Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-03/0032 of 10 October 2024

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	Bonded fasteners and bonded expansion fasteners for use in concrete
Manufacturer	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Plants
This European Technical Assessment contains	16 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-02-0601, Edition 12/2023
This version replaces	ETA-03/0032 issued on 27 August 2015

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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-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 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 to tension load (static and quasi-static loading)	See Annexes C1 and B2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C2
Displacements under short-term and long-term loading	See Annex C3
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed

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

In accordance with the European Assessment Document EAD 330499-02-0601 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.

The following standards and documents are referred to in this European Technical Assessment:

-	EN 1992-4:2018	Eurocode 2: Design of concrete structures - Part 4: Design of fastenings for use in concrete
-	EN 1993-1-4:2006 + A1:2015	Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels
-	EN 10088-1:2014	Stainless steels - Part 1: List of stainless steels
-	EN 206:2013 + A1:2016	Concrete - Specification, performance, production and conformity

Issued in Berlin on 10 October 2024 by Deutsches Institut für Bautechnik

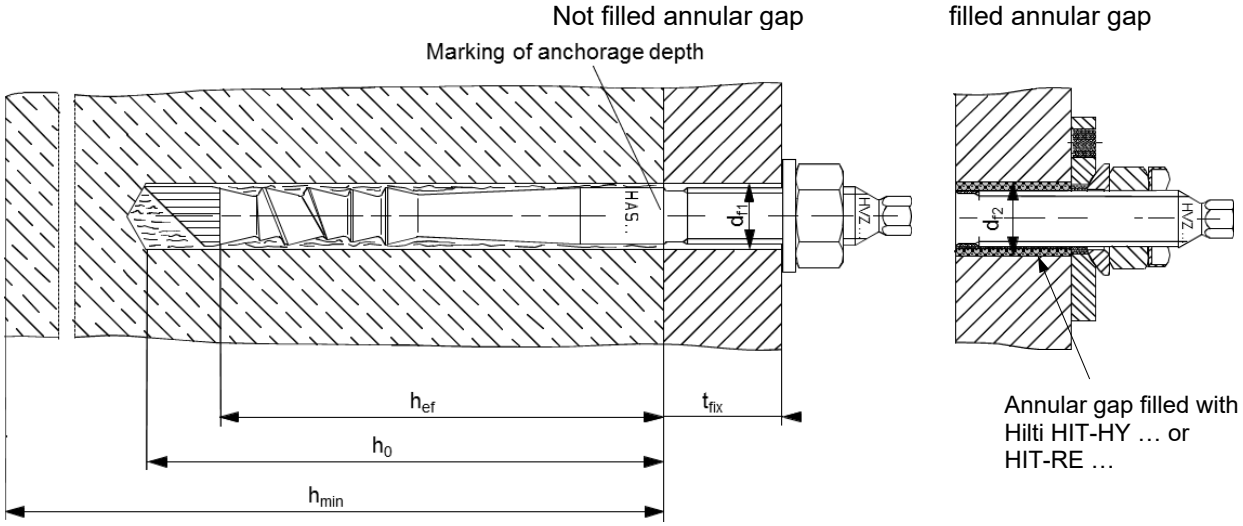
Beatrix Wittstock
Head of Section

beglaubigt:
Stiller

Deutsches Institut für Bautechnik DIBt

Installed condition

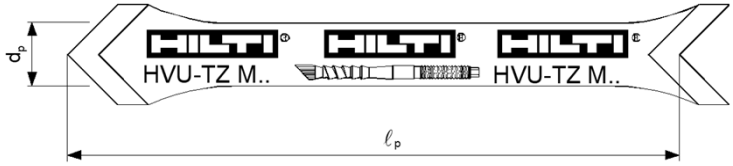
HVZ / HVZ R / HVZ HCR



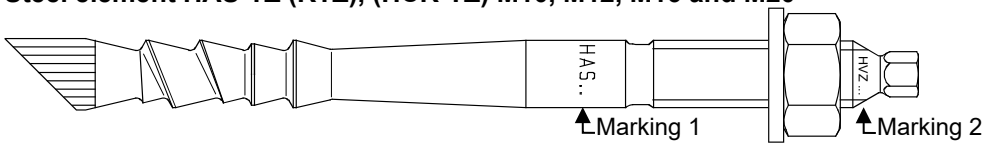
Product description: Mortar capsule and steel elements

Mortar capsule HVU-TZ M10 to M20: Resin and hardener with aggregate

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

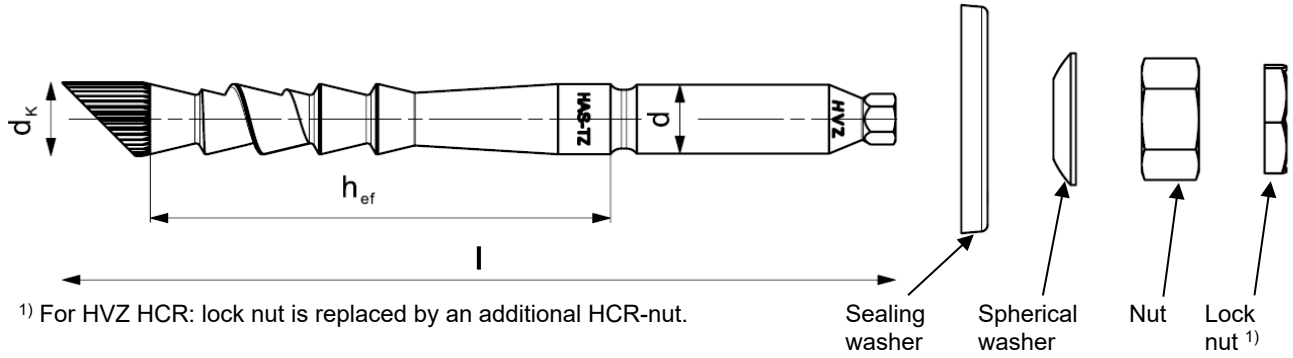


Steel element HAS-TZ (RTZ), (HCR-TZ) M10, M12, M16 and M20



Marking 1: Steel element type, size and fixture thickness; e.g., HAS-TZ M12/50
Marking 2: Fastener type and embedment depth; e.g., HVZ 95

Steel element Hilti HAS-(HCR)-TZ: M10, M12, M16 and M20 with filling set



1) For HVZ HCR: lock nut is replaced by an additional HCR-nut.

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

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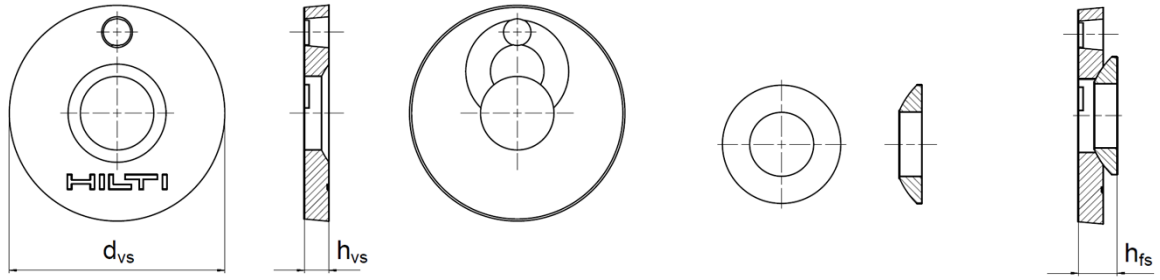
Hilti Filling set to fill the annular gap between steel element and fixture

Sealing washer | Spherical washer | Filling set



Size	**M10**	**M12**	**M16**
Diameter of sealing washer d_{vs} [mm]	42	44	52
Thickness of sealing washer h_{vs} [mm]	5		6
Thickness of Hilti Filling set h_{fs} [mm]	9	10	11

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Product description
Hilti Filling Set

Annex A2

Table A1: Materials

Designation	Material
Steel elements made of zinc coated steel	
Anchor rod HAS-TZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² Coated, elongation at fracture (l_0=5d) > 8% ductile
Washer	Electroplated zinc coated ≥ 5 µm
Nut	Electroplated zinc coated ≥ 5 µm
Hilti Filling Set	Sealing washer: Electroplated zinc coated ≥ 5 µm Spherical washer: Electroplated zinc coated ≥ 5 µm Lock nut: Electroplated zinc coated ≥ 5 µm
Steel elements made of stainless steel Corrosion resistance class III acc. to EN 1993-1-4	
Anchor rod HAS-RTZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² Stainless steel 1.4401, 1.4404; elongation at fracture (l_0=5d) > 8% ductile
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1
Nut	Strength class 70 or 80 Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1
Hilti Filling Set	Sealing washer: Stainless steel according to EN 10088-1 Spherical washer: Stainless steel according to EN 10088-1 Lock nut: Stainless steel according to EN 10088-1
Steel elements made of high corrosion resistant steel Corrosion resistance class V acc. to EN 1993-1-4	
Anchor rod HAS-HCR-TZ	f_{uk} = 800 N/mm²; f_{yk} = 640 N/mm² High corrosion resistant steel 1.4529 EN 10088-1; elongation at fracture (l_0=5d) > 8% ductile
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1
Nut	Strength class 80 High corrosion resistant steel 1.4529, 1.4565 EN 10088-1

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loading.

Base material:

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

Temperature in the base material:

- **at installation**
  0 °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 (all materials).
- For all other conditions according EN 1993-1-4 corresponding to corrosion resistance classes given in Table A1 (stainless steel or high corrosion resistant steel).

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:
  EN 1992-4.

Installation:

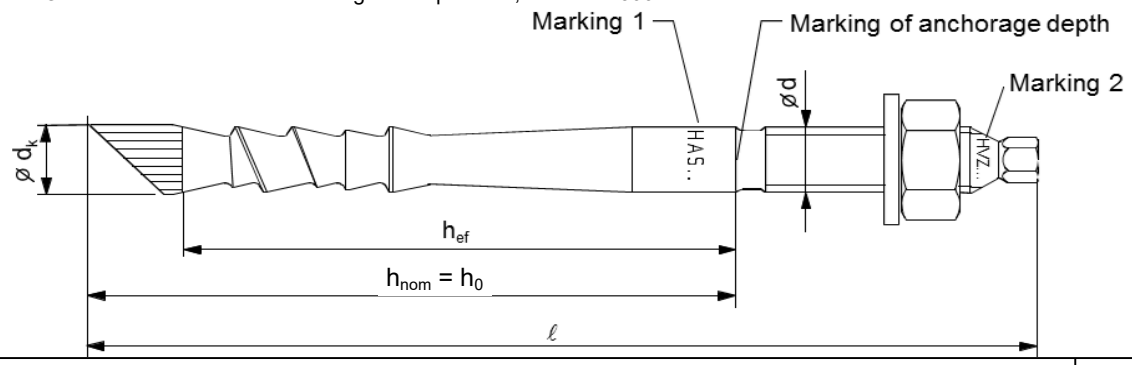
- Concrete condition I1: Installation in dry or wet (water saturated) concrete (not in flooded holes) and use in service in dry and wet concrete for all drilling techniques.
- Drilling technique:
  - Hammer drilling,
  - Hammer drilling with hollow drill bit TE-CD, TE-YD.
- Installation direction D3: Downward, horizontal and upwards (e.g., overhead) installation.
- Fastener 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	

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		∅ 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
Effective embedment depth		h_{ef}	[mm]	75	95	105	125	170
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
Uncracked concrete								
Minimum spacing		s_{min}	[mm]	50	60	70		80
Minimum edge distance		c_{min}	[mm]	50	70	85		80

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



Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Intended use
Installation parameters

Annex B2

Table B2: Curing time t_{cure} [1)]

Temperature in the base material T	Curing time: full load t_{cure}
0 °C to 9 °C	1 hour
10 °C to 19 °C	30 min
20 °C to 40 °C	20 min

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

Table B3: Parameters of drilling and setting tool

Fastener	Drill		Setting tool
HAS-TZ HAS-RTZ HAS-HCR-TZ	Hammer drilling		
		Hollow drill bit TE-CD, TE-YD	
			
Size	d_0 [mm]	d_0 [mm]	
M10	12	-	TE-C HEX M10
M12	14	14	TE-C HEX M12
M16	18	18	TE-C HEX M16
M20	25	25	TE-C HEX M20

Table B4: Cleaning alternatives

Manual cleaning (MC): Hilti hand pump for blowing out drill holes.	
Automatic Cleaning (AC): Cleaning is performed during drilling with Hilti TE-CD and TE-YD drilling system including vacuum cleaner.	

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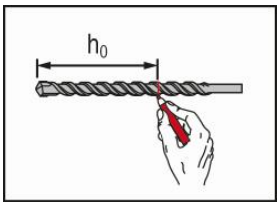
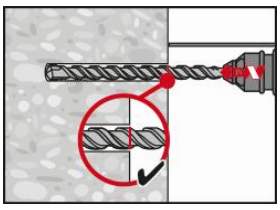
Installation instruction

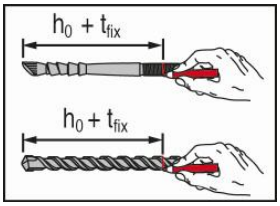
Hole drilling



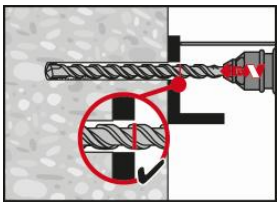
Pre-setting:
Mark drill hole depth h_0 on drill bit TE-C, TE-Y, TE-CD or TE-YD or sett the depth gauge of the drilling machine to drill hole depth h_0.



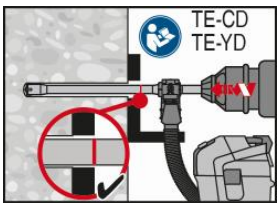
Pre-setting:
Drill hole to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Do not drill deeper.



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 set the depth gauge of the drilling machine to drill hole depth $h_0 + t_{fix}$.



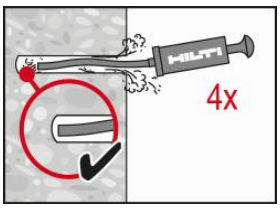
Through-setting:
Drill hole to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Do not drill deeper.



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

Pre- / Through-setting: Just before setting the fastener, 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	

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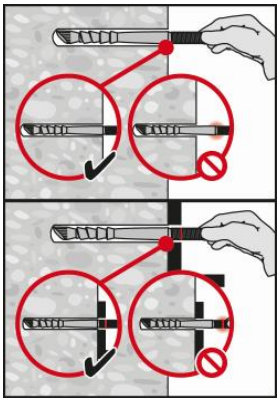
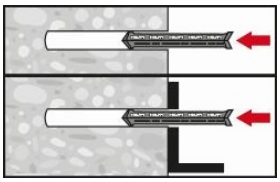
Check setting depth

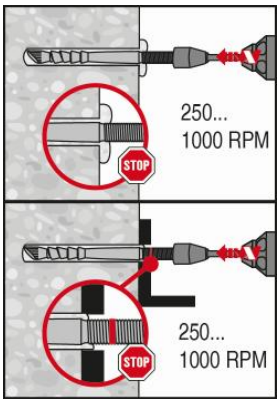


Pre- / Through-setting:
Check the setting depth with the marked element.
The element has to fit in the hole until the required embedment depth (pre-setting) or until the fixture surface (Through-setting).
If it is not possible to insert the element to the required embedment depth, drill deeper.

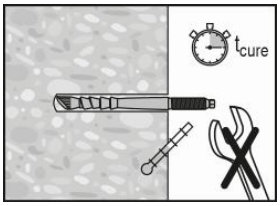
Setting the element



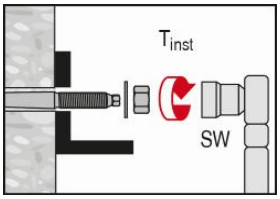
Pre- / Through-setting:
Push the anchor foil capsule with the peak ahead to the back of the hole.



Pre- / Through-setting:
Drive the anchor rod with the setting tool (see Table B3) into the hole, applying moderate pressure and with the hammering action switched on (250 RPM to maximum 1000 RPM).
After reaching the embedment depth switch off setting machine.



Pre- / Through-setting:
After required curing time t_{cure} (see Table B2) remove excess mortar.



Pre-setting with clearance hole diameter ≤ d_{f1}:
Use of washer and nut with the anchor rod delivered.
Apply installation torque T_{inst} given in Table B1.
The anchor can be loaded.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR	**Annex B5**
Intended use Installation instruction	

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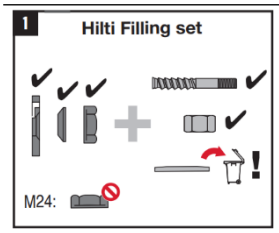
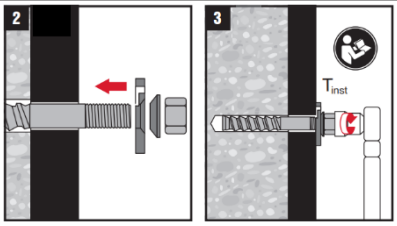
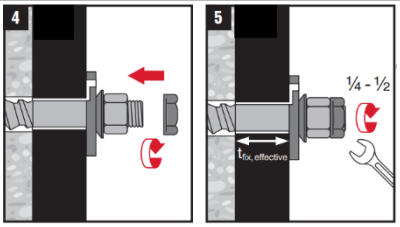
Installation with Hilti filling set (mandatory for clearance hole diameter > d_{f1} and ≤ d_{f2})



Use Hilti Filling Set with standard nut. Observe the correct orientation of filling washer and spherical washer.

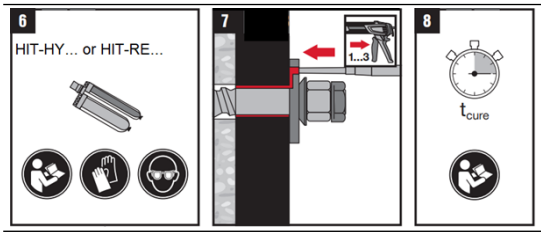


Apply installation torque T_{inst} given in Table B1.



Pre-setting:
Optional: Installation of lock nut. Tighten with a ¼ to ½ turn.
Through-setting:
Apply the lock nut and tighten with a ¼ to ½ turn.

For HVZ HCR: Lock nut is replaced by an additional HCR-nut.



Fill the annular gap between steel element and fixture with 1-3 strokes of a Hilti injection mortar HIT-HY … or HIT-RE … .
Follow the installation instructions supplied with the respective Hilti injection mortar.
After the required curing time t_{cure} the fastening can be loaded.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR	**Annex B6**
Intended use Installation instruction	

Table C1: Essential characteristics for HVZ (R) (HCR) under tension load

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			**M10x75**	**M12x95**	**M16x105**	**M16x125**	**M20x170**
Installation factor	γ_{inst}	[-]	1,0				
Steel failure							
Characteristic resistance HAS-TZ / HAS-RTZ / HAS-HCR-TZ	$N_{Rk,s}$	[kN]	35	51	90		182
Partial factor	$\gamma_{Ms,N}$ [1]	[-]	1,5				
Pull-out failure							
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p,ucr}$	[kN]	- [2]	40	- [2]	- [2]	- [2]
Characteristic bond in cracked concrete C20/25	$N_{Rk,p,cr}$	[kN]	- [2]	- [2]	- [2]	- [2]	- [2]
Factors for the influence of concrete strength class $N_{Rk,p} = N_{Rk,p(C20/25)} \cdot \psi_c$	ψ_c	C30/37	1,22				
		C40/50	1,41				
		C50/60	1,58				
Concrete cone failure							
Effective embedment depth	h_{ef}	[mm]	75	95	105	125	170
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0				
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7				
Spacing	$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$				
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$				
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 [3]	h_{min}	[mm]	150	190	210	250	340
For member thickness $h < 2\ h_{ef}$							
Edge distance	$c_{cr,sp}$	[mm]	- [4]	- [4]	$2\ h_{ef}$	$3\ h_{ef}$	- [4]
Minimum member thickness [3]	h_{min}	[mm]	- [4]	- [4]	160	190	- [4]

1) In absence of national regulations.
2) $N_{Rk,p} > N^0_{Rk,c}$ according to EN 1992-4
3) Minimum member thickness to be used for splitting failure.
4) No performance assessed.

Hilti bonded anchor HVZ / HVZ R / HVZ HCR

Performance
Essential characteristics under tension load in concrete

Annex C1

Table C2: Essential characteristics for HVZ (R) (HCR) under shear loads

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			**M10x75**	**M12x95**	**M16x105**	**M16x125**	**M20x170**
Steel failure without lever arm							
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
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25				
Ductility factor	k_7	[-]	1,00				
Steel failure with lever arm							
Characteristic resistance HAS-TZ / HAS-RTZ / HAS-HCR-TZ	$M_{Rk,s}$	[kN]	48	86	227		519
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25				
Ductility factor	k_7	[-]	1,00				
Concrete pry out failure							
Pry-out factor	k_8	[-]	2,0				
Concrete edge failure							
Effective length of fastener in shear loading	l_f	[mm]	75	95	105	125	170
Outside diameter of fastener	d_{nom}	[mm]	10	12	16		20
Partial factor	γ_{Mc} [1)]	[-]	1,5				

[1)] In absence of national regulations.

Table C3: Displacements under tension load for HVZ (R) (HCR)

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			M10x75	M12x95	M16x105	M16x125	M20x170
Displacement uncracked concrete	δ_{N0} – factor	[mm/kN]	0,006	0,011	0,008	0,006	0,004
	$\delta_{N\infty}$ – factor	[mm/kN]	0,077	0,063	0,046	0,036	0,023
Displacement cracked concrete	δ_{N0} – factor	[mm/kN]	0,030	0,019	0,016	0,013	0,008
	$\delta_{N\infty}$ – factor	[mm/kN]	0,108	0,094	0,054	0,046	0,032

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

Table C4: Displacements under shear load for HVZ (R) (HCR)

HAS-TZ / HAS-RTZ / HAS-HCR-TZ			M10x75	M12x95	M16x105	M16x125	M20x170
Displacement	δ_{V0} – factor	[mm/kN]	0,132	0,146	0,094		0,063
	$\delta_{V\infty}$ – factor	[mm/kN]	0,202	0,222	0,141		0,089

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