Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment ETA-03/0032 of 27 August 2015

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti bonded anchor HVZ / HVZ R / HVZ HCR
Product family to which the construction product belongs	Torque controlled bonded anchor for use in concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	15 pages including 3 annexes
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The 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 galvanized steel (HAS-(E-)TZ), stainless steel (HAS-(E-)RTZ) or high corrosion resistant steel (HAS-(E-)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 realized by mechanical interlock of several cones in the bonding mortar and then via a combination of bonding and friction forces in the concrete.
The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi static action and displacements	See Annex C1 – C3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC]

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 27 August 2015 by Deutsches Institut für Bautechnik

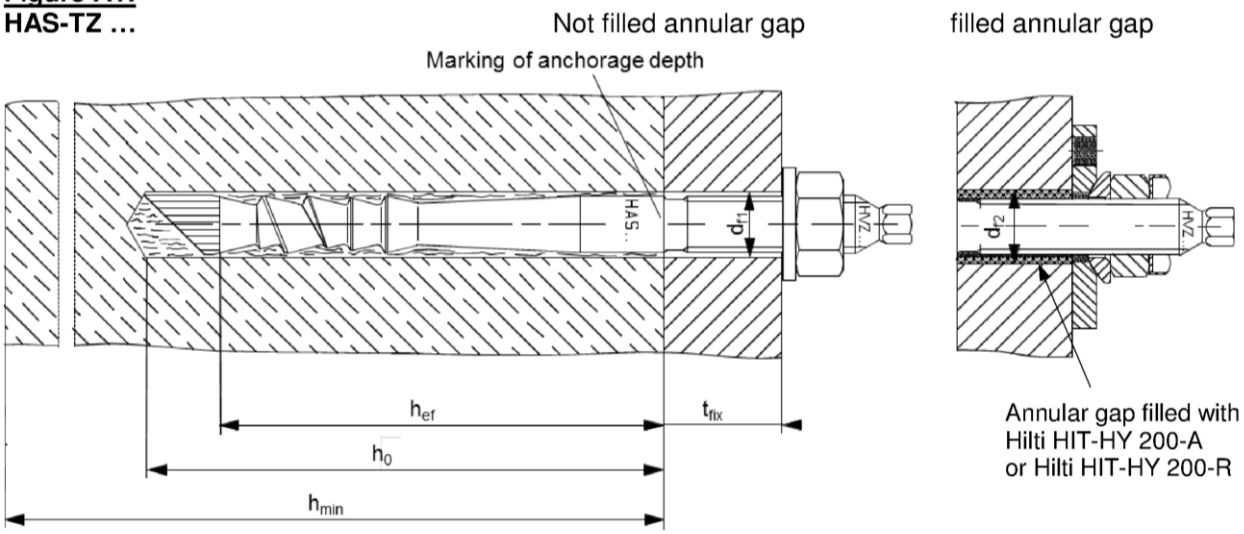
Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik

Installed condition

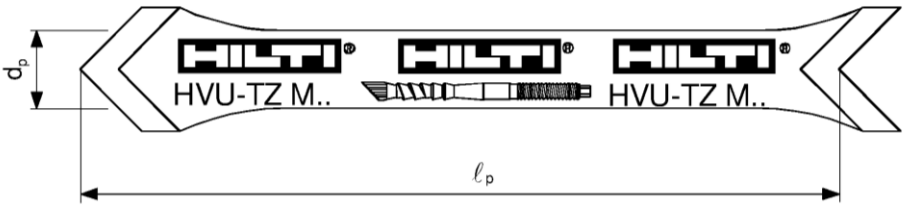
Figure A1:
HAS-TZ …



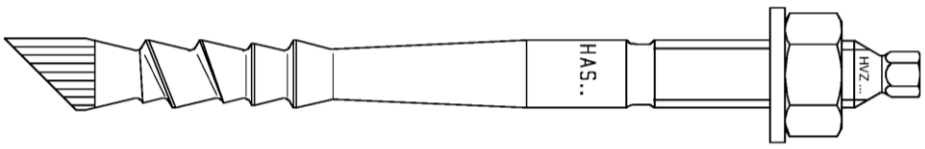
Product description: Mortar capsule and steel elements

Mortar capsule HVU-TZ: resin and hardener with aggregate

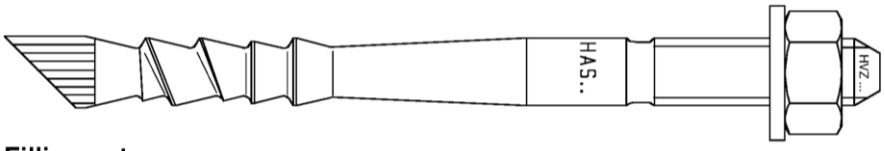
Marking:
HVU-TZ M …
Expiry date mm/yyyy



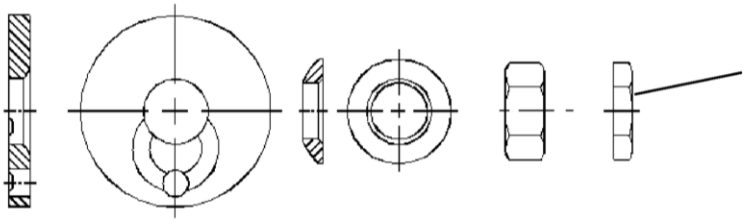
Steel element HAS-TZ (RTZ), (HCR-TZ) M10, M12, M16, M20



Steel element HAS-E-TZ (E-RTZ), (E-HCR-TZ) M10, M12, M16, M20



Filling set



Hilti bonded anchor HVZ / HVZ R / HVZ HCR	Annex A1
Product description Installed condition Mortar capsule / Steel elements	

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Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
Anchor rod HAS-TZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² Elongation at fracture (l_0=5d) > 8% ductile; Coated Fe/Cu 3Ni 10
Washer	Electroplated zinc coated ≥ 5 µm
Filling washer	Case hardened steel or cast iron part EN-GJMB-550 Electroplated zinc coated ≥ 5 µm
Spherical washer	DIN 6319; Electroplated zinc coated ≥ 5 µm
Nut	Strength class 8; Electroplated zinc coated ≥ 5 µm
Lock nut	Self locking counter nut DIN 7967: 1970; Electroplated zinc coated ≥ 5 µm
Metal parts made of stainless steel	
Anchor rod HAS-RTZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² Elongation at fracture (l_0=5d) > 8% ductile; Stainless steel 1.4401, 1.4404
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Filling washer	Precision casting 1.4401
Spherical washer	DIN 6319; Stainless steel 1.4401, 1.4571, 1.4362 EN 10088-1:2014
Nut	Strength class 70 or 80 Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Lock nut	Self locking couter nut DIN 7967; Stainless steel A4
Metal parts made of high corrosion resistant steel	
Anchor rod HAS-HCR-TZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² Elongation at fracture (l_0=5d) > 8% ductile; Stainless steel 1.4529
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Filling washer	Precision casting 1.4529
Spherical washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	Strength class 80 High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Product description
Materials

Annex A2

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.

Base material:

- Reinforced or unreinforced normal weight concrete according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and non-cracked concrete.

Temperature in the base material:

- **at installation**
  -5 °C to +40 °C
- **in-service**
  Temperature range: -40 °C to +80 °C
  (max. long term temperature +50 °C and max. short term temperature +80 °C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal conditions, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal conditions, if other particular aggressive conditions exist (high corrosion resistant steel).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing products are used).

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static loading are designed in accordance with:
  "EOTA ETAG 001 Annex C, 08/2010" or "CEN/TS 1992-4:2009, design method A".

Installation:

- Use category: dry or wet concrete (not in flooded holes).
- Drilling technique: hammer drilling and hammer drilling with hollow drill bit TE-CD, TE-YD.
- Overhead installation is admissible.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR	**Annex B1**
Intended Use Specifications	

Deutsches Institut für Bautechnik DIBt

Table B1: Installation parameters

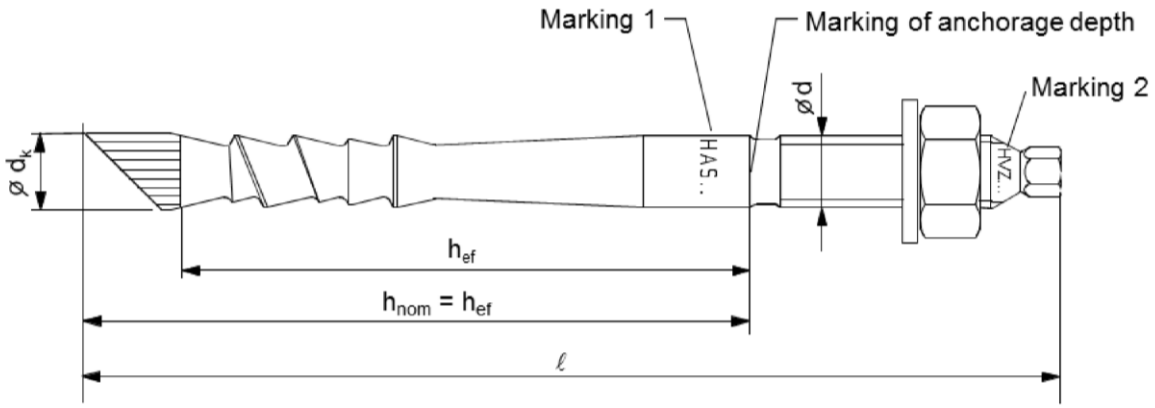
HAS-TZ / HAS-RTZ / HAS-HCR-TZ				M10x75	M12x95	M16x105	M16x125	M20x170
Nominal diameter		d	[mm]	10	12	16		20
Nominal diameter of drill bit		d_0	[mm]	12	14	18		25
Fixture thickness [1] standard		t_{fix}	[mm]	15 / 30 50	25 / 40 50 / 100	30 / 60 / 100		40
Fixture thickness [1] with filling set	HVZ HVZ-RTZ	t_{fix}	[mm]	6 / 21 / 41	15 / 30 40 / 90	19 / 49 / 89		-
	HVZ-HCR-TZ	t_{fix}	[mm]	-	10 / 25 35 / 85	11 / 41 / 81		-
Total length of the steel element [1]		ℓ	[mm]	124 / 139 159	158 / 173 183 / 233	181 / 211 251	201 / 231 271	269
Diameter at the tip		$\varnothing d_k$	[mm]	10,8	12,8	16,8		22,7
Nominal embedment depth and drill hole depth		h_{nom} $= h_0$	[mm]	90	110	125	145	195
Maximum diameter of clearance hole in the fixture		d_{f1}	[mm]	12	14	18	18	22
Maximum diameter of clearance hole in the fixture		d_{f2}	[mm]	14	16	20		-
Installation torque	HAS-TZ	T_{inst}	[Nm]	40	50	90		150
	HAS-RTZ HAS-HCR-TZ	T_{inst}	[Nm]	50	70	100		150
Minimum thickness of concrete member		h_{min}	[mm]	150	190	160	190	340
Cracked concrete								
Minimum spacing		s_{min}	[mm]	50	60	70		80
Minimum edge distance		c_{min}	[mm]	50	60	70		80
Non-cracked concrete								
Minimum spacing		s_{min}	[mm]	50	60	70		80
Minimum edge distance		c_{min}	[mm]	50	70	85		80

[1] Other fixture thickness' and lengths are possible; max. l = 1500 mm

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Intended Use
Installation parameters

Annex B2



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 B2: Setting tool

HAS-(E-)TZ-…	M10	M12	M16	M20
HAS-TZ	TE-C HEX M10	TE-C HEX M12	TE-C HEX M16	TE-C HEX M20
HAS-E-TZ	TE-C E M10	TE-C E M12	TE-C(Y) E M16	TE-C E M20

Table B3: Curing time t_{rel} and t_{cure} [1)]

Temperature in the base material T	Curing time: release screwed on setting tool t_{rel}	Curing time: full load t_{cure}
- 5 °C to - 1 °C	60 min	5 hour
0 °C to 9 °C	30 min	1 hour
10 °C to 19 °C	20 min	30 min
20 °C to 40 °C	8 min	20 min

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

Hilti bonded anchor HVZ / HVZ R / HVZ HCR	Annex B3
Intended Use Installation parameters Setting tool, Curing time	

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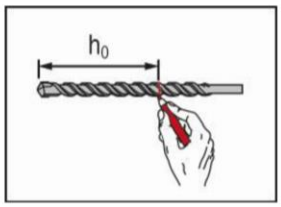
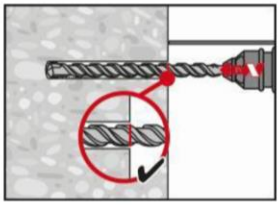
Installation instruction

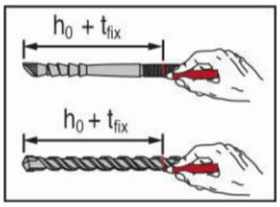
Hole drilling



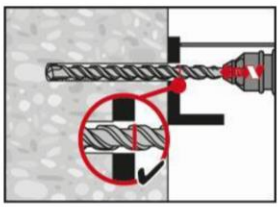
Pre-setting:
Mark drill hole depth h_0 on drill bit TE-C, TE-Y, TE-CD or TE-YD or sett the depth gauge of the drilling machine to drill hole depth h_0.



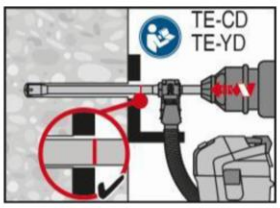
Pre-setting:
Drill hole to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Do not drill deeper.



Through-setting:
Mark setting depth $h_0 + t_{fix}$ on element.
Mark drill hole depth $h_0 + t_{fix}$ on drill bit TE-C, TE-Y, TE-CD or TE-YD or sett the depth gauge of the drilling machine to drill hole depth $h_0 + t_{fix}$.



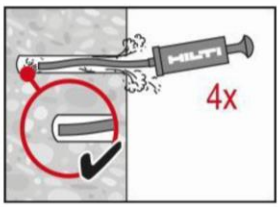
Through-setting:
Drill hole to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Do not drill deeper.



Pre- / Through-setting:
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment.
This drilling removes dust while drilling. After drilling is complete, proceed to the "check setting depth" step in the instructions for use.

Drill hole cleaning

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

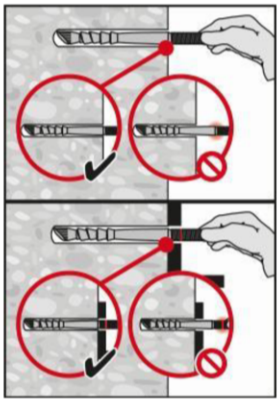


Pre- / Through-setting:
The Hilti hand pump may be used for blowing out drill holes.
Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR	**Annex B4**
Intended Use Installation instruction	

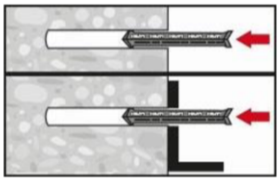
Deutsches Institut für Bautechnik

Check setting depth

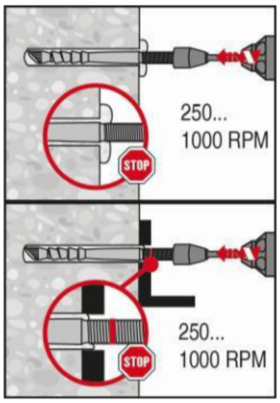


Pre- / Through-setting:
Check the setting depth with the marked element.
The element has to fit in the hole until the required embedment depth (pre-setting) or until the fixture surface.
If it is not possible to insert the element to the required embedment depth, drill deeper.

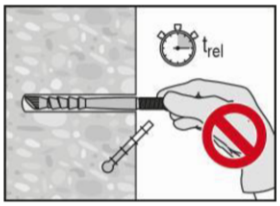
Setting the element



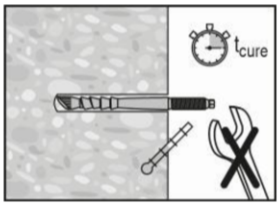
Pre- / Through-setting:
Push the anchor foil capsule with the peak ahead to the back of the hole.



Pre- / Through-setting:
Drive the anchor rod with the plugged on or screwed on tool into the hole, applying moderate pressure and with the hammering action switched on (250 RPM to maximum 1000 RPM).
Setting tool see Table B2.
After reaching the embedment depth switch off setting machine.



Pre- / Through-setting:
After required curing time t_{rel} (see Table B3) the screwed on setting tool can be removed.



Pre- / Through-setting:
After required curing time t_{cure} (see Table B3) remove excess mortar.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Intended Use
Installation instructions

Annex B5

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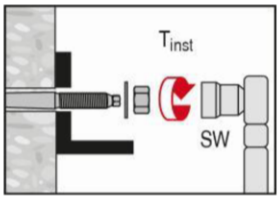
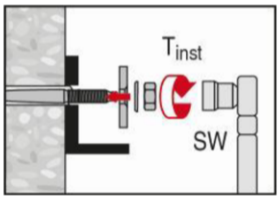
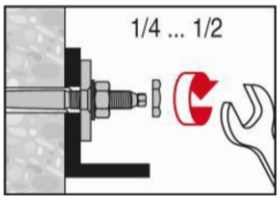


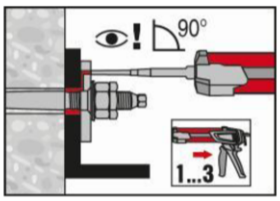
Pre-setting:
Use of washer and nut with the anchor rod delivered.
Apply installation torque T_{inst} given in Table B1.
The anchor can be loaded.



Through-setting:
Use of filling set.
Apply installation torque T_{inst} given in Table B1.



Through-setting:
Apply the lock nut and tighten with a ¼ to ½ turn.



Through-setting:
Fill annular gap between anchor rod and fixture with injection mortar Hilti HIT-HY 200-A or Hilti HIT-HY 200-R with approximately 1 to 3 trigger pull. Set mixing nozzle vertical in the filling hole.
Handling and curing time of the mortar see instruction for use packed with the mortar foil packs. After required curing time t_{cure} the anchor can be loaded.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Intended Use
Installation instructions

Annex B6

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Table C1: Characteristic resistance for HVZ (R) (HCR) under tension load in case of static and quasi static loading

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			**M10x75**	**M12x95**	**M16x105**	**M16x125**	**M20x170**
Installation safety factor	γ_2 [1] = γ_{inst} [2]	[-]	1,0				
Steel failure							
Characteristic resistance HAS-TZ / HAS-RTZ / HAS-HCR-TZ	$N_{Rk,s}$	[kN]	35	51	90		182
Pull-out failure							
Characteristic bond resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	- [3]	- [3]	- [3]	- [3]	- [3]
Characteristic bond resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	- [3]	40	- [3]	- [3]	- [3]
Increasing factors for τ_{Rk} in concrete	ψ_c	C30/37	1,22				
		C40/50	1,41				
		C50/60	1,55				
Concrete cone failure							
Effective anchorage depth	h_{ef}	[mm]	75	95	105	125	170
Cracked concrete							
Factor acc. to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	$k_8 = k_{cr}$ [2]	[-]	7,2				
Non-cracked concrete							
Factor acc. to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	$k_8 = k_{ucr}$ [2]	[-]	10,1				
Splitting failure							
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$				
For member thickness $h \geq 2\ h_{ef}$							
Edge distance	$c_{cr,sp}$	[mm]	$1,5\ h_{ef}$				
Minimum member thickness [4]	h_{min}	[mm]	150	190	210	250	340
For member thickness $h < 2\ h_{ef}$							
Edge distance	$c_{cr,sp}$	[mm]	-	-	$2\ h_{ef}$	$3\ h_{ef}$	-
Minimum member thickness [4]	h_{min}	[mm]	-	-	160	190	-

[1] Parameter for design according to EOTA ETAG 001 Annex C, 08/2010.
[2] Parameter for design according to CEN/TS 1992-4:2009.
[3] Pull out failure is not decisive.
[4] Minimum member thickness to be used for splitting failure.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Performances
Characteristic resistance under tension loads
Design according to "ETAG 001 Annex C, 08/2010" or "CEN/TS 1992-4:2009"

Annex C1

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Table C2: Characteristic resistance for HVZ (R) (HCR) under shear loads in case of static and quasi static loading

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			M10x75	M12x95	M16x105	M16x125	M20x170
Steel failure without lever arm							
Factor according to section 6.3.2.1 of CEN/TS 1992-4: 2009 part 5	k_2 [2)]	[-]	1,0				
Characteristic resistance HAS-TZ	$V_{Rk,s}$	[kN]	18	27	51		88
Characteristic resistance HAS-RTZ / HAS-HCR-TZ	$V_{Rk,s}$	[kN]	20	30	56		98
Steel failure with lever arm							
Characteristic resistance HAS-TZ / HAS-RTZ / HAS-HCR-TZ	$M_{Rk,s}$	[kN]	48	86	227		519
Concrete pry out failure							
Factor acc. to equation (5.6) of ETAG001 Annex C, 5.2.3.3 or acc. to equation (27) of CEN/TS 1992-4: 2009 part 5	$k^{1)} = k_3$ [2)]	[-]	2,0				
Concrete edge failure							
Effective length of anchor in shear loading	l_f	[mm]	75	95	105	125	170
Diameter of anchor	d_{nom}	[mm]	10	12	16		20

[1)] Parameter for design according to EOTA ETAG 001 Annex C, 08/2010.
[2)] Parameter for design according to CEN/TS 1992-4:2009.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Performances
Characteristic resistance under shear loads and displacements
Design according to "ETAG 001 Annex C, 08/2010" or "CEN/TS 1992-4:2009"

Annex C2

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Table C3: Displacements under tension load for HVZ (R) (HCR) in case of static and quasi static loading

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			M10x75	M12x95	M16x105	M16x125	M20x170
Displacement cracked concrete	δ_{N0} – factor	[mm/10 kN]	0,30	0,19	0,16	0,13	0,08
	$\delta_{N\infty}$ – factor	[mm/10 kN]	1,08	0,94	0,54	0,46	0,32
Displacement non-cracked concrete	δ_{N0} – factor	[mm/10 kN]	0,06	0,11	0,08	0,06	0,04
	$\delta_{N\infty}$ – factor	[mm/10 kN]	0,77	0,63	0,46	0,36	0,23

1) Calculation of the displacement
$\delta_{N0} = \delta_{N0}$ – factor · N /10
$\delta_{N\infty} = \delta_{N\infty}$ – factor · N/10 (N: action tension load)

Table C4: Displacements under shear load for HVZ (R) (HCR) in case of static and quasi static loading

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			M10x75	M12x95	M16x105	M16x125	M20x170
Displacement	δ_{V0} – factor	[mm/10 kN]	1,32	1,46	0,94		0,63
	$\delta_{V\infty}$ – factor	[mm/10 kN]	2,02	2,22	1,41		0,89

1) Calculation of the displacement
$\delta_{V0} = \delta_{V0}$ – factor · V/10
$\delta_{V\infty} = \delta_{V\infty}$ – factor · V/10 (V: action shear load)