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-17/0199 of 30 August 2019

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-MM Plus
Product family to which the construction product belongs	Bonded anchor for use in non-cracked concrete
Manufacturer	Hilti Aktiengesellschaft 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
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
This version replaces	ETA-17/0199 issued on 3 April 2017

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Specific Part

1 Technical description of the product

The Injection system Hilti HIT-MM Plus is a bonded anchor for use in concrete consisting of a foil pack with injection system Hilti HIT-MM Plus and a steel element according to Annex A.

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 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 tension load	See Annex C1
Characteristic resistance for static and quasi-static shear load	See Annex C2
Displacements for static and quasi-static loads	See Annex C3
Characteristic resistance for seismic performance categories C1 and C2	No performance assessed
Durability	See Annex B1

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 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 at Deutsches Institut für Bautechnik.

Issued in Berlin 30. August 2019 by Deutsches Institut für Bautechnik

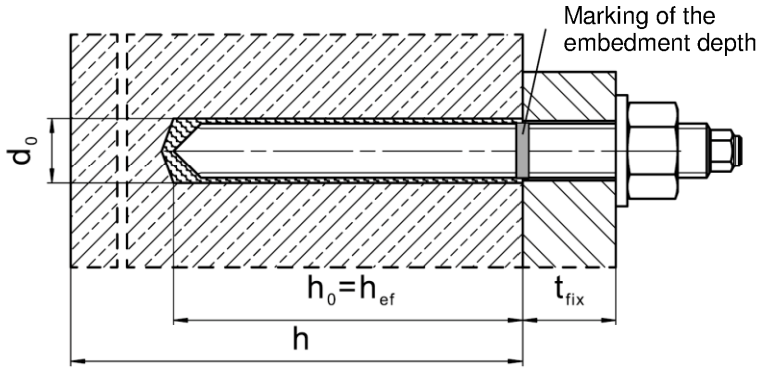
BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Lange

Deutsches Institut für Bautechnik DIBt

Installed condition

Figure A1:
Threaded rod, HAS-U-… and HIT-V-…



Injection system Hilti HIT-MM Plus	
Product description Installed condition	**Annex A1**

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Product description: Injection mortar and steel elements

Injection mortar Hilti HIT-MM Plus: hybrid system with aggregate

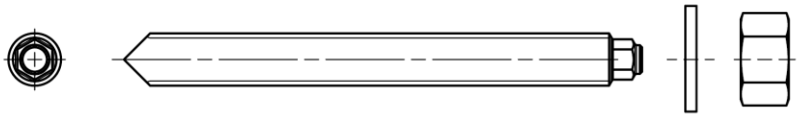
330 ml and 500 ml

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

Product name: "Hilti HIT-MM Plus"

Static mixer Hilti HIT-RE-M

Steel elements



HAS-U-…: M8 to M16 washer nut

Threaded rod, HIT-V-…: M8 to M16 washer nut

Commercial standard threaded rod with:

- Materials and mechanical properties according to Table A1
- Inspection certificate 3.1 according to EN 10204: 2004. The document shall be stored.
- Marking of embedment depth

Injection system Hilti HIT-MM Plus	**Annex A2**
Product description Injection mortar / Static mixer / Steel elements	

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Table A1: Materials

Designation	Material
Metal parts made of zinc coated steel	
HAS-U-5.8 (HDG), HIT-V-5.8(F), Threaded rod	Strength class 5.8, f_{uk} = 500 N/mm², f_{yk} = 400 N/mm², Elongation at fracture (l_0=5d) > 8% ductile. Electroplated zinc coated ≥ 5 µm, (F) or (HDG) hot dip galvanized ≥ 45 µm.
HAS-U-8.8 (HDG), HIT-V-8.8(F), Threaded rod	Strength class 8.8, f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², Elongation at fracture (l_0=5d) > 12% ductile. Electroplated zinc coated ≥ 5 µm, (F) or (HDG) hot dip galvanized ≥ 45 µm.
Washer	Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm.
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5 µm, (F) hot dip galvanized ≥ 45 µm.
Metal parts made of stainless steel corrosion resistance classes III according EN 1993-1-4:2006+A1:2015-06	
HAS-U A4, HIT-V-R	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm², Elongation at fracture (l_0=5d) > 8% ductile.
Threaded rod	Strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm²; Elongation at fracture (l_0=5d) > 8% ductile. Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Nut	For ≤ M24: strength class 70, f_{uk} = 700 N/mm², f_{yk} = 450 N/mm², Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Metal parts made of high corrosion resistant steel corrosion resistance classes V according EN 1993-1-4:2006+A1:2015-06	
HAS-U HCR, HIT-V-HCR	f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², Elongation at fracture (l_0=5d) > 8% ductile.
Threaded rod	f_{uk} = 800 N/mm², f_{yk} = 640 N/mm², Elongation at fracture (l_0=5d) > 8% ductile. High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	Strenght class of nut adapted to strength class of threaded rod, High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

Injection system Hilti HIT-MM Plus

Product description
Materials

Annex A3

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Specifications of intended use

Anchorages subject to:

- Static and quasi static loading: M8 to M16

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 206:2013 + A1:2016.
- Cracked and uncracked 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)

Table B1: Specifications of intended use

Anchorages subject to:	**HIT-MM Plus with …**
Elements	Threaded rod, HAS-U-…, HIT-V-… 
Hammer drilling mode	✓
Static and quasi static loading in uncracked concrete	M8 to M16

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according EN 1993-1-4:2006+A1:2015-06 correspoding to corrosion resistance classes Table A1 Annex A3 (stainless steels).

Injection system Hilti HIT-MM Plus	**Annex B1**
Intended Use Specifications	

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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 1992-4:2018 and EOTA Technical Report TR 055

Installation:

- Use category: dry or wet concrete (not in flooded holes)
- Drilling technique:
  - Hammer drilling
- Installation direction D3: downward and horizontal and upward (e.g. overhead) installation admissible for all elements.
- 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-MM Plus	**Annex B2**
Intended Use Specifications	

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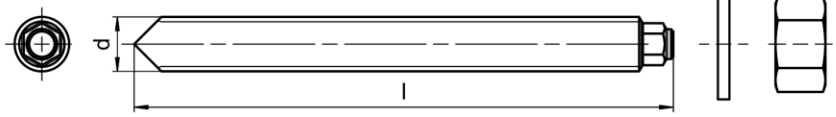
Table B2: Installation parameters of threaded rod, HAS-U-… and HIT-V-…

Threaded rod, HAS-U-… and HIT-V-…			M8	M10	M12	M16
Diameter of element	d	[mm]	8	10	12	16
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18
Effective embedment depth and drill hole depth	$h_{ef} = h_0$	[mm]	60 to 96	60 to 120	70 to 144	80 to 192
Maximum diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			$h_{ef} + 2 \cdot d_0$
Maximum torque moment	T_{max}	[Nm]	10	20	40	80
Minimum spacing	s_{min}	[mm]	40	50	60	80
Minimum edge distance	c_{min}	[mm]	40	45	45	50

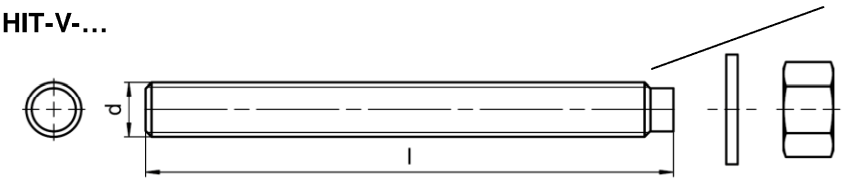
HAS-U-…



Marking:

Steel grade number and length identification letter: e.g. 8L

HIT-V-…



Marking:

5.8 - l	=	HIT-V-5.8 M…x l
5.8F - l	=	HIT-V-5.8F M…x l
8.8 - l	=	HIT-V-8.8 M…x l
8.8F - l	=	HIT-V-8.8F M…x l
R - l	=	HIT-V-R M …x l
HCR - l	=	HIT-V-HCR M …x l

Injection system Hilti HIT-MM Plus

Intended Use
Installation parameters of threaded rod, HAS-U-… and HIT-V-…

Annex B3

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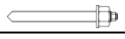
Table B3: Maximum working time and minimum curing time [1)]

Temperature in the base material T	Maximum working time t_{work}	Minimum curing time 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 curing time data are valid for dry base material only.
In wet base material the curing times must be doubled.

Table B4: Parameters of cleaning and setting tools

Elements	Drill and clean		Installation
Threaded rod, HAS-U-…, HIT-V-…	Hammer drilling	Brush	Piston plug
			
size	d_0 [mm]	HIT-RB	HIT-SZ
M8	10	10	-
M10	12	12	12
M12	14	14	14
M16	18	18	18

Cleaning alternatives

Manual Cleaning (MC):
Hilti hand pump for blowing out drill holes with diameters $d_0 \leq 18$ mm and drill hole depths $h_0 \leq 10 \cdot d$

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

Injection system Hilti HIT-MM Plus	Annex B4
Intended Use Minimum working and curing time Cleaning and setting tools	

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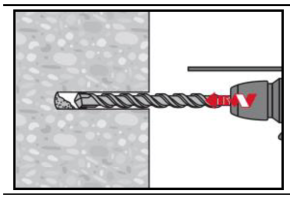
Installation

Hole drilling

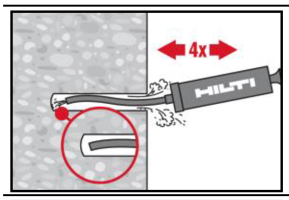
Hammer drilling



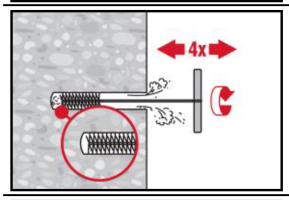
Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

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

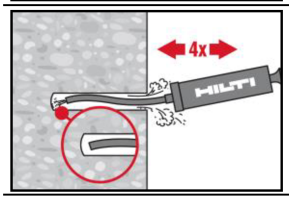
Manual Cleaning (MC) **Non-cracked concrete only**
for drill hole diameters $d_0 \leq 18$ mm and drill hole depths $h_0 \leq 10 \cdot d$



The Hilti manual pump may be used for blowing out drill holes up to diameters $d_0 \leq 18$ mm and embedment depths up to $h_{ef} \leq 10 \cdot d$.
Blow out at least 4 times from the back of the drill hole until return air stream is free of noticeable dust

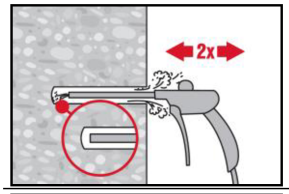


Brush 4 times with the specified brush (see Table B4) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the drill hole (brush Ø ≥ drill hole Ø) - if not the brush is too small and must be replaced with the proper brush diameter.

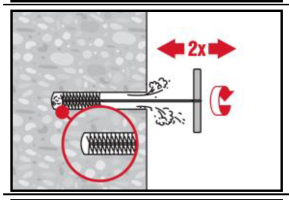


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

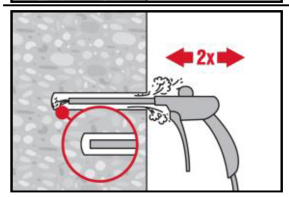
Compressed air cleaning (CAC) for all drill hole diameters d_0 and all drill hole depths h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole 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 B4) 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 system Hilti HIT-MM Plus

Intended Use
Installation instructions

Annex B5

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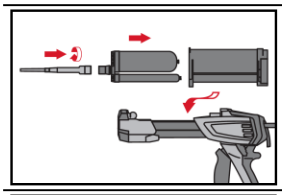
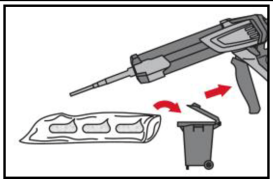
Injection preparation



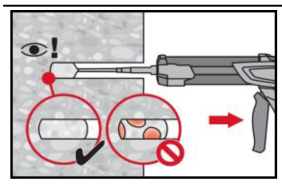
Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle.
Observe the instruction for use of the dispenser.
Check foil pack holder for proper function. Do not use damaged foil packs / holders.
Insert foil pack into foil pack holder and put holder into HIT-dispenser.



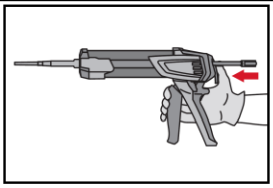
Discard initial adhesive. The foil pack opens automatically as dispensing is initiated.
Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discarded quantities are

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

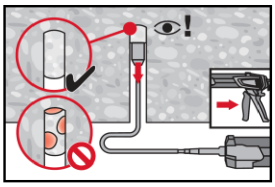
Inject adhesive from the back of the drill hole without forming air voids.



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

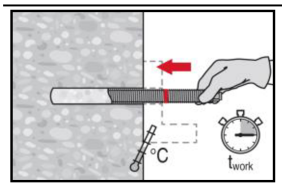


After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

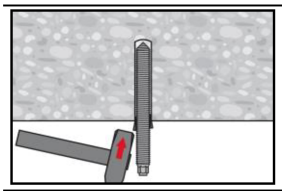


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ (see Table B4). Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the drill hole by the adhesive pressure

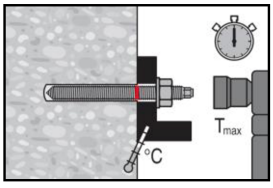
Setting the element



Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth until working time t_{work} has elapsed. The working time t_{work} is given in Table B3



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



Loading the anchor: After required curing time t_{cure} (see Table B3) the anchor can be loaded.
The applied installation torque shall not exceed the values T_{max} given in Table B2.

Injection system Hilti HIT-MM Plus

Intended Use
Installation instructions

Annex B6

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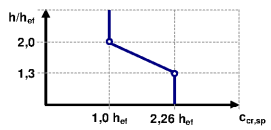
Table C1: Essential Characteristics for threaded rod, HAS-U-… and HIT-V-… under tension load in concrete

Threaded rod, HAS-U-… and HIT-V-…				**M8**	**M10**	**M12**	**M16**
Installation safety factor		γ_{inst}	[-]	1,0			
Steel failure							
Characteristic steel resistance		$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$			
Partial factor grade 5.8		$\gamma_{Ms,N}$ [1)]	[-]	1,5			
Partial factor grade 8.8		$\gamma_{Ms,N}$ [1)]	[-]	1,5			
Partial factor HAS-U A4, HIT-V-R		$\gamma_{Ms,N}$ [1)]	[-]	1,86			
Partial factor HAS-U HCR, HIT-V-HCR		$\gamma_{Ms,N}$ [1)]	[-]	1,5			
Combined pullout and concrete cone failure							
Characteristic bond resistance in uncracked concrete C20/25							
Temperature range I:	40 °C/24 °C	$\tau_{Rk,ucr}$	[N/mm²]	7,5			
Temperature range II:	80 °C/50 °C	$\tau_{Rk,ucr}$	[N/mm²]	5,5			
Influence factors ψ on bond resistance τ_{Rk}							
Cracked and uncracked concrete: Factor for concrete strength		ψ_c	C30/37	1,04			
			C40/50	1,07			
			C50/60	1,09			
Concrete cone failure							
Factor for uncracked concrete		$k_{ucr,N}$	[-]	11,0			
Edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$			
Spacing		$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$			
Splitting failure							
Edge distance $c_{cr,sp}$ [mm] for		$h / h_{ef} \geq 2,0$		$1,0 \cdot h_{ef}$			
		$2,0 > h / h_{ef} > 1,3$		$4,6\ h_{ef} - 1,8\ h$			
		$h / h_{ef} \leq 1,3$		$2,26\ h_{ef}$			
Spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$			

[1)] In absence of national regulations.

Injection system Hilti HIT-MM Plus

Performances
Essential characteristics under tension load in concrete

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Essential Characteristics for threaded rod, HAS-U-… and HIT-V-… under tension load in concrete

Threaded rod, HAS-U-… and HIT-V-…			**M8**	**M10**	**M12**	**M16**
Steel failure without lever arm						
Characteristic steel resistance	$V_{Rk,s}$	[kN]	$0,5 \cdot A_s \cdot f_{uk}$			
Partial factor grade 5.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Partial factor grade 8.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Partial factor HAS-U A4, HIT-V-R	$\gamma_{Ms,V}$ [1)]	[-]	1,56			
Partial factor HAS-U HCR, HIT-V-HCR	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Ductility factor	k_7	[-]	1,0			
Steel failure with lever arm						
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1,2 \cdot W_{el} \cdot f_{uk}$			
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]	$\min (h_{ef}; 12 \cdot d_{nom})$			
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16

[1)] In absence of national regulations.

Injection system Hilti HIT-MM Plus

Performances
Essential characteristics under shear load in concrete

Annex C2

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Table C3: Displacement under tension load

Threaded rod, HAS-U-… and HIT-V-…			M8	M10	M12	M16
Non-cracked concrete						
Displacement	δ_{N0}	[mm/(N/mm²)]	0,07	0,07	0,07	0,08
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,07	0,07	0,07	0,08

Table C4: Displacement under shear load

Threaded rod, HAS-U-… and HIT-V-…			M8	M10	M12	M16
Displacement	δ_{V0}	[mm/(kN)]	0,06	0,06	0,05	0,04
Displacement	$\delta_{V\infty}$	[mm/(kN)]	0,09	0,08	0,08	0,06