Deutsches Institut für Bautechnik
DIBt

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

European Technical Assessment

ETA-15/0296 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	Injection System Hilti HIT-HY 200-A with HIT-Z-D and HIT-Z-R-D
Product family to which the construction product belongs	Bonded expansion fastener for use in concrete
Manufacturer	Hilti AG Liechtenstein Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Corporation
This European Technical Assessment contains	18 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 Injection System Hilti HIT-HY 200-A with HIT-Z-D and HIT-Z-R-D is a bonded anchor consisting of a foil pack with injection mortar Hilti HIT-HY 200-A and a steel element HIT-Z-D M16 or HIT-Z-R-D M16.

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.

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.

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi static action and displacements	See Annex C1 – C4
Characteristic resistance for seismic performance category C1 and displacements	See Annex C5
Characteristic resistance for seismic performance category C2 and displacements	See Annex C6

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.

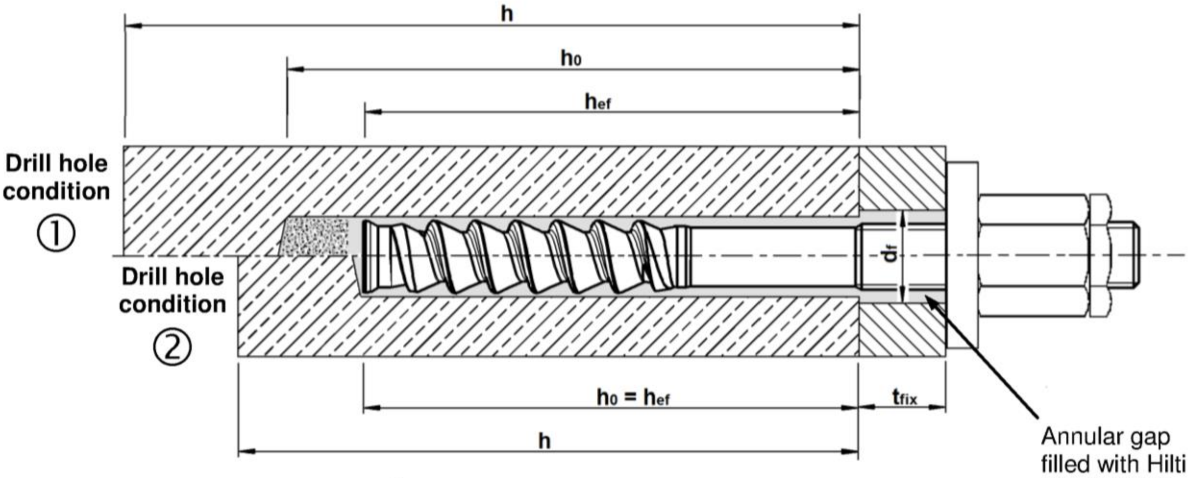
Issued in Berlin on 27 August 2015 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Installed condition

Figure A1:
HIT-Z-D



Drill hole condition ① → non-cleaned drill hole
Drill hole condition ② → drilling dust is removed

Product description: Injection mortar and steel elements

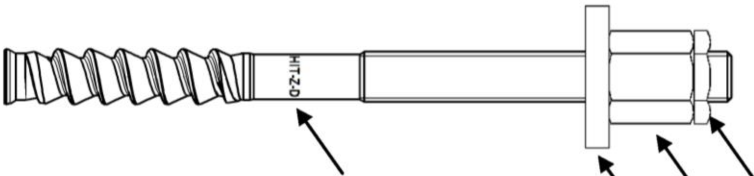
Injection mortar Hilti HIT-HY 200-A: hybrid system with aggregate
330 ml and 500 ml

Marking:
HILTI HIT
HY 200-A
Production number and production line
Expiry date mm/yyyy

Product name: “Hilti HIT-HY 200-A”

Static mixer Hilti HIT-RE-M

Steel element HIT-Z(-R)-D M16



Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D	
Product description Installed condition Injection mortar / Static mixer / Steel elements	**Annex A1**

Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
Anchor rod HIT-Z-D M16	f_{uk} = 610 N/mm²; f_{yk} = 490 N/mm² Elongation at fracture (l_0=5d) > 8% ductile Electroplated zinc coated ≥ 5 µm
Spherical washer	Spherical washer G19 DIN 6319: 2001 Electroplated zinc coated ≥ 5 µm
Nut	Hexagon nut with a height of 1,5 d DIN 6330: 2003 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 HIT-Z-R-D M16	f_{uk} = 610 N/mm²; f_{yk} = 490 N/mm² Elongation at fracture (l_0=5d) > 8% ductile Stainless steel 1.4401, 1.4404 EN 10088-1:2014
Spherical washer	Spherical washer G19 DIN 6319: 2001 Stainless steel A4 EN 10088-1:2014
Nut	Hexagon nut with a height of 1,5 d DIN 6330: 2003 Stainless steel A4 EN 10088-1:2014
Lock nut	Self locking counter nut DIN 7967: 1970 Stainless steel A4 EN 10088-1:2014

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading
- Seismic performance category C1 and C2

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 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)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel or stainless 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).
  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 Technical Report TR 029, 09/ 2010" or "CEN/TS 1992-4:2009, design method A"
- Anchorages under seismic actions (cracked concrete) are designed in accordance with:
  "EOTA Technical Report TR 045, 02/2013"
  Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastenings in stand-off installation or with a grout layer under seismic action are not covered in this European technical assessment (ETA).

Installation:

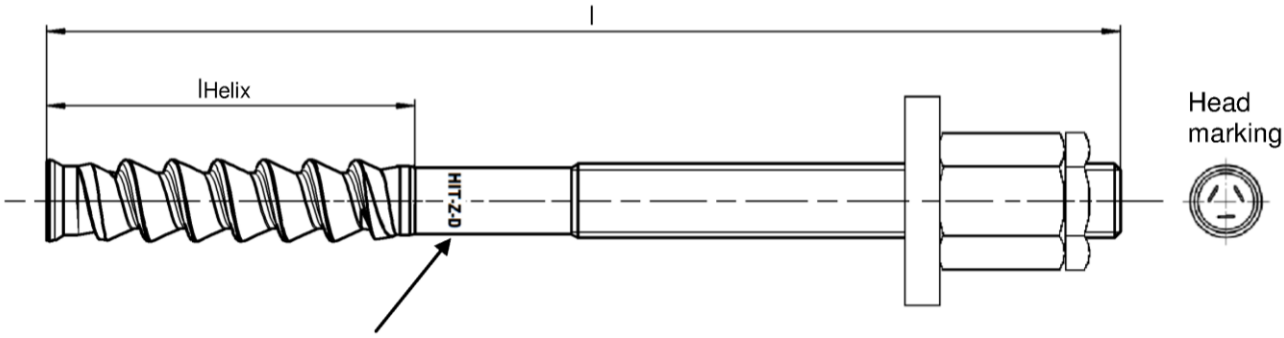
- Use category: dry or wet concrete (not in flooded holes)
- Drilling technique: hammer drilling and hammer drilling with hollow drill bit TE-CD, TE-YD
- Overhead installation is admissible
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person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

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D	
Intended Use Specifications	**Annex B1**

Table B1: Installation parameters HIT-Z(-R)-D

HIT-Z-D; HIT-Z-R-D			**M16**
Nominal diameter	d	[mm]	16
Nominal diameter of drill bit	d_0	[mm]	18
Length of anchor	min l	[mm]	175
	max l	[mm]	240
Length of helix	l_{Helix}	[mm]	96
Effective anchorage depth	h_{ef}	[mm]	125
Drill hole condition ① Minimum thickness of concrete member	h_{min}	[mm]	225
Drill hole condition ② Minimum thickness of concrete member	h_{min}	[mm]	160
Maximum depth of drill hole	h_0	[mm]	$h - 2\,d_0$
Maximum diameter of clearance hole [1)] in the fixture	d_f	[mm]	20
Maximum fixture thickness	t_{fix}	[mm]	80
Torque moment	T_{inst}	[Nm]	80

[1)] for larger clearance hole see "TR 029 section 1.1"



Marking:
Embossing "HIT-Z-D M 16 x l " zinc coated steel
Embossing "HIT-Z-R-D M 16 x l" stainless steel
(e.g. HIT-Z-D M 16 x 175)

Minimum edge distance and spacing

For the calculation of minimum spacing and minimum edge distance of anchors in combination with different thickness of concrete member the following equation shall be fulfilled:

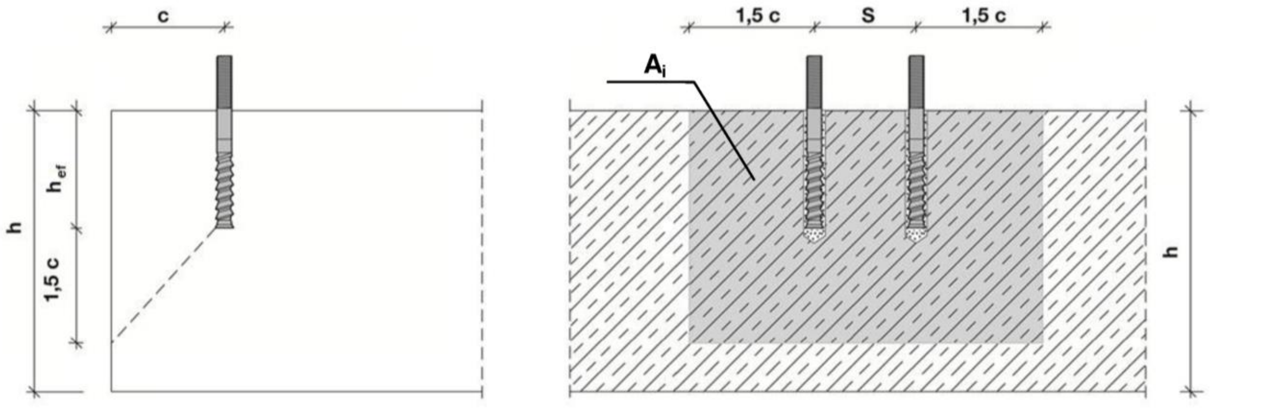
$$\mathbf{A_{i,req} < A_{i,ef}}$$

Table B2: Required area $A_{i,req}$

HIT-Z-D; HIT-Z-R-D			**M16**
Cracked concrete	$A_{i,req}$	[mm²]	94700
Non-cracked concrete	$A_{i,req}$	[mm²]	128000

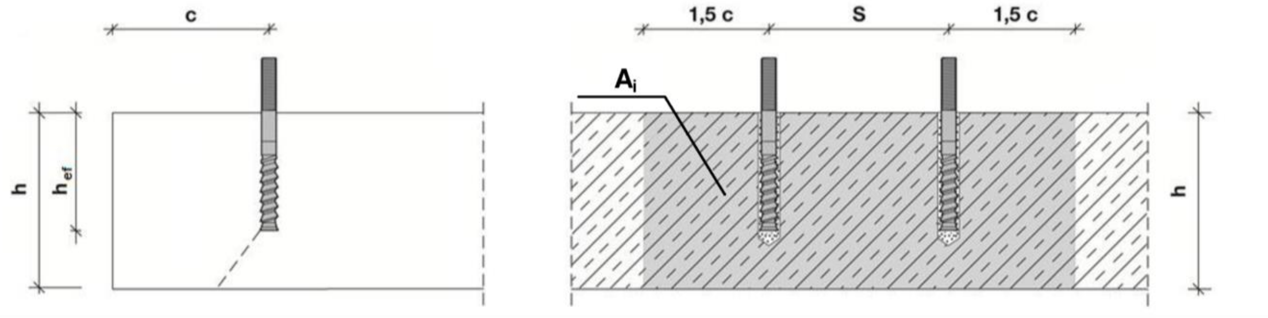
Table B3: Effective area $A_{i,ef}$

Member thickness $h > h_{ef} + 1{,}5 \cdot c$



Single anchor and group of anchors with $s > 3 \cdot c$	[mm²]	$\mathbf{A_{i,ef} = (6 \cdot c) \cdot (h_{ef} + 1{,}5 \cdot c)}$	with $c \geq 5 \cdot d$
Group of anchors with $s \leq 3 \cdot c$	[mm²]	$\mathbf{A_{i,ef} = (3 \cdot c + s) \cdot (h_{ef} + 1{,}5 \cdot c)}$	with $c \geq 5 \cdot d$ and $s \geq 5 \cdot d$

Member thickness $h \leq h_{ef} + 1{,}5 \cdot c$



Single anchor and group of anchors with $s > 3 \cdot c$	[mm²]	$\mathbf{A_{i,ef} = (6 \cdot c) \cdot h}$	with $c \geq 5 \cdot d$
Group of anchors with $s \leq 3 \cdot c$	[mm²]	$\mathbf{A_{i,ef} = (3 \cdot c + s) \cdot h}$	with $c \geq 5 \cdot d$ and $s \geq 5 \cdot d$

c_{min} and s_{min} in 5 mm steps

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Intended Use
Installation parameters: member thickness, spacing and edge distances

Annex B3

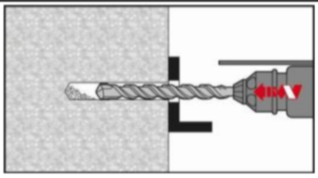
Table B4: Maximum working time and minimum curing time

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time t_{cure}
5 °C	25 min	2 hours
6 °C to 10 °C	15 min	75 min
11 °C to 20 °C	7 min	45 min
21 °C to 30 °C	4 min	30 min
31 °C to 40 °C	3 min	30 min

Installation

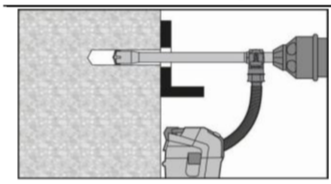
Hole drilling

a) Hammer drilling



Through-setting: Drill hole through the clearance hole in the fixture to the required drilling depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

b) Hammer drilling with hollow drill bit

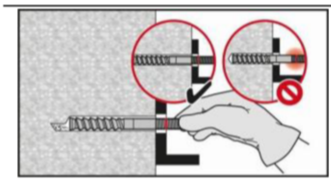


Through-setting: Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling system removes the dust and cleans the drill hole during drilling when used in accordance with the user's manual (see Annex A1 - Borehole condition ②).

Bore hole cleaning

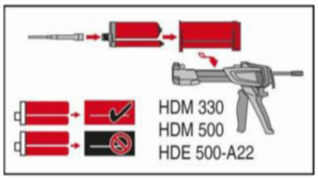
No cleaning required for hammer drilled boreholes

Check of setting depth

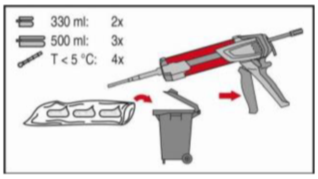


Mark the element and check the setting depth. The element has to fit in the hole until the required embedment depth. If it is not possible to insert the element to the required embedment depth, remove the dust in the drill hole or drill deeper.

Injection preparation



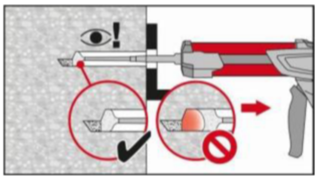
Tightly attach Hilti mixing nozzle HIT-RE-M to foil pack manifold. Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser and the mortar.
Check foil pack holder for proper function. Insert foil pack into foil pack holder and put holder into HIT-dispenser.



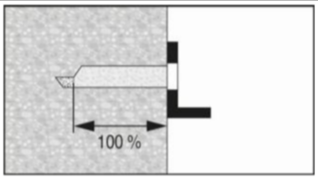
The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded. Discarded quantities are:

2 strokes	for 330 ml foil pack,
3 strokes	for 500 ml foil pack.

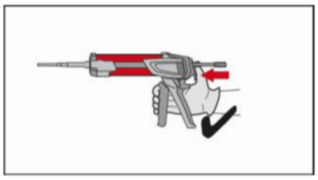
Inject adhesive from the back of the drill hole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.

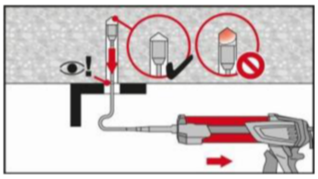


Fill 100% of the drill hole.



After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

Overhead installation



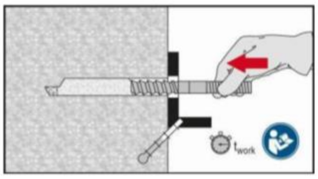
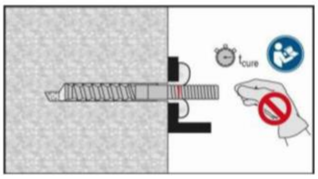
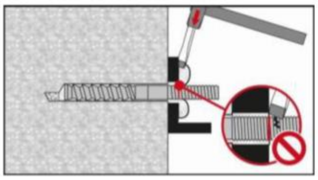
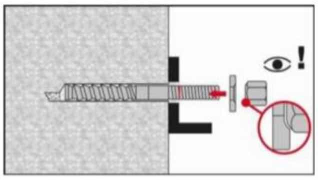
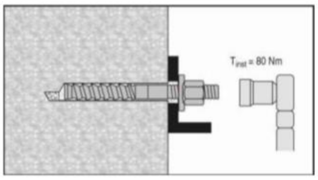
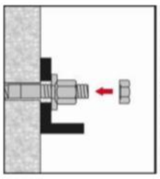
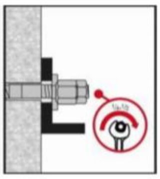
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ 18. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Intended Use
Installation instructions

Annex B5

Setting the element

	Before use, verify that the element is dry and free of oil and other contaminants. Set element to the required embedment depth before working time t_{work} has elapsed. The working time t_{work} is given in Table B4. After setting the element the annular gap between the anchor and the fixture (through-setting) has to be completely filled with mortar.
	After required curing time t_{cure} (see Table B4) remove excess mortar.
	Do not damage thread of HIT-Z(-R)-D while removing excess mortar.
	Orient round part of the nut to the conical washer and install.
	The required installation torque moment is given in Table B1.
 	Apply the lock nut and tighten with a ¼ to ½ turn. The anchor can be loaded.

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Intended Use
Installation instructions

Annex B6

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Table C1: Characteristic resistance for HIT-Z(-R)-D under tension load in case of static and quasi static loading

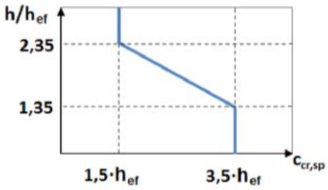
HIT-Z-D; HIT-Z-R-D			**M16**
Installation safety factor	γ_2 1) = γ_{inst} 2)	[-]	1,0
Steel failure			
Characteristic resistance HIT-Z-D	$N_{Rk,s}$	[kN]	96
Characteristic resistance HIT-Z-R-D	$N_{Rk,s}$	[kN]	96
Combined pullout and concrete cone failure			
Effective anchorage depth for calculation of $N^0_{Rk,p}$ (TR 029, 5.2.2.3 respectively CEN/TS 1992-4:2009 part 5, 6.2.2)	$h_{ef} = l_{Helix}$	[mm]	96
Characteristic bond resistance in non-cracked concrete C20/25			
Temperature range I: 40 °C/24 °C	$\tau_{Rk,ucr}$	[N/mm²]	24
Temperature range II: 80 °C/50 °C	$\tau_{Rk,ucr}$	[N/mm²]	22
Temperature range III: 120 °C/72 °C	$\tau_{Rk,ucr}$	[N/mm²]	20
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 2)	[-]	10,1
Characteristic bond resistance in cracked concrete C20/25			
Temperature range I: 40 °C/24 °C	$\tau_{Rk,cr}$	[N/mm²]	22
Temperature range II: 80 °C/50 °C	$\tau_{Rk,cr}$	[N/mm²]	20
Temperature range III: 120 °C/72 °C	$\tau_{Rk,cr}$	[N/mm²]	18
Factor acc. to section 6.2.2.3 of CEN/TS 1992-4:2009 part 5	k_8 2)	[-]	7,2
Increasing factors for τ_{Rk} in concrete > C20/25	ψ_c	[-]	1,0
Concrete cone failure			
Effective embedment depth for calculation of $N_{Rk,c}$ (TR 029, 5.2.2.4 or CEN/TS 1992-4:2009 part 5, 6.2.3)	h_{ef}	[mm]	125
Factor acc. to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	k_{cr} 2)	[-]	7,2
Factor acc. to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	k_{ucr} 2)	[-]	10,1
Edge distance	$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3{,}0 \cdot h_{ef}$

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Performances
Characteristic values of resistance under tension loads – static and quasi-static loading
Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C1

Table C1 continued

Splitting failure				
Effective embedment depth for calculation of $N_{Rk,c}$ (TR 029, 5.2.2.6 or CEN/TS 1992-4:2009 part 5, 6.2.4)	h_{ef}	[mm]	125	
Factor according to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	k_{cr} 2)	[-]	7,2	
Factor according to section 6.2.3.1 of CEN/TS 1992-4:2009 part 5	k_{ucr} 2)	[-]	10,1	
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,35$		$1,5\ h_{ef}$	
	$2,35 > h / h_{ef} > 1,35$		$6,2\ h_{ef} - 2,0\ h$	
	$h / h_{ef} \leq 1,35$		$3,5\ h_{ef}$	
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$	

1) Parameter for design according to EOTA Technical Report TR 029.
2) Parameter for design according to CEN/TS 1992-4:2009.

Table C2: Characteristic resistance for HIT-Z(-R)-D under shear load in case of static and quasi static loading

HIT-Z-D; HIT-Z-R-D			**M16**
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 HIT-Z-D	$V_{Rk,s}$	[kN]	48
Characteristic resistance HIT-Z-R-D	$V_{Rk,s}$	[kN]	57
Steel failure with lever arm			
Characteristic resistance HIT-Z-D	$M^0_{Rk,s}$	[kN]	203
Characteristic resistance HIT-Z-R-D	$M^0_{Rk,s}$	[kN]	203
Concrete pry-out failure			
Factor acc. to equation (5.7) of TR 029 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]	125
Diameter of anchor	d [1)] = d_{nom} [2)]	[mm]	16

1) Parameter for design according to EOTA Technical Report TR 029.
2) Parameter for design according to CEN/TS 1992-4:2009.

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Performances
Characteristic values of resistance under tension loads – static and quasi-static loading
Design according to „EOTA Technical Report TR 029, 09/2010“ or “CEN/TS 1992-4:2009”

Annex C3

Table C3: Displacements under tension load [1)] for HIT-Z(-R)-D in case of static and quasi static loading

HIT-Z-D; HIT-Z-R-D			**M16**	
Temperature range I : 40°C / 24°C			**Non-cracked concrete**	**Cracked concrete**
Displacement	δ_{N0} – factor	[mm/(N/mm²)]	0,05	0,09
	$\delta_{N\infty}$ – factor	[mm/(N/mm²)]	0,13	0,21
Temperature range II : 80°C / 50°C				
Displacement	δ_{N0} – factor	[mm/(N/mm²)]	0,06	0,10
	$\delta_{N\infty}$ – factor	[mm/(N/mm²)]	0,15	0,23
Temperature range III : 120°C / 72°C				
Displacement	δ_{N0} – factor	[mm/(N/mm²)]	0,06	0,11
	$\delta_{N\infty}$ – factor	[mm/(N/mm²)]	0,16	0,25

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}$ – factor $\cdot \tau$
$\delta_{N\infty} = \delta_{N\infty}$ – factor $\cdot \tau$ (τ: action bond strength)

Table C4: Displacements under shear load [1)] for HIT-Z(-R)-D in case of static and quasi static loading

HIT-Z-D; HIT-Z-R-D			**M16**
Displacement	δ_{V0} – factor	[mm/kN]	0,04
	$\delta_{V\infty}$ – factor	[mm/kN]	0,06

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

Table C5: Characteristic resistance under tension load for HIT-Z(-R)-D in case of seismic performance category C1

HIT-Z-D; HIT-Z-R-D			**M16**
Installation safety factor	γ_2	[-]	1,0
Steel failure			
Characteristic resistance HIT-Z-D	$N_{Rk,s,seis}$	[kN]	96
Characteristic resistance HIT-Z-R-D	$N_{Rk,s,seis}$	[kN]	96
Combined pullout and concrete cone failure			
Effective anchorage depth for calculation of $N_{Rk,p,seis}$	$h_{ef} = l_{Helix}$	[mm]	96
Characteristic bond resistance in cracked concrete C20/25			
Temperature range I: 40 °C/24 °C	$\tau_{Rk,seis}$	[N/mm²]	21
Temperature range II: 80 °C/50 °C	$\tau_{Rk,seis}$	[N/mm²]	19
Temperature range III: 120 °C/72 °C	$\tau_{Rk,seis}$	[N/mm²]	17

Table C6: Characteristic resistance under shear load for HIT-Z(-R)-D in case of seismic performance category C1

HIT-Z-D; HIT-Z-R-D			**M16**
Steel failure without lever arm			
Characteristic resistance HIT-Z-D	$V_{Rk,s,seis}$	[kN]	28
Characteristic resistance HIT-Z-R-D	$V_{Rk,s,seis}$	[kN]	31

Table C7: Displacements under tension load for HIT-Z(-R)-D in case of seismic performance category C1[1)]

HIT-Z-D; HIT-Z-R-D			**M16**
Displacement	$\delta_{N,seis}$	[mm]	1,3

[1)] Maximum displacement during cycling (seismic event).

Table C8: Displacements under shear load for HIT-Z(-R)-D in case of seismic performance category C1[1)]

HIT-Z-D; HIT-Z-R-D			**M16**
Displacement HIT-Z-D	$\delta_{V,seis}$	[mm]	4,3
Displacement HIT-Z-R-D	$\delta_{V,seis}$	[mm]	6,0

[1)] Maximum displacement during cycling (seismic event).

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Performances
Characteristic values of resistance, displacements – seismic performance category C1
Design according to „EOTA Technical Report TR 045, 02/2013“

Annex C5

Table C9: Characteristic resistance under tension load for HIT-Z(-R)-D in case of seismic performance category C2

HIT-Z-D; HIT-Z-R-D			**M16**
Installation safety factor	γ_2	[-]	1,0
Steel failure			
Characteristic resistance HIT-Z-D	$N_{Rk,s,seis}$	[kN]	96
Characteristic resistance HIT-Z-R-D	$N_{Rk,s,seis}$	[kN]	96
Combined pullout and concrete cone failure			
Effective anchorage depth for calculation of $N_{Rk,p,seis}$	$h_{ef} = l_{Helix}$	[mm]	96
Characteristic bond resistance in cracked concrete C20/25			
Temperature range I: 40 °C/24 °C	$\tau_{Rk,seis}$	[N/mm²]	19
Temperature range II: 80 °C/50 °C	$\tau_{Rk,seis}$	[N/mm²]	17
Temperature range III: 120 °C/72 °C	$\tau_{Rk,seis}$	[N/mm²]	16

Table C10: Characteristic resistance under shear load for HIT-Z(-R)-D in case of seismic performance category C2

HIT-Z-D; HIT-Z-R-D			**M16**
Steel failure			
Characteristic resistance HIT-Z-D	$V_{Rk,s,seis}$	[kN]	17
Characteristic resistance HIT-Z-R-D	$V_{Rk,s,seis}$	[kN]	21

Table C11: Displacements under tension load for HIT-Z(-R)-D in case of seismic performance category C2

HIT-Z-D; HIT-Z-R-D			**M16**
Displacement DLS	$\delta_{N,seis(DLS)}$	[mm]	1,9
Displacement ULS	$\delta_{N,seis(ULS)}$	[mm]	3,6

Table C12: Displacements under shear load for HIT-Z(-R)-D in case of seismic performance category C2

HIT-Z-D; HIT-Z-R-D			**M16**
Displacement DLS HIT-Z-D	$\delta_{V,seis(DLS)}$	[mm]	3,1
Displacement ULS HIT-Z -D	$\delta_{V,seis(ULS)}$	[mm]	6,2
Displacement DLS HIT-Z-R-D	$\delta_{V,seis(DLS)}$	[mm]	3,1
Displacement ULS HIT-Z-R-D	$\delta_{V,seis(ULS)}$	[mm]	6,2

Injection System Hilti HIT-HY 200-A with HIT-Z-D; HIT-Z-R-D

Performances
Characteristic values of resistance, displacements – seismic performance category C2
Design according to „EOTA Technical Report TR 045, 02/2013“

Annex C6