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-17/0315 of 1 December 2021

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 170 with HIT-CS(-F)
Product family to which the construction product belongs	Bonded expansion fastener 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 330499-01-0601 Edition 04/2020
This version replaces	ETA-17/0315 issued on 14 December 2017

Deutsches Institut für Bautechnik
Kolonnenstraße 30 B | 10829 Berlin | GERMANY | Phone: +49 30 78730-0 | Fax: +49 30 78730-320 | Email: dibt@dibt.de | www.dibt.de

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Specific Part

1 Technical description of the product

The injection system Hilti HIT-HY 170 with HIT-CS(-F) is a bonded expansion fastener consisting of a foil pack with injection mortar Hilti HIT-HY 170 and the conical rod HIT-CS-F (including two nuts and a washer) in the sizes M12, M16 and M20 or the conical rod HIT-CS (including a nut and a washer) in the size M12.

The conical rod HIT-CS-F (including nuts and washer) is made of hot dip galvanized steel and the conical rod HIT-CS (including nut and washer) is made of electroplated zinc coated steel.

The conical rod is placed into a drill hole filled with injection mortar. 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 base material (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 fastener 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 Annex 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 for seismic performance category C1 and C2, displacements	See Annex C4

3.2 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 330499-01-0601 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 with Deutsches Institut für Bautechnik.

Issued in Berlin on 1 December 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Stiller

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Installed condition

Figure A1:

Conical rod HIT-CS-F

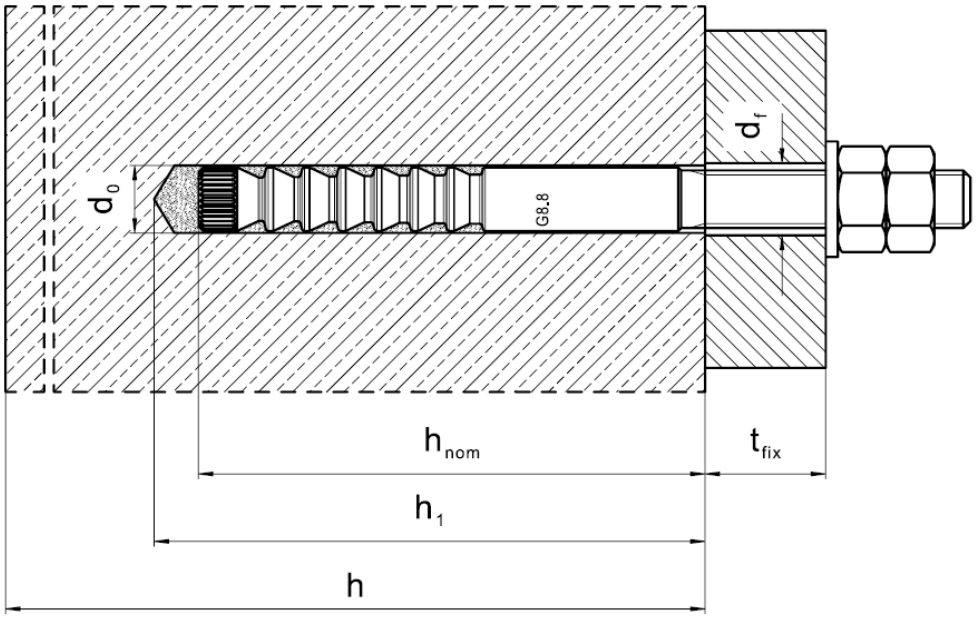
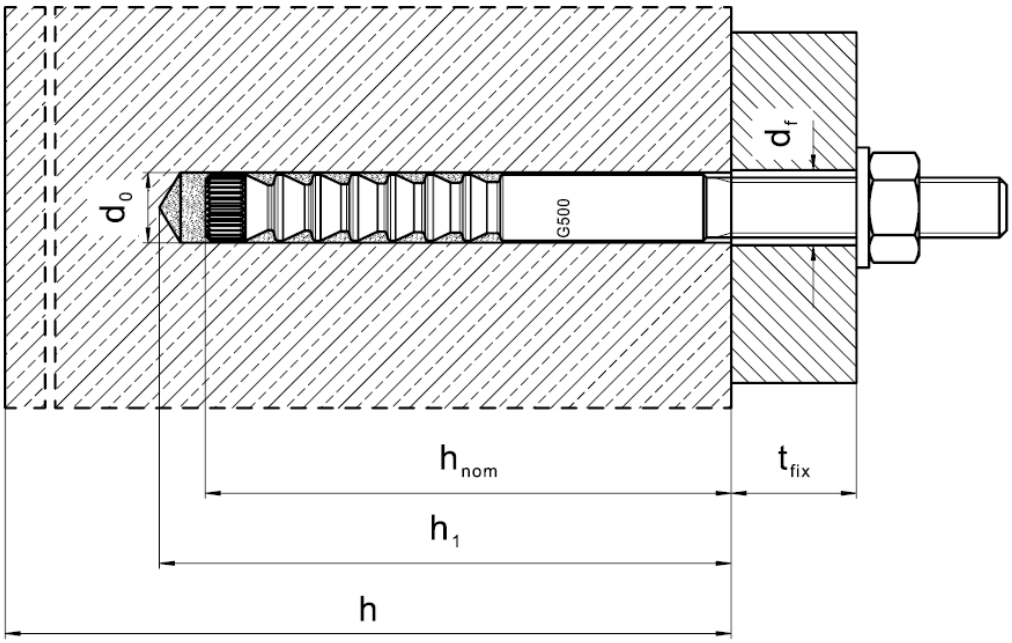


Figure A2:

Conical rod HIT-CS



Injection system Hilti HIT-HY 170 with HIT-CS(-F)	Annex A1
Product description Installed condition	

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Product description: Injection mortar and steel elements

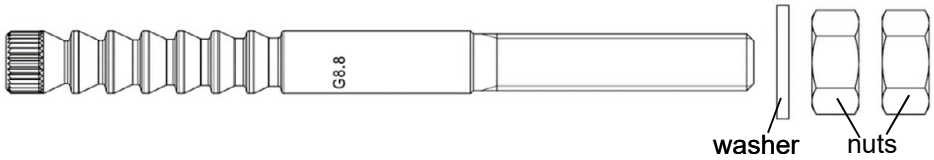
Injection mortar Hilti HIT-HY 170: hybrid system with aggregate
330 ml and 500 ml

Marking:
HILTI HIT
Production number and production line
Expiry date mm/yyyy

Product name: “Hilti HIT-HY 170”

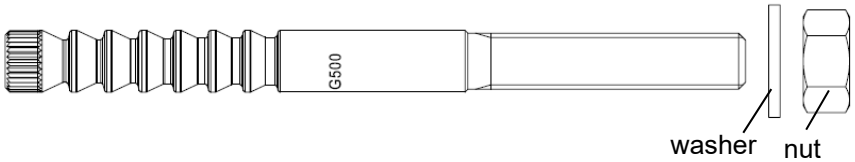
Static mixer Hilti HIT-RE-M

Steel elements (8.8)



Hilti anchor rod HIT-CS-F with washer and 2 nuts
Thread sizes M12, M16 and M20

Steel element (5.8)



Hilti anchor rod HIT-CS with washer and 1 nut
Thread size M12

Injection system Hilti HIT-HY 170 with HIT-CS(-F)	**Annex A2**
Product description Injection mortar / Static mixer / Steel elements	

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Table A1: Materials

Designation	Material
Steel elements made of hot dip galvanized steel	
Anchor rod HIT-CS-F 8.8	Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm² Elongation at fracture (l_0 = 5d) > 12% ductile (F) hot dip galvanized ≥ 55 µm
Washer	(F) hot dip galvanized ≥ 55 µm or ≥ 80 µm
Nut	Strength class of nut adapted to strength class of threaded rod (F) hot dip galvanized ≥ 55 µm
Steel elements made of zinc coated steel	
Anchor rod HIT-CS 5.8	Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm² Elongation at fracture (l_0 = 5d) > 10% ductile Electroplated zinc coated ≥ 5 µm
Washer	Electroplated zinc coated ≥ 5 µm
Nut	Strength class of nut adapted to strength class of threaded rod Electroplated zinc coated ≥ 5 µm

Injection system Hilti HIT-HY 170 with HIT-CS(-F)

Product description
Materials

Annex A3

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.
- Seismic performance category C1 and C2: sizes M16 and M20 only.

Base material:

- Compacted reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013+A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206-1:2013+A1:2016.
- Cracked and uncracked concrete.

Temperature in the base material:

- **At installation**

  -5 °C to +40 °C for the standard variation of temperature after installation
- **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)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).

Design:

- Fastenings are designed under the responsibility of an engineer experienced in fastenings and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be fastened. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- The anchorages are designed in accordance with:
  EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018.

Installation:

- Use category: dry or wet concrete (not in flooded holes) for all drilling techniques.
- Drilling technique:
  - Hammer drilling
- Installation direction D3: downward, horizontal and upward (e.g. overhead) installation admissible for all elements.
- Fastener 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 170 with HIT-CS(-F)	**Annex B1**
Intended Use Specifications	

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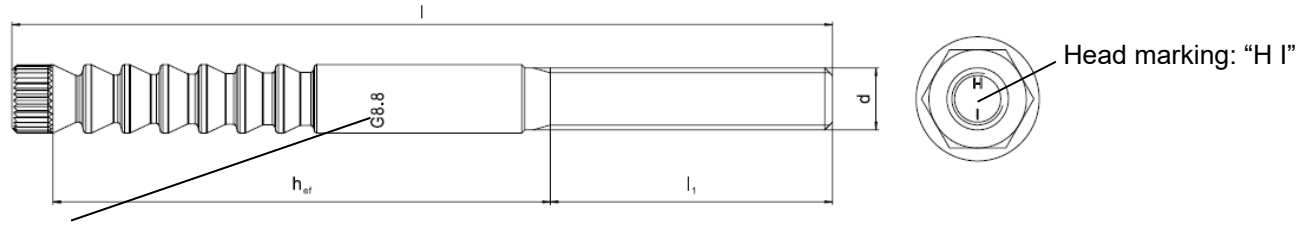
Table B1: Installation parameters of anchor rod HIT-CS(-F)

HIT-CS(-F)	Size		M12 5.8	M12 8.8	M16	M20
Diameter of element	d	[mm]	12	12	16	20
Nominal diameter of drill bit	d_0	[mm]	14	14	18	24
Length of anchor	min l	[mm]	160	160	190	240
	max l	[mm]	660	660	675	720
Effective embedment depth	h_{ef}	[mm]	102	102	117	158
Nominal embedment depth	h_{nom}	[mm]	110	110	125	170
Drill hole depth	h_1	[mm]	115	115	130	175
Maximum diameter of clearance hole in the fixture	d_f	[mm]	14	14	18	22
Maximum fixture thickness	t_{fix}	[mm]	525	462	506	496
Minimum thickness of concrete member	h_{min}	[mm]	140	140	170	230
Minimum spacing and edge distance	s_{min}	[mm]	80	60	96	120
	for c ≥	[mm]	80	120	220	120
Minimum edge distance and spacing	c_{min}	[mm]	80	60	96	120
	for s ≥	[mm]	80	120	350	120
Installation torque	T_{inst}	[Nm]	30	40	80	150



Marking:
Embossing: “M..xh_{nom}/l_1 G8.8” hot dip galvanized steel (HIT-CS-F)
(e.g. M16x125/85 G8.8)
Embossing: “M..xh_{nom}/l_1 G500” zinc coated steel (HIT-CS)
(e.g. M12x110/50 G500)

Injection system Hilti HIT-HY 170 with HIT-CS(-F)

Intended Use
Installation parameters

Annex B2

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Table B2: Maximum working time and minimum curing time HIT-HY 170

Temperature in the base material T [1]	Maximum working time t_{work}	Minimum curing time [2] t_{cure}
-5°C to 0°C	10 min	12 h
> 0°C to 5°C	10 min	5 h
> 5°C to 10°C	8 min	2,5 h
> 10°C to 20°C	5 min	1,5 h
> 20°C to 30°C	3 min	45 min
> 30°C to 40°C	2 min	30 min

[1] The minimum foil pack temperature is +5 °C

[2] 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, cleaning and setting tools

Steel elements	Drill and clean		Installation
Anchor rod HIT-CS(-F)	Drill bit	Brush	Piston plug
			
Size	d_0 [mm]	HIT-RB	HIT-SZ
M12	14	14	14
M16	18	18	18
M20	24	24	24

Cleaning equipment

Compressed air cleaning (CAC):
Air nozzle with an orifice opening of minimum 3,5 mm in diameter.

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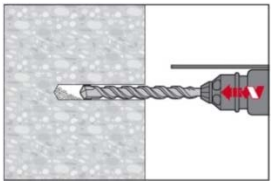
Installation instruction

Hole drilling

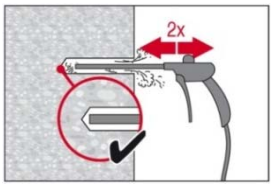
Hammer drilling



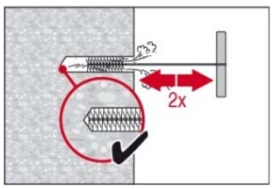
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Drill hole cleaning: Just before injection of the mortar, the drill hole must be free of dust and debris.
Inadequate hole cleaning = poor load values.

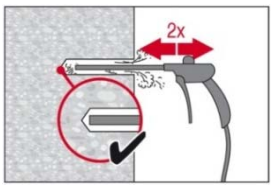
Compressed air cleaning (CAC): For all drill hole diameters d_0 and all drill hole depths h_1.



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust.

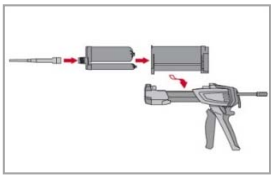


Brush 2 times with the specified brush (see Table B3) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

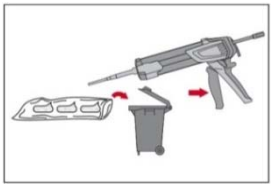


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation



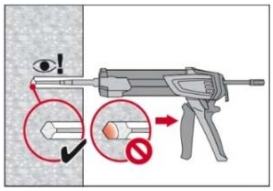
Tightly attach Hilti mixing nozzle HIT-RE-M to foil pack manifold. Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser and the mortar. Check foil pack holder for proper function. Insert foil pack into foil pack holder and put holder into dispenser.



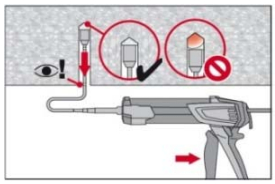
The foil pack opens automatically as dispensing is initiated. Depending on the size of the foil pack an initial amount of adhesive has to be discarded. Discarded quantities are:
2 strokes for 330 ml foil pack,
3 strokes for 500 ml foil pack,

Injection system Hilti HIT-HY 170 with HIT-CS(-F)	**Annex B4**
Intended Use Installation instructions	

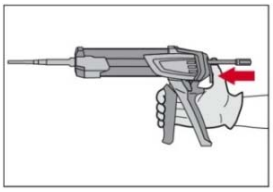
Inject adhesive from the back of the drill hole without forming air voids.



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull.
Fill approximately 2/3 of the drill hole to ensure that the annular gap between the steel element and the concrete is completely filled with adhesive along the embedment length.

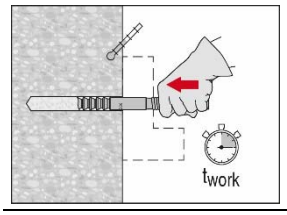


Overhead installation:
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ (see Table B3). Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure.

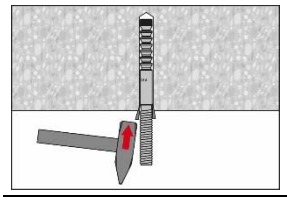


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

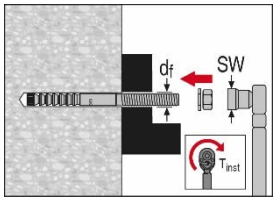
Setting the steel element



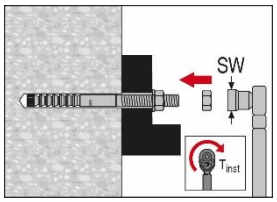
Before use, verify that the element is dry and free of oil and other contaminants. Set the steel element to the required embedment depth before working time t_{work} has elapsed. The working time t_{work} is given in Table B2.



Overhead installation:
For overhead installation use piston plugs and fix embedded parts, e.g. with wedges (HIT-OHW).



After required curing time t_{cure} (see Table B2) remove excess mortar.
Assemble the washer and the first nut and apply the installation torque. The required installation torque T_{inst} is given in Table B1.



HIT-CS-F 8.8 only:
Assemble the second nut and apply the installation torque. The required installation torque T_{inst} is given in Table B1.
After torqueing the fastening can be loaded.

Injection system Hilti HIT-HY 170 with HIT-CS(-F)	**Annex B5**
Intended Use Installation instructions	

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Table C1: Essential characteristics for HIT-CS(-F) under tension load in concrete

Size			M12 5.8	M12 8.8	M16	M20
For a working life of 50 years						
Installation factor	γ_{inst}	[-]	1,0			
Steel failure						
Characteristic resistance	$N_{Rk,s}$	[kN]	42,5	65,4	125,6	190,2
Partial factor	$\gamma_{Ms,N}$ [1)]	[-]	1,5			
Pull-out failure						
Characteristic resistance in uncracked concrete C20/25						
Temperature range I: 40 °C / 24 °C	$N_{Rk,p}$	[kN]	59		- [2)]	- [2)]
Temperature range II: 80 °C / 50 °C	$N_{Rk,p}$	[kN]	51		78,0	- [2)]
Increasing factor ψ_c for concrete strength class > C20/25: $N_{Rk,p} = N_{Rk,p,(C20/25)} \cdot \psi_c$	C30/37	[-]	1,12		1,10	- [2)]
	C40/50	[-]	1,22		1,18	- [2)]
	C50/60	[-]	1,30		1,23	- [2)]
Characteristic resistance in cracked concrete C20/25						
Temperature range I: 40 °C / 24 °C	$N_{Rk,p}$	[kN]	38		- [2)]	- [2)]
Temperature range II: 80 °C / 50 °C	$N_{Rk,p}$	[kN]	33		- [2)]	- [2)]
Concrete cone failure						
Effective anchorage depth for calculation of $N_{Rk,c}$	h_{ef}	[mm]	102		117	158
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11			
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7			
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$			
Spacing	$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$			
Splitting failure relevant for uncracked concrete						
Effective anchorage depth for calculation of $N_{Rk,sp}$	h_{ef}	[mm]	102		117	158
Edge distance	$c_{cr,sp}$	[mm]	$2,7 \cdot h_{ef}$		$2,6 \cdot h_{ef}$	
Spacing	$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$			

[1)] In absence of national regulations.

[2)] > $N^0_{Rk,c}$ according to EN 1992-4:2018

Injection system Hilti HIT-HY 170 with HIT-CS(-F)

Performances
Essential characteristics under tension load in concrete

Annex C1

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Table C2: Essential characteristics for HIT-CS(-F) under shear load in concrete

Size			M12 5.8	M12 8.8	M16	M20
For a working life of 50 years						
Steel failure without lever arm						
Characteristic resistance	$V^0_{Rk,s}$	[kN]	21,9	33,7	62,8	98,0
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Steel failure with lever arm						
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	68	105	266	519
Partial factor	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Concrete pry-out failure						
Pry-out factor	k_8	[-]	2,0			
Concrete edge failure						
Effective length of fastener	l_f	[mm]	h_{ef}			
Outside diameter of fastener	d_{nom}	[mm]	12		16	20

[1)] In absence of national regulations.

Injection system Hilti HIT-HY 170 with HIT-CS(-F)

Performances
Essential characteristics under shear load in concrete

Annex C2

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Table C3: Displacements under tension load

Size			M12	M16	M20
Uncracked concrete temperature range I: 40°C / 24°C					
Displacement	δ_{N0}	[mm/kN]	0,009	0,006	0,006
	$\delta_{N\infty}$	[mm/kN]	0,029	0,029	0,029
Uncracked concrete temperature range II: 80 °C / 50 °C					
Displacement	δ_{N0}	[mm/kN]	0,021	0,021	0,021
	$\delta_{N\infty}$	[mm/kN]	0,040	0,040	0,040
Cracked concrete temperature range I: 40°C / 24°C					
Displacement	δ_{N0}	[mm/kN]	0,020	0,020	0,020
	$\delta_{N\infty}$	[mm/kN]	0,035	0,029	0,029
Cracked concrete temperature range II: 80°C / 50°C					
Displacement	δ_{N0}	[mm/kN]	0,032	0,035	0,035
	$\delta_{N\infty}$	[mm/kN]	0,046	0,040	0,040

Table C4: Displacements under shear load

Size			M12	M16	M20
Displacement	δ_{v0}	[mm/kN]	0,060	0,040	0,030
	$\delta_{V\infty}$	[mm/kN]	0,090	0,060	0,045

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Table C5: Essential characteristics for HIT-CS-F under tension load for seismic performance categories C1 and C2

			Size	M16	M20
For a working life of 50 years					
Steel failure					
Characteristic resistance HIT-CS-F		$N_{Rk,s,C1} = N_{Rk,s,C2}$	[kN]	125,6	190,2
Pull-out failure					
Characteristic resistance (only C20/25)					
Temperature range I:	40 °C / 24 °C	$N_{Rk,p,C1} = N_{Rk,p,C2}$	[kN]	43,1	71,5
Temperature range II:	80 °C / 50 °C	$N_{Rk,p,C1} = N_{Rk,p,C2}$	[kN]	43,1	71,5

Table C6: Essential characteristics for HIT-CS-F under shear load for seismic performance categories C1 and C2

			Size	M16	M20
For a working life of 50 years					
Annular gap factor		α_{gap}	[-]	0,5	
Steel failure					
Characteristic resistance HIT-CS-F		$V_{Rk,s,C1} = V_{Rk,s,C2}$	[kN]	31,6	51,9

Table C7: Displacements for HIT-CS-F under tension load for seismic performance categories C2

		Size	M16	M20
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	1,2	1,5
Displacement ULS	$\delta_{N,C2(ULS)}$	[mm]	2,7	2,6

Table C8: Displacements for HIT-CS-F under shear load for seismic performance categories C2

		Size	M16	M20
Displacement DLS	$\delta_{V,C2(DLS)}$	[mm]	3,0	3,3
Displacement ULS	$\delta_{V,C2(ULS)}$	[mm]	4,6	5,3