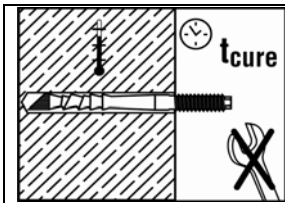
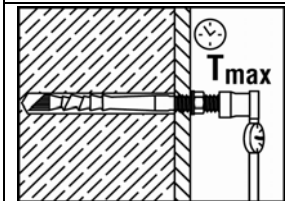
**Installation instruction**

	<p>Drill bore hole to the required bore hole depth <math>h_1</math> with a hammer drill set in rotation hammer mode using an appropriately sized carbide drill bit.</p> <p>Set the depth gauge to the correct drilling depth.</p>
	<p>Clean the hole immediately before setting the anchor: Remove drilling dust and standing water from the base of the hole by blowing out at least 4 times with the Hilti manual pump, until return air stream is free of noticeable dust. (Or alternatively using compressed air or an industrial vacuum cleaner).</p>
	<p>Check that the hole is drilled in the correct depth before setting the anchor. Hole depth is correct when the anchor rod contacts the base of the hole and the setting depth mark coincides with the concrete surface</p>
	<p>Push the anchor foil capsule with peak ahead to the back of the hole.</p>
	<p>Use the setting tool at a speed of min. 250 – max. 850 RPM to drive the anchor rod into the hole, applying moderate pressure and with the hammering action switched on.</p> <p>Setting tools (see table 6)</p>
	<p>Switch off the rotary hammer drill immediately when the setting depth is reached (refer to embedment mark on anchor rod).</p> <p>After setting, adhesive mortar must fill the annular gap completely, right up to the concrete surface. Caution! If no adhesive emerges, the anchor fastening may not be used.</p>
	<p>The waiting time <math>t_{rel}</math>, which depends on base material temperature, must be observed.</p> <p>The screwed-on setting tool shall be removed only after the waiting time <math>t_{rel}</math> has elapsed (see Table 5).</p>

**Hilti bonded anchor HVZ / HVZ R / HVZ HCR**

Installation instruction I

Annex 4

	<p>Take care of curing time <math>t_{cure}</math> before loading the anchor (see table 5)</p>
	<p>A load may be applied to the anchor only after the curing time <math>t_{cure}</math> has elapsed. The applied installation torque <math>T_{max}</math> shall not exceed the values given in table 7.</p>

**Table 5: Temperature, waiting time to release “ $t_{rel}$ ” and minimum curing time “ $t_{cure}$ ”**

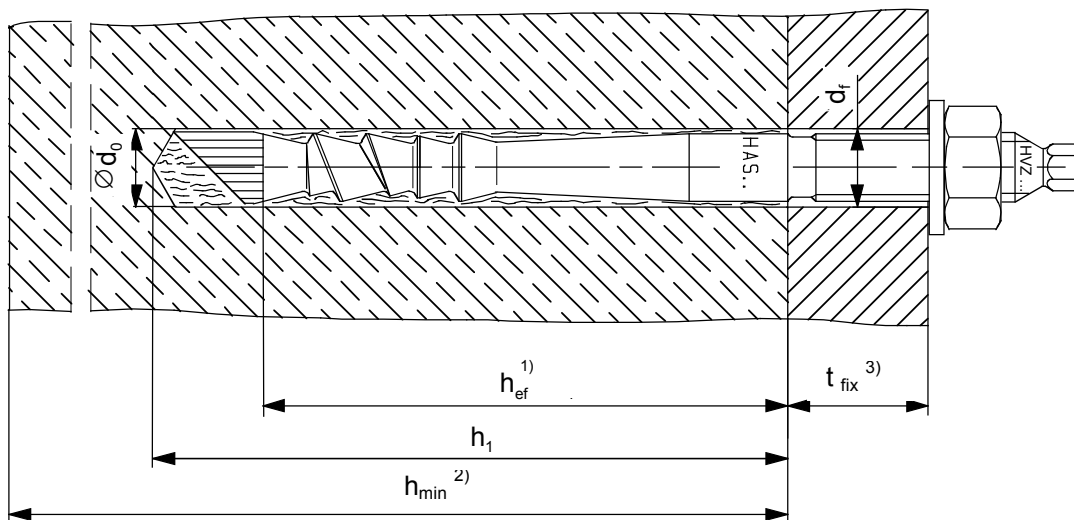
Base material temperature		Waiting time $t_{rel}$ to release the setting tool	min. curing time $t_{cure}$
°C	°F	minutes	minutes
0 to +10	32... to 50	30	60
+10 to +20	50... to 68	20	30
+20 to +40	68... to max.104	8	20

**Table 6: Anchor dimension, drill bit diameter and setting tool**

Anchor dimension	Drill bit diameter $d_0$ [mm]	Setting tool <sup>1)</sup>
M10	12	TE-C HEX M10
M12	14	TE-C HEX M12
M16	18	TE-C HEX M16
M20	25	TE-C HEX M20

<sup>1)</sup> Alternative: Use of double nut and wrench socket with appropriate size is possible.

<b>Hilti bonded anchor HVZ / HVZ R / HVZ HCR</b>	Annex 5
Installation instruction II	



- 1) Effective anchorage depth  $h_{ef}$  see Table 4  
 2) Minimum thickness of concrete member  $h_{min}$  see Table 8  
 3) Fixture thickness  $t_{fix}$  see Table 4

**Table 7: Characteristic values of anchors and installation**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ	M10x75	M12x95	M16x105	M16x125	M20x170
Nominal diameter of drill bit $d_0$ [mm]	12	14	18		25
Cutting diameter of drill bit $d_{cut,max} \leq$ [mm]	12,5	14,5	18,5		25,55
Depth of drilled hole $h_1 \geq$ [mm]	90	110	125	145	195
Diameter of clearance hole in the fixture $d_f \leq$ [mm]	12	14	18		22
Torque moment $T_{max}$ [Nm]	40	50	90		150

**Table 8: Minimum thickness of concrete member, minimum spacing and minimum edge distance of anchors**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ	M10x75	M12x95	M16x105	M16x125	M20x170
Min. thickness of concrete member $h_{min}$ [mm]	150	190	210	250	340
<b>Cracked concrete</b>					
Minimum spacing $s_{min}$ [mm]	50	60	70		80
Minimum edge distance $c_{min}$ [mm]	50	60	70		80
<b>Non-cracked concrete</b>					
Minimum spacing $s_{min}$ [mm]	50	60	70		80
Minimum edge distance $c_{min}$ [mm]	50	70	85		80

**Hilti bonded anchor HVZ / HVZ R / HVZ HCR**

Characteristic values of anchors and installation;  
Minimum thickness of concrete,  
Minimum spacing and edge distance

Annex 6

**Table 9: Characteristic values of resistance to tension loads for design method A**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ		M10x75	M12x95	M16x105	M16x125	M20x170
<b>Steel failure</b>						
Characteristic resistance	$N_{Rk,s}$ [kN]	35	51	90		182
Partial safety factor	$\gamma_{Ms}^{3)}$ [-]	1,5				
<b>Pullout failure</b>						
Characteristic resistance in cracked concrete	$N_{Rk,p}$ [kN]	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>
Characteristic resistance in non-cracked concrete	$N_{Rk,p}$ [kN]	- <sup>1)</sup>	40	- <sup>1)</sup>	- <sup>1)</sup>	- <sup>1)</sup>
Increasing factors for $N_{Rk,p}$ for cracked and non-cracked concrete	$\psi_c$ C30/37	1,22				
	C40/50	1,41				
	C50/60	1,55				
Partial safety factor	$\gamma_{Mp}^{3)}$ [-]	1,5 <sup>2)</sup>				
<b>Concrete cone failure and splitting failure</b>						
Effective anchorage depth	$h_{ef}$ [mm]	75	95	105	125	170
Spacing	$s_{cr,N} = s_{cr,sp}$ [mm]	3 $h_{ef}$				
Edge distance	$c_{cr,N} = c_{cr,sp}$ [mm]	1,5 $h_{ef}$				
Partial safety factor	$\gamma_{Mc} = \gamma_{M,sp}^{3)}$ [-]	1,5 <sup>2)</sup>				

<sup>1)</sup> Pullout failure is not decisive.

<sup>2)</sup> The partial safety factor  $\gamma_2 = 1,0$  is included.

<sup>3)</sup> in absence of other national regulations

**Table 10: Displacements under tension loads**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ		M10x75	M12x95	M16x105	M16x125	M20x170
Tension load in cracked concrete	N [kN]	11,1	15,9	18,4	24,0	38,0
Displacement	$\delta_{N0}$ [mm]	0,3	0,3	0,3	0,3	0,3
	$\delta_{N\infty}$ [mm]	1,2	1,5	1,0	1,1	1,2
Tension load in non-cracked concrete	N [kN]	15,6	19,0	25,9	33,6	53,3
Displacement	$\delta_{N0}$ [mm]	0,1	0,2	0,2	0,2	0,2
	$\delta_{N\infty}$ [mm]	1,2	1,2	1,2	1,2	1,2

**Hilti bonded anchor HVZ / HVZ R / HVZ HCR**

Design method A  
Characteristic values of resistance to tension loads;  
displacements

Annex 7

**Table 11: Characteristic values of resistance to shear loads for design method A**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ		M10x75	M12x95	M16x105	M16x125	M20x170
<b>Steel failure without lever arm</b>						
Characteristic resistance	HAS-TZ	18	27	51	88	
	HAS-RTZ HAS-HCR-TZ	20	30	56	98	
Partial safety factor	$\gamma_{Ms}^{2)}$ [-]	1,25				
<b>Steel failure with lever arm</b>						
Characteristic resistance	$M_{Rk,s}$ [Nm]	48	86	227	519	
Partial safety factor	$\gamma_{Ms}^{2)}$ [-]	1,25				
<b>Concrete pryout failure</b>						
Factor in equation (5.6) of ETAG Annex C, 5.2.3.3	k [-]	2,0				
Partial safety factor	$\gamma_{Mcp}^{2)}$ [-]	1,5 <sup>1)</sup>				
<b>Concrete edge failure</b>						
Effective length of anchor in shear loading	$l_f$ [mm]	75	95	105	125	170
Diameter of anchor	$d_{nom}$ [mm]	12	14	18	25	
Partial safety factor	$\gamma_{Mc}^{2)}$ [-]	1,5 <sup>1)</sup>				

<sup>1)</sup> The partial safety factor  $\gamma_2 = 1,0$  is included.

<sup>2)</sup> in absence of other national regulations

**Table 12: Displacements under shear loads**

HVZ with HAS-TZ / HAS-RTZ / HAS-HCR-TZ		M10x75	M12x95	M16x105	M16x125	M20x170
Shear load in cracked and non-cracked concrete	V [kN]	11,4	17,1	32,0	56,0	
Displacement	$\delta_{v0}$ [mm]	1,5	2,5	3,0	3,5	
	$\delta_{v\infty}$ [mm]	2,3	3,8	4,5	5,0	

**Hilti bonded anchor HVZ / HVZ R / HVZ HCR**

Design method A  
Characteristic values of resistance to shear loads;  
displacements

Annex 8