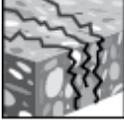
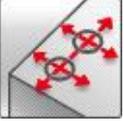
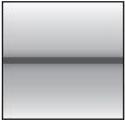


Hilti HIT-RE 500 V3 mortar with rebar (as anchor)

Injection mortar system	Benefits
 <p>Hilti HIT-RE 500 V3 330 ml, 500 ml and 1400 ml foil pack</p>  <p>Statik mixer</p>  <p>rebar BSt 500 S</p>	<ul style="list-style-type: none"> - SAFEset technology: hammer drilling and borehole cleaning in one step with Hilti hollow drill bit - SAFEset technology: highest reliability in diamond coring with Hilti Roughening tool - suitable for cracked/non-cracked concrete C 20/25 to C 50/60 - high loading capacity - suitable for dry and water saturated concrete - under water application - fastest curing epoxy mortar to speed up construction process - long working time to allow installation of big diameters and/or deep embedment depths even at higher temperatures - cures down to -5°C - odourless epoxy

<p>Base material</p>  <p>Concrete (non-cracked)</p>  <p>Concrete (cracked)</p>	<p>Installation conditions</p>  <p>Hammer drilled holes</p>  <p>Diamond drilled holes</p> <p>SAFEset</p> <p>Hilti SAFEset technology</p>  <p>Small edge distance and spacing</p>
<p>Load conditions</p>  <p>Static/ quasi-static</p>  <p>Seismic ETA-C1</p>	<p>Other information</p>  <p>European Technical Assessment</p>  <p>CE conformity</p>  <p>PROFIS Anchor design Software</p>

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment	CSTB	ETA-16/0143 / 2016-04-18

Basic loading data (for a single anchor)

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Temperate range I
(min. base material temperature -40°C , max. long term/short term base material temperature: $+24^\circ\text{C}/40^\circ\text{C}$)
- Installation temperature range -5°C to $+40^\circ\text{C}$

Embedment depth and base material thickness for the basic loading data

	ETA-16/0143, issue 2016-04-18									Additional Hilti tech. data	
Anchor size	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Typical embedment depth [mm]	90	110	125	125	170	210	270	285	300	330	360
Base material thickness [mm]	120	140	161	165	220	274	340	359	380	420	470

a) The allowed range of embedment depth is shown in the setting details.

For hammer drilled holes and hollow drill bit and diamond drilling with roughening¹⁾:

Mean ultimate resistance

	ETA-16/0143, issue 2016-04-18									Additional Hilti tech. data	
Anchor size	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete											
Tensile $N_{Ru,m}$ BSt 500 S [kN]	45,2	65,1	89,3	93,7	148,6	204,0	297,4	331,1	348,4	401,9	457,9
Shear $V_{Ru,m}$ BSt 500 S [kN]	23,1	32,6	44,1	57,8	90,3	141,8	177,5	203,7	232,1	293,9	363,0
Cracked concrete											
Tensile $N_{Ru,m}$ BSt 500 S [kN]	31,9	52,3	66,8	66,8	105,9	145,4	212,0	229,9	248,3	-	-
Shear $V_{Ru,m}$ BSt 500 S [kN]	23,1	32,6	44,1	57,8	90,3	141,8	177,5	203,7	232,1	-	-

1) Roughening tools are available for element sizes $\text{Ø}14 - \text{Ø}28$.

Characteristic resistance

	ETA-16/0143, issue 2016-04-18									Additional Hilti tech. data	
Anchor size	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete											
Tensile N_{Rk} BSt 500 S [kN]	39,6	58,1	70,6	70,6	111,9	153,7	224,0	249,4	262,4	302,7	344,9
Shear V_{Rk} BSt 500 S [kN]	22,0	31,0	42,0	55,0	86,0	135,0	169,0	194,0	221,0	280,0	345,7
Cracked concrete											
Tensile N_{Rk} BSt 500 S [kN]	24,0	39,4	50,3	50,3	79,8	109,6	159,7	177,8	187,1	-	-
Shear V_{Rk} BSt 500 S [kN]	22,0	31,0	42,0	55,0	86,0	135,0	169,0	194,0	221,0	-	-

Design resistance

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete													
Tensile N_{Rd}	BSt 500 S	[kN]	26,4	38,7	47,1	47,1	74,6	102,5	149,4	166,3	174,9	168,2	191,6
Shear V_{Rd}	BSt 500 S	[kN]	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	186,6	230,5
Cracked concrete													
Tensile N_{Rd}	BSt 500 S	[kN]	16,0	26,3	33,5	33,5	53,2	73,0	106,5	118,5	124,7	-	-
Shear V_{Rd}	BSt 500 S	[kN]	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

Recommended loads

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete													
Tensile N_{Rec}	BSt 500 S	[kN]	18,8	27,6	33,6	33,6	53,3	73,2	106,7	115,7	125,0	120,1	136,9
Shear V_{Rec}	BSt 500 S	[kN]	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	133,3	164,6
Cracked concrete													
Tensile N_{Rec}	BSt 500 S	[kN]	11,4	18,8	24,0	24,0	38,0	52,2	76,1	84,7	89,1	-	-
Shear V_{Rec}	BSt 500 S	[kN]	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	-	-

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond drilling:

Mean ultimate resistance

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete													
Tensile $N_{Ru,m}$	BSt 500 S	[kN]	33,8	49,6	65,7	75,1	127,6	197,1	297,4	331,1	348,4	-	-
Shear $V_{Ru,m}$	BSt 500 S	[kN]	23,1	32,6	44,1	57,8	90,3	141,8	177,5	203,7	232,1	-	-

Characteristic resistance

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Non cracked concrete													
Tensile N_{Rd}	BSt 500 S	[kN]	25,5	37,3	49,5	56,6	96,1	148,4	224,0	249,4	262,4	-	-
Shear V_{Rd}	BSt 500 S	[kN]	22,0	31,0	42,0	55,0	86,0	135,0	169,0	194,0	221,0	-	-

Design resistance

			ETA-16/0143, issue 2016-04-18										Additional Hilti tech. data	
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40	
Non cracked concrete														
Tensile N_{Rd}	BSt 500 S	[kN]	14,1	20,7	27,5	26,9	45,8	70,7	106,7	115,7	125,0	-	-	
Shear V_{Rd}	BSt 500 S	[kN]	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-	

Recommended loads ^{a)}

			ETA-16/0143, issue 2016-04-18										Additional Hilti tech. data	
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40	
Non cracked concrete														
Tensile N_{Rec}	BSt 500 S	[kN]	10,1	14,8	19,6	19,2	32,7	50,5	76,2	82,6	89,3	-	-	
Shear V_{Rec}	BSt 500 S	[kN]	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	-	-	

a) With overall partial safety factor for action $\gamma = 1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Seismic resistance C1

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Steel failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25, $f_{ck,cube} = 25 \text{ N/mm}^2$
Temperate range I
(min. base material temperature -40°C , max. long/short term base material temperature: $+24^\circ\text{C}/40^\circ\text{C}$)
- Installation temperature range -5°C to $+40^\circ\text{C}$
- $\alpha_{gap} = 1,0$ (no hole clearance between anchor and fixture); in case of connections with hole clearance, $\alpha_{gap} = 0,5$ has to be used

Embedment depth and base material thickness for the basic loading data

			ETA-16/0143, issue 2016-04-18										Additional Hilti tech. data	
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40	
Typical embedment depth [mm]			90	110	125	125	170	210	270	285	300	330	360	
Base material thickness [mm]			120	140	161	165	220	274	340	359	380	420	470	

For hammer drilled holes and hollow drill bit:

Characteristic resistance

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Cracked concrete													
Tensile N_{Rk}	BSt 500 S	[kN]	22,6	35,3	42,8	42,8	67,8	93,1	135,8	151,1	159,0	-	-
Shear V_{Rk}	BSt 500 S	[kN]	22,0	31,0	42,0	55,0	86,0	135,0	169,0	194,0	221,0	-	-

Design resistance

			ETA-16/0143, issue 2016-04-18								Additional Hilti tech. data		
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Cracked concrete													
Tensile N_{Rd}	BSt 500 S	[kN]	15,1	23,5	28,5	28,5	45,2	62,1	90,5	100,7	106,0	-	-
Shear V_{Rd}	BSt 500 S	[kN]	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

Service temperature range

Hilti HIT-RE 500 V3 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +70 °C	+43 °C	+70 °C

Max short term base material temperature

Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Max long term base material temperature

Long-term elevated base material temperatures are roughly constant over significant periods of time.

Materials

Mechanical properties

			ETA-16/0143, issue 2016-04-18									Additional Hilti tech. data	
Anchor size			Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Nominal tensile strength f_{uk}	BSt 500 S	[N/mm ²]	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	BSt 500 S	[N/mm ²]	500	500	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	BSt 500 S	[mm ²]	50,3	78,5	113,1	153,9	201,1	314,2	490,9	615,8	804,2	1018	1257
Moment of resistance W	BSt 500 S	[mm ³]	50,3	98,2	169,6	269,4	402,1	785,4	1534	2155	3217	4580	6283

Material quality

Part	Material
rebar BSt 500 S	Geometry and mechanical properties according to DIN 488-2:1986 or E DIN 488-2:2006

Setting

Installation equipment

Anchor size	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Rotary hammer	TE 2 – TE 16				TE 40 – TE 70						
Other tools	compressed air gun, set of cleaning brushes, dispenser, roughening tools TE-YRT										

Parameters of cleaning and setting tools

Element	Drill and clean				Installation	
Rebar	Hammer drilling	Hollow drill bit TE-CD, TE-YD	Diamond coring	Diamond coring with roughening tool TE-YRT	Brush	Piston plug
						
Size	d ₀ [mm]	d ₀ [mm]	d ₀ [mm]	d ₀ [mm]	HIT-RB	HIT-SZ
Ø10	12	-	12	-	12	12
Ø10, Ø12	14	14	14	-	14	14
Ø12	16	16	16	-	16	16
Ø14	18	18	18	18	18	18
Ø16	20	20	20	20	20	20
Ø20	25	25	25	25	25	25
Ø25	32	32	32	32	32	32
Ø28	35	35	35	35	35	35
Ø30	37	-	37	-	37	37
Ø32	40	-	42	-	42	42
Ø36	45	-	-	-	36	36
Ø40	55	-	-	-	40	40

Associated components for the use of Hilti Roughening tool TE-YRT

Diamond coring		Roughening tool TE-YRT	Wear gauge RTG...
			
d ₀ [mm]		d ₀ [mm]	size
Nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

Minimum roughening time t_{roughen} (t_{roughen} [sec] = h_{ef} [mm] / 10)

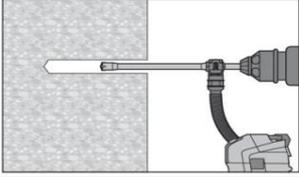
h _{ef} [mm]	t _{roughen} [sec]
0 to 100	10
101 to 200	20
201 to 300	30
301 to 400	40
401 to 500	50
501 to 600	60

Setting instruction

Bore hole drilling

a) Hilti hollow drill bit

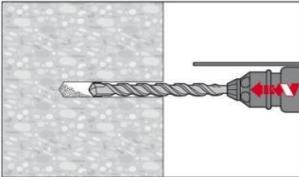
For dry and wet concrete only.



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 bore hole during drilling when used in accordance with the user's manual. After drilling is complete, proceed to the "injection preparation" step in the instructions for use.

b) Hammer drilling

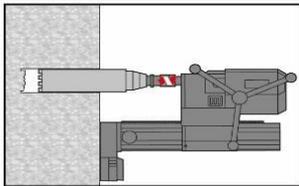
Dry or wet concrete and installation in flooded holes (no sea water).



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

c) Diamond coring

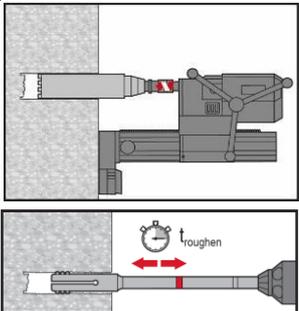
For dry and wet concrete only.



Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

d) Diamond coring followed by roughening with Hilti rough. tool

For dry and wet concrete only.



Diamond coring is permissible when suitable diamond core drilling machines and the corresponding core bits are used.

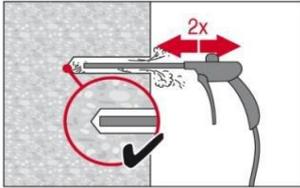
Before roughening the borehole needs to be dry. Check usability of the roughening tool with the wear gauge RTG. Roughen the borehole over the whole length to the required hef.

Bore hole cleaning

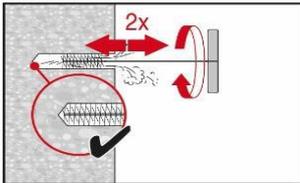
Just before setting an anchor, the bore hole must be free of dust and debris. Inadequate hole cleaning = poor load values.

a) Compressed air cleaning (CAC)

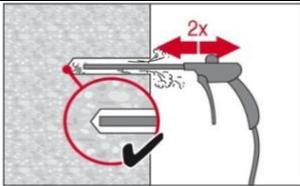
For all drill hole diameters d_0 and all drill hole depths h_0 .



Blow 2 times from the back of the hole (if needed with nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust. For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m³/h.



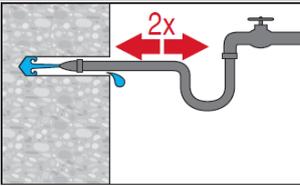
Brush 2 times with the specified brush by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush $\varnothing \geq$ drill hole \varnothing) - if not the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



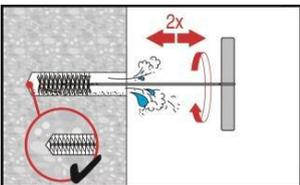
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

b) Cleaning of hammer drilled flooded holes and diamond cored holes

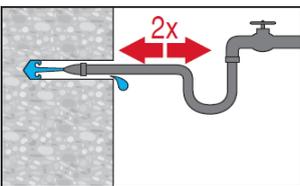
For all bore hole diameters d_0 and all bore hole depth h_0



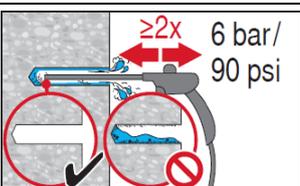
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



Brush 2 times with the specified brush size 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 bore hole - if not the brush is too small and must be replaced with the proper brush diameter.

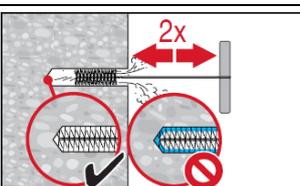


Flush again 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

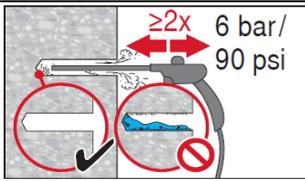


Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust and water.

Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.



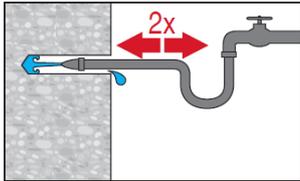
Brush 2 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole - if not the brush is too small and must be replaced with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



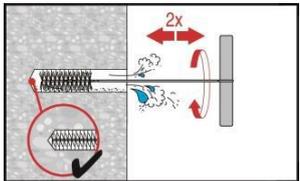
Blow again with compressed air 2 times until return air stream is free of noticeable dust and water.

c) Cleaning of diamond cored holes followed by roughening

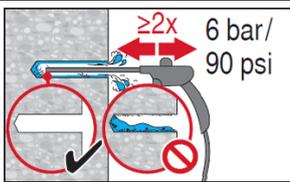
For all drill hole diameters d_0 and all drill hole depths h_0 .



Flush 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

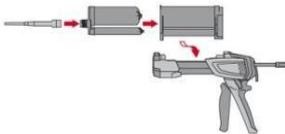


Brush 2 times with the specified brush by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the drill hole (brush $\varnothing \geq$ drill hole \varnothing) - if not the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



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 and water. For drill hole diameters ≥ 32 mm the compressor has to supply a minimum air flow of 140 m³/h.

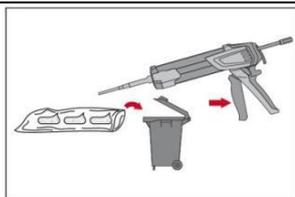
Injection preparation



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 and mortar.

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.

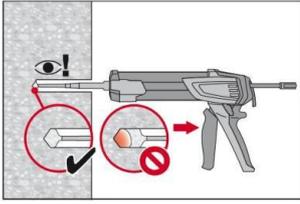


The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.

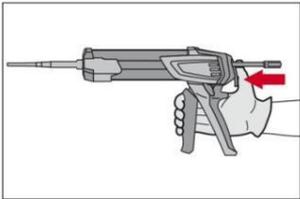
Discard quantities are: 3 strokes for 330 ml foil pack, 4 strokes for 500 ml foil pack, 65 ml for 1400 ml foil pack.

Inject adhesive

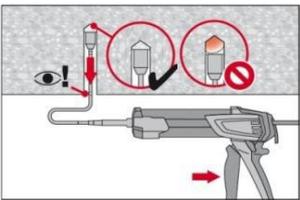
From the back of the drill hole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full. It is required 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.

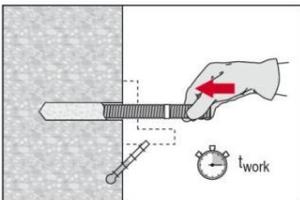


Overhead installation and/or installation with embedment depth $h_{ef} > 250\text{mm}$.

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. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

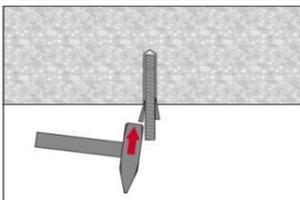
Setting the element

Just before setting an anchor, the drill hole must be free of dust and debris.

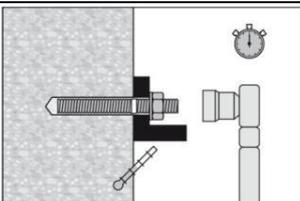


Before use, verify that the element is dry and free of oil and other contaminants.

Mark and set element to the required embedment depth until working time t_{work} has elapsed.



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} the anchor can be loaded.

The applied installation torque shall not exceed T_{max} .

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

Curing time for general conditions

Temperature of the base material T	Working time t_{work}	Minimum curing time $t_{cure}^{1)}$
-5 °C to -1 °C	2 h	168 h
0 °C to 4 °C	2 h	48 h
5 °C to 9 °C	2 h	24 h
10 °C to 14 °C	1,5 h	16 h
15 °C to 19 °C	1 h	16 h
20 °C to 24 °C	30 min	7 h
25 °C to 29 °C	20 min	6 h
30 °C to 34 °C	15 min	5 h
35 °C to 39 °C	12 min	4,5 h
40 °C	10 min	4 h

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

		ETA-16/0143, issue 2016-04-18										Additional Hilti tech. data	
Anchor size		Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40	
Nominal diameter of drill bit	d_0 [mm]	12 ¹⁾ 14 ¹⁾	14 ¹⁾ 16 ¹⁾	18	20	25	32	35	37	40	45	55	
Effective anchorage and drill hole depth range ^{a)}	$h_{ef,min}$ [mm]	60	70	75	80	90	100	112	120	128	144	160	
	$h_{ef,max}$ [mm]	200	240	280	320	400	500	560	600	640	720	800	
Minimum base material thickness	h_{min} [mm]	$h_{ef} + 30$ ≥ 100 mm		$h_{ef} + 2 d_0$									
Minimum spacing	s_{min} [mm]	50	60	70	80	100	125	140	150	160	180	200	
Minimum edge distance	c_{min} [mm]	45	45	50	50	65	70	75	80	80	180	200	
Critical spacing for splitting failure	$s_{cr,sp}$	$2 c_{cr,sp}$											
Critical edge distance for splitting failure ^{b)}	$c_{cr,sp}$ [mm]	$1,0 \cdot h_{ef}$ for $h / h_{ef} \geq 2,0$											
		$4,6 h_{ef} - 1,8 h$ for $2,0 > h / h_{ef} > 1,3$											
		$2,26 h_{ef}$ for $h / h_{ef} \leq 1,3$											
Critical spacing for concrete cone failure	$s_{cr,N}$	$2 c_{cr,N}$											
Critical edge distance for concrete cone failure ^{c)}	$c_{cr,N}$	$1,5 h_{ef}$											

1) Each of the two given values can be used.

For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef} : embedment depth)

b) h : base material thickness ($h \geq h_{min}$)

c) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the safe side.