HIT-FP 700 R
INJECTION MORTAR

Technical Datasheet

Update: March-23

HIT-FP 700 R injection mortar

Rebar design (EN 1992-1-1) / Rebar elements / Concrete

Injection mortar system

Foil pack: HIT-FP 700 R

(Available in 490 ml foil pack)

Rebar
(ϕ 8 - ϕ 40)

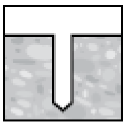
Benefits

- **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 concrete C12/15 to C50/60
- ETA Data for 100 years working life
- High resistance at elevated temperatures
- Suitable for dry and water saturated concrete
- Non-corrosive to rebar elements

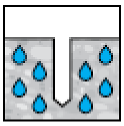
Base material

Concrete (non-cracked)

Concrete (cracked)

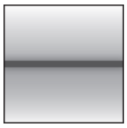


Dry concrete

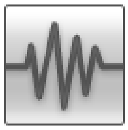


Wet concrete

Load conditions



Static/ quasi-static

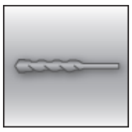


Seismic

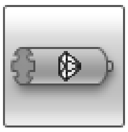
Fire resistance

Working life 100 years

Installation conditions



Hammer drilling



Diamond coring [a)]

Hilti **SafeSet** technology

a) Diamond coring only with Roughening Tool (RT)

Other informations

European Technical Assessment

CE conformity

PROFIS Design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [b)]	CSTB, Marne la Vallée	ETA-21/0624 / 2022-12-16

b) All data given in this section according to ETA-21/0624 issue 2022-12-16 (if not stated otherwise).

Static and quasi-static loading

Static design acc. to EN 1992-1-1

Design bond strength $f_{bd,PIR}$ in N/mm² for good bond conditions for service life of 50 and 100 years[1)]

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

Rebar size	$f_{bd,PIR}$ [N/mm²] according to ETA 21/0624, issued 2022-12-16								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ 8	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6
ϕ 10	1,6	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
ϕ 12	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 14	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 16	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7
ϕ 18	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7
ϕ 20	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7
ϕ 22	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7
ϕ 25	1,6	2,0	2,3	2,7	2,7	2,7	2,7	2,7	2,7
ϕ 26	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 28	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 30	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 32	1,6	2,0	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ 34	1,6	2,0	2,0	2,0	2,0	2,0	2,0	2,0	2,0
ϕ 36	1,5	1,9	1,9	1,9	1,9	1,9	1,9	1,9	1,9
ϕ 40	1,5	1,8	2,1	2,1	2,1	2,1	2,1	2,1	2,1

1) For poor bond conditions multiply the values by 0,7.
2) Hilti hollow drill bit available for rebar size ϕ 8 - ϕ 28.
3) Roughening tools are available for rebar size ϕ 14 - ϕ 28.

Minimum anchorage length and minimum lap length

The minimum anchorage length $\ell_{b,min}$ and the minimum lap length $\ell_{0,min}$ according to EN 1992-1-1 shall be multiplied by relevant **Amplification factor α_{lb}** in the table below.

Amplification factor α_{lb} for the min. anchorage length and min. lap length:

Hammer drilled holes, hammer drilled holes with hollow drill bit[1)] and diamond cored with Hilti roughening tool TE-YRT[2)]

Rebar size	α_{lb} [-] according to ETA 21/0624, issued 2022-12-16								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ 8 - ϕ 40	1,5								

1) Hilti hollow drill bit available for rebar size ϕ8-ϕ28.
2) Roughening tools are available for rebar size ϕ14-ϕ28.

Anchorage length for characteristic steel strength f_{yk} = 500 N/mm² for good conditions

Hammer drilling							
Rebar-size	Concrete class	$f_{bd,PIR}$ [N/mm²]	$l_{0,min}$ 1) [mm]	$l_{b,min}$ 2) [mm]	$l_{bd,y,\alpha2=1}$ 3) [mm]	$l_{bd,y,\alpha2=0.7}$ 4) [mm]	l_{max} 5) [mm]
ϕ 8	C20/25	1.6	367	245	543	380	1000
	C50/60	1.6	367	245	543	380	1000
ϕ 10	C20/25	2.0	367	245	543	380	1000
	C50/60	2.0	367	245	543	380	1000
ϕ 12	C20/25	2.3	383	255	567	397	1200
	C50/60	2.3	383	255	567	397	1200
ϕ 14	C20/25	2.3	447	298	662	463	1400
	C50/60	2.3	447	298	662	463	1400
ϕ 16	C20/25	2.3	510	340	756	529	1600
	C50/60	2.7	435	290	644	451	1600
ϕ 18	C20/25	2.3	574	383	851	595	1800
	C50/60	2.7	489	326	725	507	1800
ϕ 20	C20/25	2.3	638	425	945	662	2000
	C50/60	2.7	543	362	805	564	2000
ϕ 22	C20/25	2.3	702	468	1040	728	2200
	C50/60	2.7	598	399	886	620	2200
ϕ 24	C20/25	2.3	766	510	1134	794	2400
	C50/60	2.7	652	435	966	676	2400
ϕ 25	C20/25	2.3	797	532	1181	827	2500
	C50/60	2.7	679	453	1006	705	2500
ϕ 26	C20/25	2.3	829	553	1229	860	2500
	C50/60	2.3	829	553	1229	860	2500
ϕ 28	C20/25	2.3	893	595	1323	926	2500
	C50/60	2.3	893	595	1323	926	2500
ϕ 30	C20/25	2.3	957	638	1418	992	2500
	C50/60	2.3	957	638	1418	992	2500
ϕ 32	C20/25	2.3	1021	681	1512	1059	2500
	C50/60	2.3	1021	681	1512	1059	2500
ϕ 34	C20/25	2	1247	832	1848	1293	2500
	C50/60	2	1247	832	1848	1293	2500
ϕ 36	C20/25	1.9	1390	927	2059	1442	2500
	C50/60	1.9	1390	927	2059	1442	2500
ϕ 40	C20/25	2.1	1398	932	2070	1449	2500
	C50/60	2.1	1398	932	2070	1449	2500

1) Minimum anchorage length for overlap join in case of: α_6 = 1,5
2) Minimum anchorage length for simply supported connections
3) Anchorage length for simply supported connections in case of: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 1$. - (design for yielding)
4) Anchorage length for simply supported connections in case of: $\alpha_1 = \alpha_3 = \alpha_4 = \alpha_5 = 1$; $\alpha_2 = 0.7$ - (design for yielding)
5) Maximum feasible embedment depth due to mortar installation limitations.

Seismic design acc. to EN 1998-1

Design bond strength $f_{bd,PIR,seis}$ in N/mm^2 for good bond conditions for working life of 50 and 100 years[1)]

For hammer drilled holes:

Rebar size	$f_{bd,PIR,seis}$ [N/mm²] according to ETA 21/0624, issued 2022-12-16							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ 12 to ϕ 32	2,0	2,3						
ϕ 40	1,8							

1) For poor bond conditions multiply the values by 0,7.

Minimum anchorage length and minimum lap length

The minimum anchorage length $\ell_{b,min}$ and the minimum lap length $\ell_{0,min}$ according to EN 1992-1-1 shall be multiplied by relevant **Amplification factor α_{lb}** in the table below.

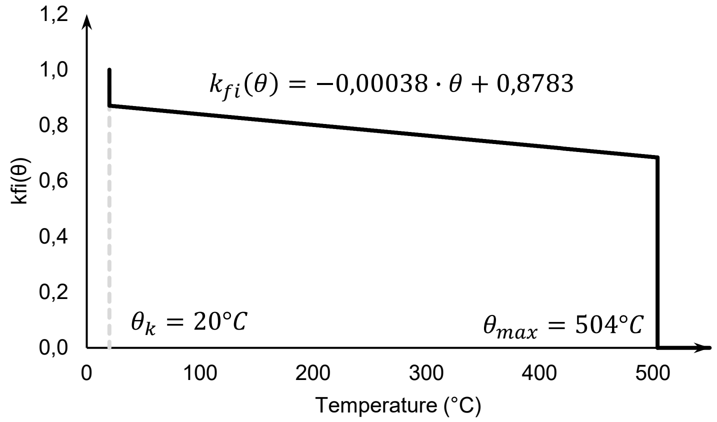
Amplification factor α_{lb} for the min. anchorage length and min. lap length:

For hammer drilled holes:

Rebar size	α_{lb} [-] according to ETA 21/0624, issued 2022-12-16							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ 12 to ϕ 40	1,5							

Fire resistance

Example graph of temperature reduction factor $k_{fi}(\theta)$ for concrete class C20/25 for good bond conditions according to ETA-21/0624 for working life of 50 and 100 years[1)]



The design value of the bond resistance $f_{bd,fi}$ under fire exposure has to be calculated by the following equation:

$$f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd,PIR} \cdot \frac{\gamma_c}{\gamma_{M,fi}}$$ for a working life of 50 years

$$f_{bd,fi,100y} = k_{b,fi,100y}(\theta) \cdot f_{bd,PIR,100y} \cdot \frac{\gamma_c}{\gamma_{M,fi}}$$ for a working life of 100 years

with $\theta \leq 504°C$:

$$k_{b,fi}(\theta) = \frac{-0{,}0038 \cdot \theta + 8{,}6867}{f_{bd,PIR} \cdot 4{,}3} \leq 1{,}0$$ for a working life of 50 years

$$k_{b,fi,100y}(\theta) = \frac{-0{,}0038 \cdot \theta + 8{,}6867}{f_{bd,PIR,100y} \cdot 4{,}3} \leq 1{,}0$$ for a working life of 100 years

$\theta > 504°C$: $k_{b,fi}(\theta) = k_{b,fi,100y}(\theta) = 0{,}0$

$f_{bd,fi}$	Design value of the bond strength in case of fire in N/mm² for a working life of 50 years.
$f_{bd,fi,100y}$	Design value of the bond strength in case of fire in N/mm² for a working life of 100 years.
(θ)	Temperature in °C in the mortar layer.
θ_{max}	Temperature in °C at which the mortar can no longer transfer bond stresses
$k_{b,fi}(\theta)$	Reduction factor under fire exposure for a working life of 50 years.
$k_{b,fi,100y}(\theta)$	Reduction factor under fire exposure for a working life of 100 years.
$f_{bd,PIR}$	Design value of the bond strength in N/mm² in cold condition according to Table C3 or Table C6 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1 for a working life of 50 years.
$f_{bd,PIR,100y}$	Design value of the bond strength in N/mm² in cold condition according to Table C3 or Table C6 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1 for a working life of 100 years.
γ_c	Partial factor according to EN 1992-1-1.
$\gamma_{M,fi}$	Partial factor according to EN 1992-1-2.

For evidence under fire exposure the anchorage length shall be calculated according to EN 1992-1- 1:2004+AC:2010 Equation 8.3 using the temperature-dependent bond resistance $f_{bd,fi}$.

Materials

Material quality

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

Fitness for use

Some creep tests have been conducted in accordance with EAD 330087 in the following conditions: **in dry environment at 100 °C for 180 days**.
These tests show an excellent behaviour of the post-installed connection made with HIT-FP 700 R: low displacements with long term stability, failure load after exposure above reference load.

Setting information

Installation temperature
+5 °C to +40 °C

Service temperature range
Hilti HIT-FP 700 R 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 +160 °C	+100 °C	+160 °C

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

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

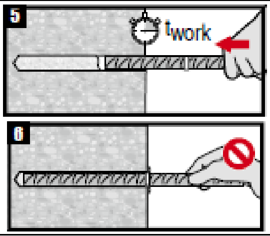
Working time, assembly, pre-loading time and curing time[1)]

Temperature in the base material	Maximum working time	Assembly time	Pre-loading time	Minimum curing time
T [°C]	t_{work}	$t_{assembly}$	$t_{pre\text{-}loading}$	t_{cure}
5 ≤ T ≤ 10	50 min	36 hours	14 days	50 days
10 < T ≤ 15	40 min	30 hours	7 days	28 days
15 < T ≤ 20	35 min	24 hours	6 days	18 days
20 < T ≤ 30	20 min	12 hours	5 days	10 days
30 < T < 40	15 min	6 hours	3 days	7 days
40	12 min	3 hours	2 days	4 days

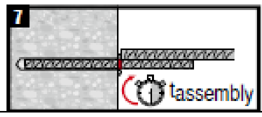
1) The minimum temperature of the foil pack is +5 °C.

Working time, assembly, pre-loading time and curing time definition

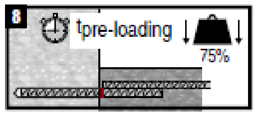
t_{work}: describes the working time, or the period in which the mortar has not yet solidified and in which the user can insert the rebar. The working time ranges from a maximum of 50 minutes at 5°C to a minimum of 12 minutes at 40°C. The long working time allows an easy setting for deep embedment. Once the rebar is inserted it must not be moved.



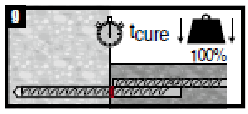
$t_{assembly}$: when t_{work} has passed, $t_{assembly}$ indicates the minimum waiting time before tying new rebars to the installed/set ones or pouring new concrete is allowed.



$t_{pre\text{-}loading}$: It is the minimum waiting time needed before 75% of the final load can be applied to the set rebar. The $t_{pre\text{-}loading}$ is provided as additional guidance. However, the Engineer of Record must use their engineering judgment to decide whether or not pre-loading can be done prior to reaching the full curing time.



t_{cure}: the full curing time has passed and the full design load can be applied to the rebar.

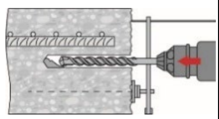


Installation equipment

Rebar size	**ϕ 8**	**ϕ 10**	**ϕ 12**	**ϕ 13**	**ϕ 14**	**ϕ 16**	**ϕ 18**	**ϕ 20**	**ϕ 24**	**ϕ 25**	**ϕ 28**	**ϕ 32**	**ϕ 34**	**ϕ 36**	**ϕ 40**
Rotary hammer	TE 2(-A) – TE 30(-A)						TE 30 – TE 80								
Other tools	Blow out pump ($h_{ef} \le 10 \cdot d$)						-								
	Compressed air gun [a] Set of cleaning brushes [b], dispenser, piston plug Roughening tools														

a) Compressed air gun with extension hose for all drill holes deeper than 250 mm (for ϕ 8 to ϕ 12) or deeper than 20·ϕ (for ϕ > 12 mm).
b) Automatic brushing with round brush for all drill holes deeper than 250 mm (for ϕ 8 to ϕ 12) or deeper than 20·ϕ (for ϕ > 12 mm.

Minimum concrete cover c_{min} of the post-installed rebar

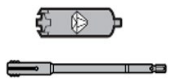
Drilling method	**Rebar size**	**Minimum concrete cover c_{min} [mm]**		
		Without drilling aid	**With drilling aid**	
Hammer drilling **(HD)** and **(HDB)** [c]	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \ge 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \ge 2 \cdot \phi$	
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \ge 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \ge 2 \cdot \phi$	
Diamond coring with Roughening tool TE-YRT **(RT)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \ge 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \ge 2 \cdot \phi$	
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \ge 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \ge 2 \cdot \phi$	

c) HDB = hollow drill bit Hilti TE-CD and TE-YD
Comments: The minimum concrete cover acc. EN 1992-1-1 must be observed.

Dispenser and corresponding maximum embedment depth $\ell_{v,max}$

Rebar Size	HDM 500	HDE 500
	$\ell_{v,max}$ [mm]	
ϕ 8 - ϕ 10	1000	1000
ϕ 12		1200
ϕ 14		1400
ϕ 16		1600
ϕ 18		1800
ϕ 20	1400	2000
ϕ 22		2200
ϕ 24		2400
ϕ 25	1500	2500
ϕ 26	1200	
ϕ 30		
ϕ 32		
ϕ 36	900	
ϕ 40	500	

Drilling diameters

Rebar size	Hammer drill (HD)	Hollow Drill Bit (HDB) [b]	Diamond coring with roughening tool (RT)
	d_0 [mm]		
			
ϕ 8	12 (10 [a])	12	-
ϕ 10	14 (12 [a])	14 (12 [a])	-
ϕ 12	16 (14 [a])	16 (14 [a])	-
ϕ 14	18	18	18
ϕ 16	20	20	20
ϕ 18	22	22	22
ϕ 20	25	25	25
ϕ 22	28	28	28
ϕ 24	32 (30 [a])	32	32
ϕ 25	32 (30 [a])	32	32
ϕ 26	35	35	35
ϕ 28	35	35	35
ϕ 30	37	-	-
ϕ 32	40	-	-
ϕ 34	45	-	-
ϕ 36	45	-	-
ϕ 40	55	-	-

[a] Each of two given values can be used.
[b] No cleaning required.

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

Installation parameters for use of the Hilti Roughening tool TE-YRT

	Roughening time $t_{roughen}$	Minimum blowing time $t_{blowing}$
l_v [mm]	**$t_{roughen}$ [sec] = l_v [mm] / 10**	**$t_{blowing}$ [sec] = $t_{roughen}$ [sec] + 20**
0 to 100	10	30
101 to 200	20	40
201 to 300	30	50
301 to 400	40	60
401 to 500	50	70
501 to 600	60	80
> 600	$t_{roughen}$ [sec] = l_v [mm] / 10	$t_{blowing}$ [sec] = $t_{roughen}$ [sec] + 20

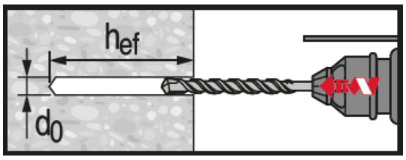
Setting instructions

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

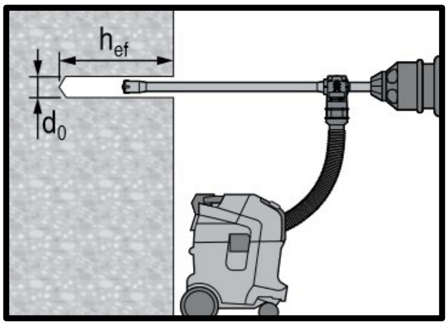
Safety regulations.

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-FP 700 R.

Drilling

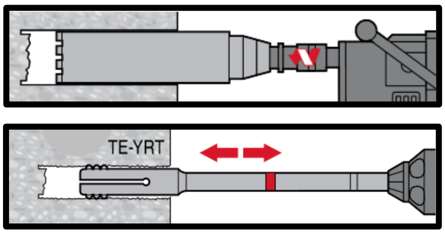


Hammer drilled hole (HD)



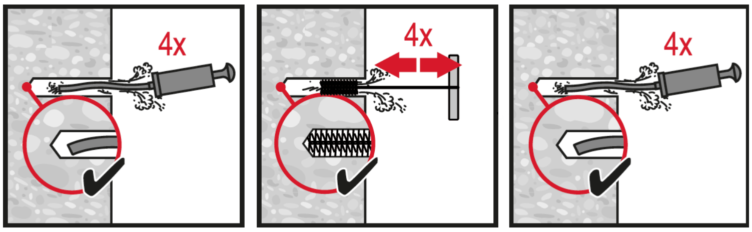
Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required.



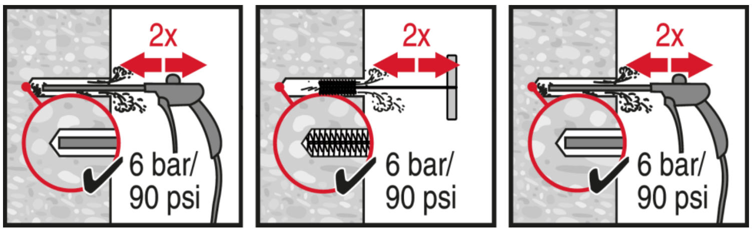
Diamond Drilling + Roughening Tool (DD+RT)

Cleaning (Inadequate hole cleaning=poor load values.)



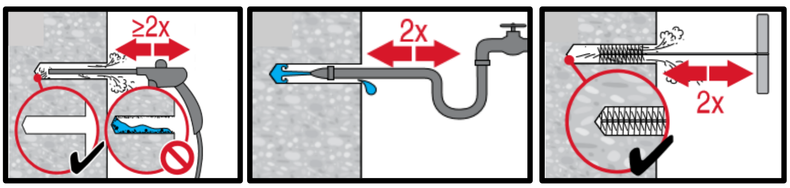
Hammer Drilling:

Manual cleaning (MC)
For drill diameters $d_0 \leq 20$ mm and drill hole depth $h_0 \leq 10 \cdot d$.



Hammer Drilling:

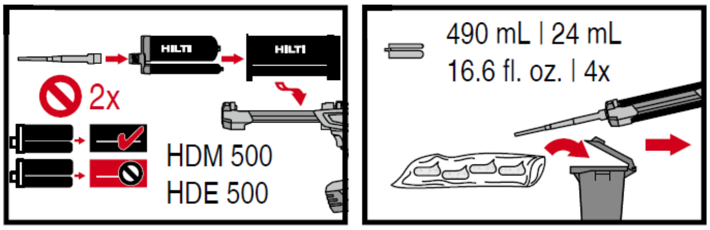
Compressed air cleaning (CAC)
For ϕ 8 to ϕ 12 and drill hole depths $\leq$ 250 mm or $\phi > 12$ mm and drill hole depths $\leq 20 \cdot \phi$.



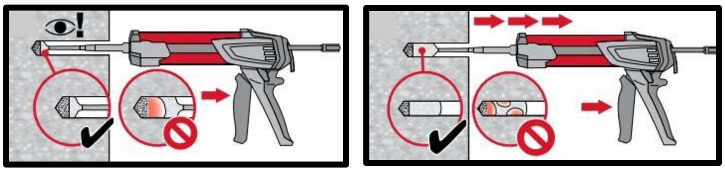
Diamond cored holes with Hilti roughening tool TE-YRT:

For all drill hole diameters d_0 and drill hole depths.

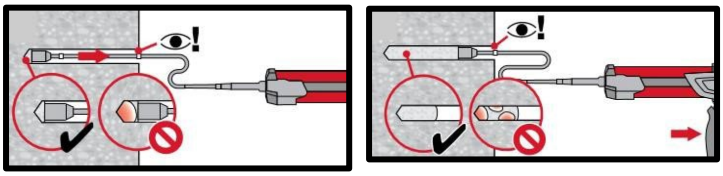
Injection preparation



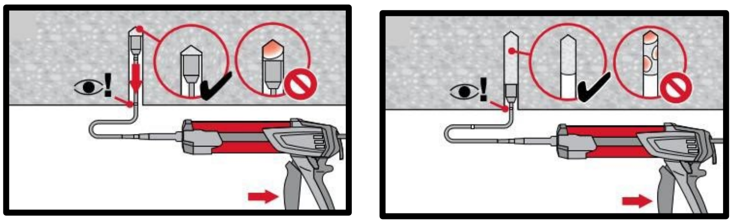
Injection system preparation.



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

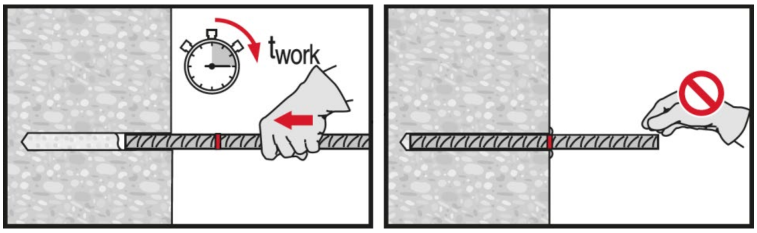


Injection method for drill hole depth $h_{ef} > 250$mm.

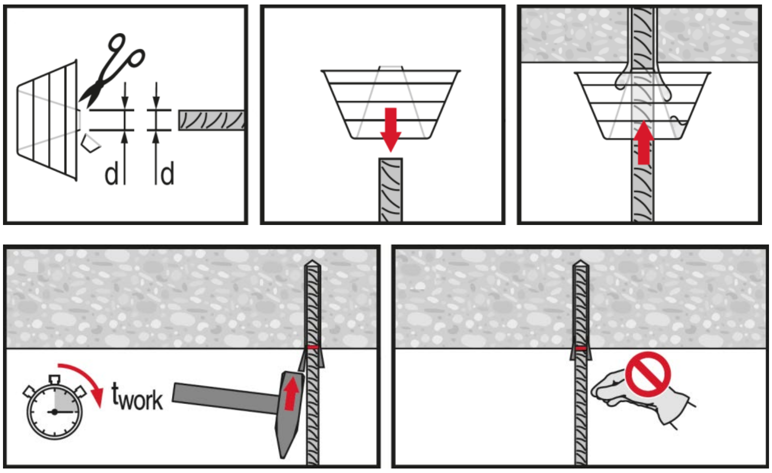


Injection method for overhead application.

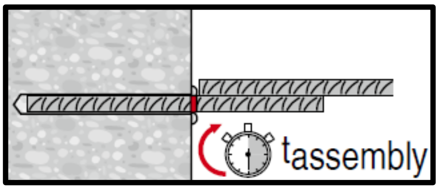
Setting the element



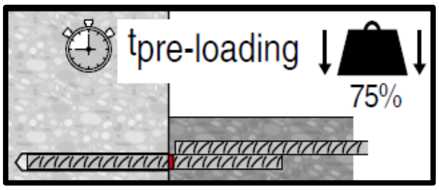
Setting element, observe working time "t_{work}".



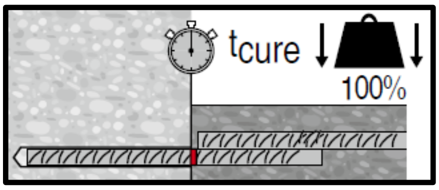
Setting element for overhead applications, observe working time "t_{work}".



Setting new rebars or pouring new concrete only after assembly time "$t_{assembly}$"



Apply 75% of full load only after curing time "$t_{pre-loading}$".



Apply full load only after curing time "t_{cure}".