HIT-RE 500 V3 injection mortar

Anchor design (ETAG 001) / Rebar elements / Concrete

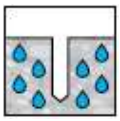
Injection mortar system	Benefits
 Hilti HIT-RE 500 V3 500 ml foil pack (also available as 330 ml and 1400 ml foil pack)	- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications - Suitable for non-cracked and cracked concrete C 20/25 to C 50/60 - ETA approval for seismic performance category C1 - Hilti Technical Data for seismic performance category C2 - High loading capacity - Suitable for dry and water saturated concrete - Hilti Technical Data for 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 temperature - Cures down to -5°C
 Rebar B500 B (ϕ8 - ϕ40)	

Base material

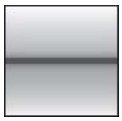

Concrete (non-cracked)


Concrete (cracked)


Dry concrete

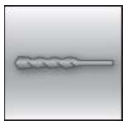

Wet concrete

Load conditions


Static/ quasi-static

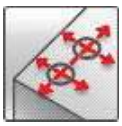

Seismic, ETA-C1
Hilti Technical Data-C2

Installation conditions


Hammer drilling


Diamond coring

SAFE-SET
Hilti **SafeSet** technology


Small edge distance and spacing

Other informations


European Technical Assessment


CE conformity


PROFIS Rebar design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [a)]	CSTB, Marne la Vallée	ETA-16/0143 / 2017-07-12

a) All data given in this section according to ETA-16/0143 issue 2016-11-30.

Static and quasi-static loading (for a single anchor)

All data in this section applies to
-Design according to TR029
-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
-Rebar B500B
-Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
-Temperate range I (min. base material temp. -40°C, max. long term/short term base material temp.: +24°C/40°C)

Embedment depth and base material thickness for static and quasi-static loading data

Anchor- size		ETA-16/0143, issue 2017-07-12										Hilti technical data	
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typ. embedment depth	[mm]	80	90	110	125	125	170	210	270	285	300	330	360
Base material thickness	[mm]	110	120	140	161	165	220	274	340	359	380	420	470

For hammer drilled holes, hollow drill bit[1] and diamond cored with roughening tool[2]:
1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Characteristic resistance

Anchor- size			ETA-16/0143, issue 2017-07-12										Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete														
Tensile N_{Rk}	B500B	[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}	B500B		-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	*280,0*	*346,0*
Cracked concrete														
Tensile N_{Rk}	B500B	[kN]	-	24,0	39,4	50,3	50,3	79,8	109,6	159,7	177,8	187,1	-	-
Shear V_{Rk}	B500B		-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Design resistance

Anchor- size			ETA-16/0143, issue 2017-07-12										Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete														
Tensile N_{Rd}	B500B	[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}	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	186,7	230,7
Cracked concrete														
Tensile N_{Rd}	B500B	[kN]	-	16,0	26,3	33,5	33,5	53,2	73,0	106,5	118,5	124,7	-	-
Shear V_{Rd}	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Recommended loads[3)]

Anchor- size			ETA-16/0143, issue 2017-07-12									Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete														
Tensile N_{Rec}	B500B	[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}	B500B		-	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}	B500B	[kN]	-	11,4	18,8	24,0	24,0	38,0	52,2	76,1	84,7	89,1	-	-
Shear V_{Rec}	B500B		-	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.
3) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond cored holes:

Characteristic resistance

Anchor- size			ETA-16/0143, issue 2017-07-12									
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Tensile N_{Rk}	B500B	[kN]	-	25,4	37,3	49,5	56,5	96,1	148,4	224,0	249,4	262,4
Shear V_{Rk}	B500B		-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*

Design resistance

Anchor- size			ETA-16/0143, issue 2017-07-12									
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Tensile N_{Rd}	B500B	[kN]	-	14,1	20,7	27,5	26,9	45,8	70,7	106,7	115,7	125,0
Shear V_{Rd}	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3

Recommended loads[a)]

Anchor- size			ETA-16/0143, issue 2017-07-12									
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Tensile N_{Rec}	B500B	[kN]	-	10,1	14,8	19,6	19,2	32,7	50,5	76,2	82,6	89,3
Shear V_{Rec}	B500B		-	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 γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Seismic loading (for a single anchor)

All data in this section applies to:
- Design according to TR 045
- Correct setting (See setting)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Rebar B450C
-Temperate range I
(min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -5°C to +40°C
- α_{gap} = 1,0

For hammer drilled holes:

Embedment depth and base material thickness in case of seismic performance category C2

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typical embedment depth	[mm]	-	-	-	-	125	170	210	-	-	-	-	-
Base material thickness	[mm]	-	-	-	-	165	220	274	-	-	-	-	-

Characteristic resistance in case of seismic performance category C2[1)]

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rk,\,seis}$	B450C	[kN]	-	-	-	-	24,5	45,9	57,7	-	-	-	-	-
Shear $V_{Rk,\,seis}$	B450C	[kN]	-	-	-	-	16,7	29,7	40,7	-	-	-	-	-

1) Hilti technical data.

Design resistance in case of seismic performance category C2[1)]

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rd,\,seis}$	B450C	[kN]	-	-	-	-	16,3	30,6	38,5	-	-	-	-	-
Shear $V_{Rd,\,seis}$	B450C	[kN]	-	-	-	-	13,3	23,7	32,5	-	-	-	-	-

1) Hilti technical data.

For hammer drilled holes, hollow drill bit[2)] and diamond cored with roughening tool[3)]:

Embedment depth and base material thickness in case of seismic performance category C1

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typical embedment depth	[mm]	-	90	110	125	125	170	210	270	285	300	-	-
Base material thickness	[mm]	-	120	140	161	165	220	274	340	359	380	-	-

Characteristic resistance in case of seismic performance category C1

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rk,\,seis}$	B500B	[kN]	-	22,6	35,3	42,8	42,8	67,8	93,1	135,8	151,1	159,0	-	-
Shear $V_{Rk,\,seis}$	B500B		-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Design resistance in case of seismic performance category C1

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rd,\,seis}$	B500B	[kN]	-	15,1	23,5	28,5	28,5	45,2	62,1	90,5	100,7	106,0	-	-
Shear $V_{Rd,\,seis}$	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

2) Hilti hollow drill bit available for element size ϕ12-ϕ28.
3) Roughening tools are available for element size ϕ14-ϕ28.

Materials

Mechanical properties

Anchor size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Nominal tensile strength f_{uk}	B500B	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550	550
	B450C		-	-	-	-	518	518	518	-	-	-	-	-
Yield strength f_{yk}	B500B	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500	500
	B450C		-	-	-	-	450	450	450	-	-	-	-	-
Stressed cross-section A_s	B500B	[mm²]	50,3	78,5	113,1	153,9	201,1	314,2	490,9	615,8	706,9	804,2	1018	1257
	B450C		-	-	-	-	201,1	314,2	490,9	-	-	-	-	-
Moment of resistance W	B500B	[mm³]	50,3	98,2	169,6	269,4	402,1	785,4	1534	2155	2650	3217	4580	6283
	B450C		-	-	-	-	402,1	785,4	1534	-	-	-	-	-

Material quality

Part	Material
Rebar EN 1992-1-1:2004 and AC:2010	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1/ NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Setting information

Installation temperature range:
-5°C to +40°C

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	Max. long term base material temperature	Max. 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.

Working time and curing time

Temperature of the base material	Max. working time in which rebar can be inserted and adjusted t_{gel}	Min. curing time before rebar can be fully loaded t_{cure} [1)]
-5 °C ≤ T_{BM} < -1 °C	2 h	168 h
0 °C ≤ T_{BM} < 4 °C	2 h	48 h
5 °C ≤ T_{BM} < 9 °C	2 h	24 h
10 °C ≤ T_{BM} < 14 °C	1,5 h	16 h
15 °C ≤ T_{BM} < 19 °C	1 h	12 h
20 °C ≤ T_{BM} < 24 °C	30 min	7 h
25 °C ≤ T_{BM} < 29 °C	20 min	6 h
30 °C ≤ T_{BM} < 34 °C	15 min	5 h
35 °C ≤ T_{BM} < 39 °C	12 min	4,5 h
T_{BM} = 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.

Installation equipment

Rebar – size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Rotary hammer	TE 2 (-A) – TE 40(-A)						TE40 – TE80					
Diamond coring tools	DD EC-1, DD 100 … DD 160 a)										-	
Other tools	Compressed air gun,brush, hollow drill bit, roughening tool, dispenser, piston plug											

a) For anchors in diamond drilled holes, load values for combined pull-out and concrete cone resistance have to be reduced (see section "Setting instruction")

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

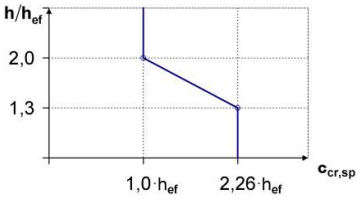
Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
			
d_0 [mm]		d_0 [mm]	size
Nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

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

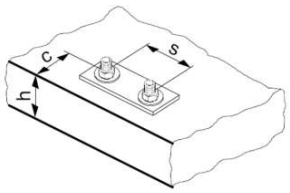
Setting details

Anchor size			Ø8	Ø10	Ø12		Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Nominal diameter of drill bit	d_0	[mm]	10 12 a)	12 14a)	14a)	16a)	18	20	25	30 32a)	35	37	40	451)	551)
Effective anchorage and drill hole depth	$h_{ef,min}$	[mm]	60	60	70	70	75	80	90	100	112	120	128	1441)	1601)
	$h_{ef,max}$	[mm]	160	200	240	240	280	320	400	500	560	600	640	7201)	8001)
Minimum base material thickness	h_{min}	[mm]	hef +30mm ≥ 100 mm			h_{ef} + 2 d_0									
Minimum spacing	s_{min}	[mm]	40	50	60	60	70	80	100	125	140	150	160	1801)	2001)
Minimum edge	c_{min}	[mm]	40	45	45	45	50	50	65	70	75	80	80	1801)	2001)
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$												
Critical edge distance for splitting failure c)	$c_{cr,sp}$	[mm]	**1,0 · h_{ef}** for h / h_{ef} ≥ 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} ≤ 1,3												
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	2 $c_{cr,N}$												
Critical edge distance for concrete cone failure d)	$c_{cr,N}$	[mm]	1,5 h_{ef}												

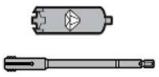


1) Additional Hilti Technical data
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) both given values for drill bit diameter can be used
b) $h_{ef,min} \le h_{ef} \le h_{ef,max}$ (h_{ef}: embedment depth)
c) h: base material thickness ($h \ge h_{min}$)
d) 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 save side



Drilling and cleaning diameters

Rebar - size	Hammer drill (HD)	Hollow Drill Bit (HDB)	Diamond coring		Brush HIT-RB	Piston plug HIT-SZ
			Diamond coring (DD)	With roughening tool (RT)		
	d_0 [mm]				size [mm]	
						
ϕ8	12 (10 a))	-	12 (10 a))	-	12 (10 a))	12
ϕ10	14 (12 a))	14	14 (12 a))	-	14 (12 a))	14 (12 a))
ϕ12	16 (14 a))	16 (14 a))	16 (14 a))	-	16 (14 a))	16 (14 a))
ϕ14	18	18	18	18	18	18
ϕ16	20	20	20	20	20	20
ϕ20	25	25	25	25	25	25
ϕ25	32	32	32	32	32	32
ϕ28	35	35	35	35	35	35
ϕ30	37	-	37	-	37	37
ϕ32	40	-	-	-	40	40
	-	-	42	-	42	42
ϕ36	45 b)	-	-	-	45 b)	45 b)
ϕ40	55 b)	-	-	-	55 b)	55 b)

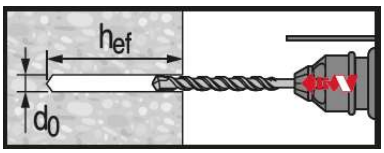
a) Each of two given values can be used
b) Additional Hilti technical data

Setting instructions

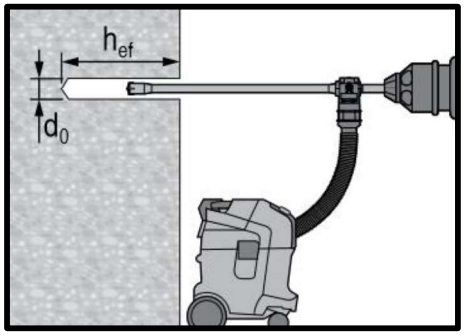
***For detailed information on installation see instruction for use given with the package of the product.**

Safety regulations.

Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V3.

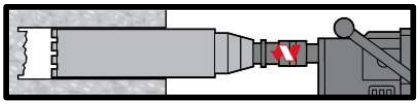


Hammer drilled hole

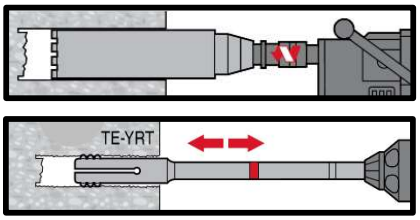


Hammer drilled hole with Hollow Drilled Bit (HDB)

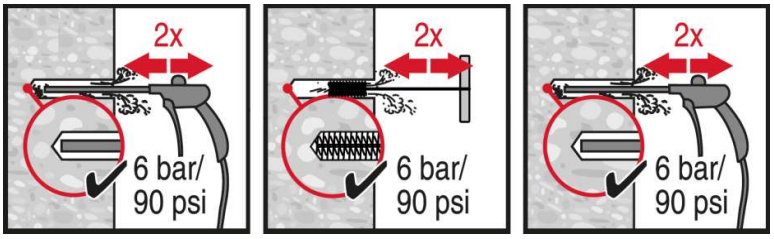
No cleaning required



Diamond Coring

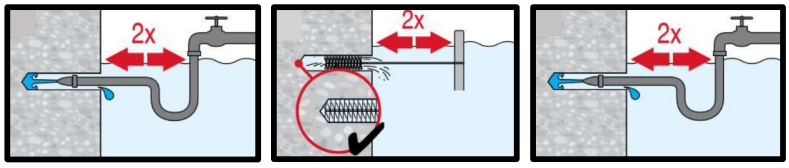


Diamond Coring + Roughening Tool



Hammer Drilling:

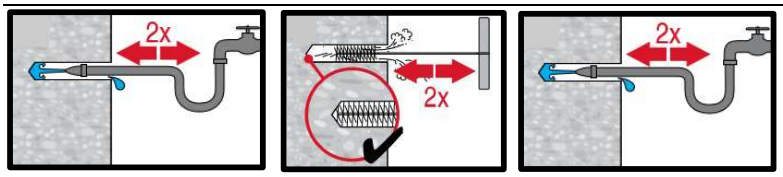
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths $h_0 \leq 20 \cdot d$.



Hammer drilling:

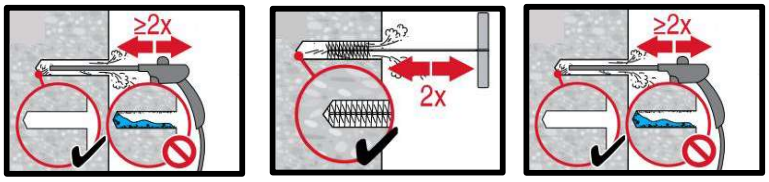
Cleaning for under water:

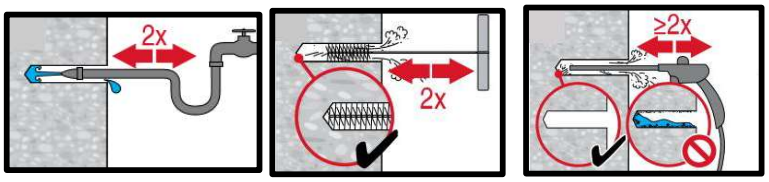
For all bore hole diameters d_0 and all bore hole depth h_0.



Hammer drilled flooded holes and diamond cored holes:

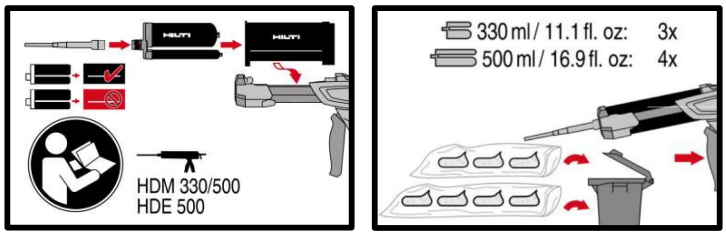
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .



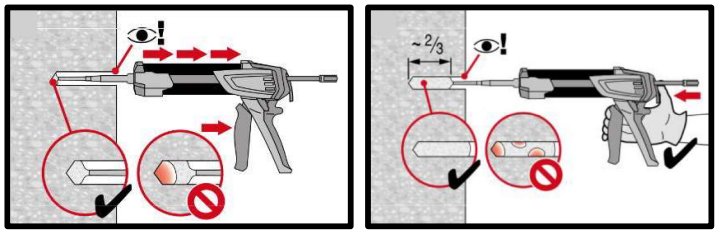


Diamond cored holes with Hilti roughening tool:

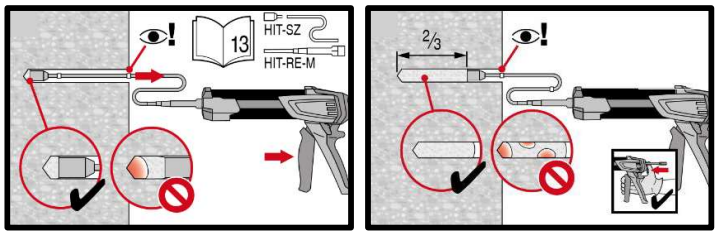
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .



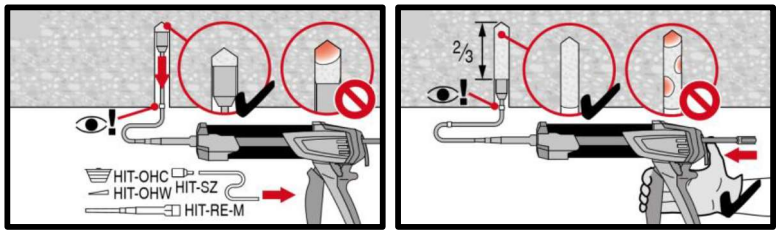
Injection system preparation.



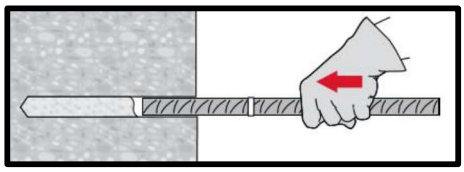
Injection method for drill hole depth $h_{ef} \leq 250$ mm.



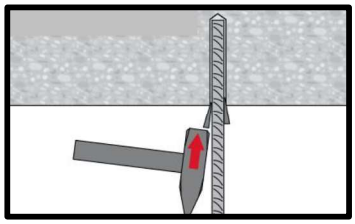
Injection method for drill hole depth $h_{ef} > 250$mm.



Injection method for overhead application.



Setting element, observe working time "t_{work}",



Setting element for overhead applications, observe working time "t_{work}",

Loading the anchor: After required curing time t_{cure} the anchor can be loaded.