Hilti HIT-CT 1 mortar with rebar (as post-installed connection)

Injection mortar system	Benefits
 Hilti HIT-CT 1 330 ml foil pack (also available as 500 ml foil pack)  Static mixer  Rebar	- **Clean-Tec** technology: HIT-CT 1 mortar contains no hazardous labels and protects users and the environment in the event of contact with the mortar . - **SAFEset** technology: drilling and borehole cleaning in one step with Hilti hollow drill bit - suitable for concrete C12/15 to C50/60 - high loading capacity and fast curing - hybrid chemistry - suitable for dry and water saturated concrete - for rebar diameters up to 25 mm - non corrosive to rebar elements - good load capacity at elevated temperatures, and suitable for applications down to -5 °C


Concrete

Hilti Clean technology


European Technical Approval


CE conformity

PROFIS Rebar design software

Hilti SAFEset technology

Service temperature range

Temperature range: -40°C to +80°C (max. long term temperature +50°C, max. short term temperature +80°C).

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	CSTB, Paris	ETA-11/0390 / 2012-08-27
Fire test report	DiBT, Berlin	Z-21.8-2004

a) All data given in this section according ETA-11/0354 issue 2012-08-27.

Materials

Reinforcmenent bars according to EC2 Annex C Table C.1 and C.2N.

Properties of reinforcement

Product form		Bars and de-coiled rods	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of k = $(f_t/f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force, ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm) ≤ 8 > 8	± 6,0 ± 4,5	
Bond: Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	0,040 0,056	

Setting details

For detailed information on installation see instruction for use given with the package of the product.

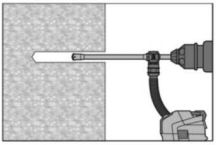
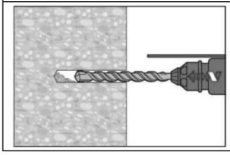
Working time, Curing time

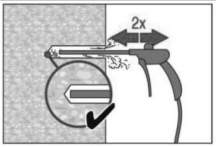
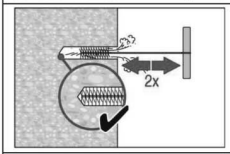
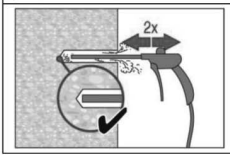
Temperature of the base material T_{BM}	Working time t_{gel}	Curing time t_{cure} a)
-5 °C ≤ T_{BM} < 0 °C	60 min	6 h
0 °C ≤ T_{BM} < 5 °C	40 min	3 h
5 °C ≤ T_{BM} < 10 °C	25 min	2 h
10 °C ≤ T_{BM} < 20 °C	10 min	90 min
20 °C ≤ T_{BM} < 30 °C	4 min	75 min
30 °C ≤ T_{BM} ≤ 40 °C	2 min	60 min

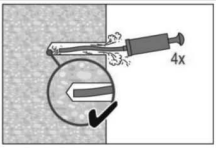
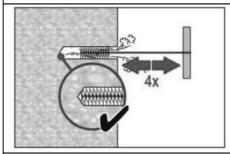
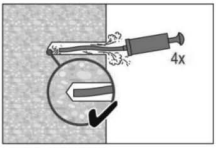
a) The curing time data are valid for dry anchorage base only. For water saturated anchorage bases the curing times must be doubled.

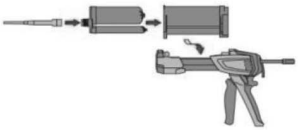
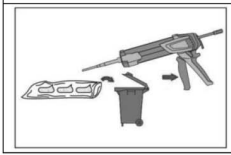
Setting instruction

Dry and water-saturated concrete, hammer drilling

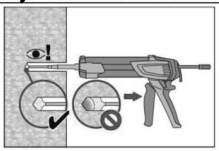
Bore hole drilling	
	Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling. After drilling is complete, proceed to the “injection preparation” step in the instructions for use.
	Drill hole to the required embedment depth using a hammer-drill with carbide drill bit set in rotation hammer mode, a Hilti hollow drill bit or a compressed air drill.

Bore hole cleaning	Just before setting an anchor, the bore hole must be free of dust and debris by one of two cleaning methods described below
a) Compressed air cleaning (CAC)	For all bore hole diameters d_0 and all bore hole depth h_0
	Blowing 2 times from the back of the hole with oil-free compressed air (min. 6 bar at 100 litres per minute (LPM)) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour. If required use additional accessories and extensions for air nozzle and brush to reach back of hole.
	Brushing 2 times with the specified brush size (brush Ø ≥ borehole Ø) by inserting the round steel brush to the back of the hole in a twisting motion. The brush shall produce natural resistance as it enters the anchor hole. If this is not the case, please use a new brush or a brush with a larger diameter.
	Blowing 2 times again with compressed air until return air stream is free of noticeable dust.

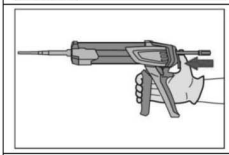
b) Manual Cleaning (MC)	As an alternative to compressed air cleaning, a manual cleaning is permitted for hammer drilled boreholes up to hole diameters $d_0 \leq 20$mm and depths l_v resp. $l_{e,ges.} \leq 160$mm or 10*d. The borehole must be free of dust, debris, water, ice, oil, grease and other contaminants prior to mortar injection.
	4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.
	4 times with the specified brush size (brush Ø ≥ borehole Ø) by inserting the round steel wire brush to the back of the hole with a twisting motion. The brush shall produce natural resistance as it enters the anchor hole. If this is not the case, please use a new brush or a brush with a larger Ø,
	4 strokes with Hilti blow-out pump from the back of the hole until return air stream is free of noticeable dust.

Injection preparation	
	Observe the Instruction for Use of the dispenser. Observe the Instruction for Use of the mortar. Tightly attach Hilti HIT-RE-M mixing nozzle to foil pack manifold. Insert foil pack into foil pack holder and swing holder into the 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. Discard quantities are 2 strokes for 330 ml foil pack 3 strokes for 500 ml foil pack

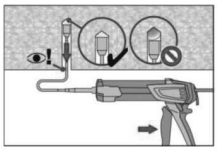
Inject adhesive from the back of the borehole without forming air voids



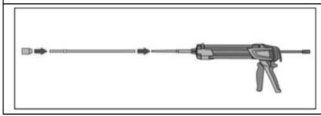
Injection method for borehole depth ≤ 250 mm:
Inject the mortar from the back of the hole towards the front and slowly withdraw the mixing nozzle step by step after each trigger pull. **Important! Use extensions for deep holes > 250 mm**. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the rebar and the concrete is completely filled with adhesive over the embedment length.



After injecting, depressurize the dispenser by pressing the release trigger (only for manual dispenser). This will prevent further mortar discharge from the mixing nozzle.



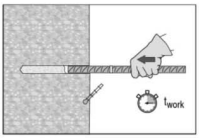
Piston plug injection for borehole depth > 250 mm or overhead applications: Assemble mixing nozzle, extension(s) and appropriately sized piston plug. Insert piston plug to back of the hole. Begin injection allowing the pressure of the injected adhesive mortar to push the piston plug towards the front of the hole. After injecting, depressurize the dispenser by pressing the release trigger. This will prevent further mortar discharge from the mixing nozzle.
The proper injection of mortar using a piston plug HIT-SZ prevents the creation of air voids. The piston plug must be insertable to the back of the borehole without resistance. During injection the piston plug will be pressed towards the front of the borehole slowly by mortar pressure. Attention! Pulling the injection or when changing the foil pack, the piston plug is rendered inactive and air voids may occur.



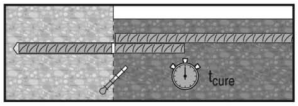
Dispenser types with related foil pack sizes:

HDM 330	Manual dispenser (330 ml)
HDM 500	Manual dispenser (330 / 500 ml)
HDE 500-A22	Electric dispenser (330 / 500 ml)

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 twork has elapsed.

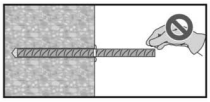


After installing the rebar the annular gap must be completely filled with mortar.

Proper installation can be verified when:

Desired anchoring embedment is reached l_v:
Embedment mark at concrete surface.
Excess mortar flows out of the borehole after the rebar has been fully inserted until the embedment mark.

Overhead application: Support the rebar and secure it from falling till mortar started to harden.



Observe the working time "t_{work}", which varies according to temperature of base material. Minor adjustments to the rebar position may be performed during the working time. After t_{cure} preparation work may continue.

For detailed information on installation see instruction for use given with the package of the product.

Fitness for use

Creep behaviour

Creep tests have been conducted in dry environment at 50°C during 90 days.

These tests show an excellent behaviour of the post installed connection made with HIT-CT 1: low displacements with long term stabilisation, failure load after exposure above reference load.

Resistance to chemical substances

Chemical	Resistance
Acetic acid 100%	o
Acetic acid 10%	+
Hydrochloric Acid 20%	+
Nitric Acid 40%	-
Phosphoric Acid 40%	+
Sulphuric acid 40%	+
Ethyl acetate 100%	o
Acetone 100%	-
Ammoniac 5%	o
Diesel 100%	+
Gasoline 100%	+
Ethanol 96%	o
Machine oils 100%	+

Chemical	Resistance
Methanol 100%	o
Peroxide of hydrogen 30%	o
Solution of phenol (sat.)	-
Sodium hydroxide pH=14	+
Solution of chlorine (sat.)	+
Solution of hydrocarbons (60 % vol Toluene, 30 % vol Xylene,10 % vol Methyl naphtalene)	+
Salted solution 10%	+
sodium chloride	
Suspension of concrete (sat.)	+
Chloroform 100%	+
Xylene 100%	+

+ resistant
o resistant in short term (max. 48h) contact
- not resistant

Electrical Conductivity

HIT-CT 1 in the hardened state **is not conductive electrically**. Its electric resistivity is $1{,}4 \cdot 10^{10}\ \Omega \cdot m$ (DIN IEC 93 – 12.93). It is adapted well to realize electrically insulating anchorings (ex: railway applications, subway).

Drilling diameters

Rebar (mm)	Drill bit diameters d_0 [mm]	
	Hammer drill (HD)	Compressed air drill (CA)
8	12 (10[a)])	-
10	14 (12[a)])	-
12	16 (14[a)])	17
14	18	17
16	20	20
20	25	26
25	32	32

a) Max. installation length l = 250 mm.

Basic design data for rebar design

Bond strength

Bond strength in N/mm² according to EC2 for good bond conditions for all drilling methods

Rebar (mm)	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 - 25	1,6	2,0	2,3	2,7	3,0	3,0	3,0	3,0	3,0

Minimum anchorage length

Minimum and maximum embedment depths and lap lengths for C20/25 according to ETA

The minimum anchorage length according to EC 2 shall be multiplied by the factor

- 1,0 for concrete class ≤ C20/25
- 1,2 for concrete class C25/30
- 1,4 for concrete class ≤ C20/25

Minimum and maximum embedment depth and lap lengths for C25/30

Rebar		Hammer drilling, Compressed air drilling		
Diameter d_s [mm]	**$f_{y,k}$ [N/mm²]**	**$l_{b,min}$* [mm]**	**$l_{0,min}$ * [mm]**	**l_{max} [mm]**
8	500	136	240	700
10	500	170	240	700
12	500	204	240	700
14	500	238	252	700
16	500	272	288	700
18	500	306	324	500
20	500	340	360	500
22	500	374	396	500
24	500	408	432	500
25	500	425	450	500

*$l_{b,min}$ (8.6) and $l_{0,min}$ (8.11) are calculated for good bond conditions with maximum utilisation of rebar yield strength f_{yk} = 500 N/mm² and α_6 = 1,0