HIT-RE 500 V4 injection mortar

Rebar design (EN 1992-1-1, HIT Rebar method, EOTA TR 069) / Rebar elements / Concrete

Injection mortar system

Foil pack: HIT-RE 500 V4

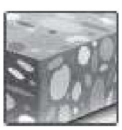
(available in 330, 500 and 1400 ml cartridges)

Rebar
(ϕ8 - ϕ40)

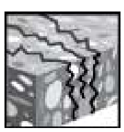
Benefits

- SafeSet technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Allows the design of post-installed, moment-resisting reinforced concrete connections under static loading conditions without using a splice configuration according to TR 069
- Suitable for concrete C 12/15 to C 50/60
- ETA Data for 100y service life
- High loading capacity
- Suitable for dry and water saturated concrete
- Non-corrosive to rebar elements
- Long working time at elevated temperatures
- Cures down to -5 °C
- Odourless epoxy

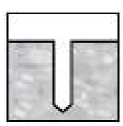
Base material



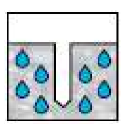
Concrete (non-cracked)



Concrete (cracked)

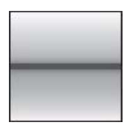


Dry concrete



Wet concrete

Load conditions



Static/ quasi-static

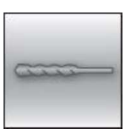
Seismic*

Fire resistance

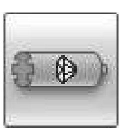
100 YEARS

Service life 100y, ETA

Installation conditions



Hammer drilling



Diamond coring

SAFESET

Hilti **SafeSet** technology

Other informations

European Technical Assessment

CE conformity

PROFIS Rebar design Software

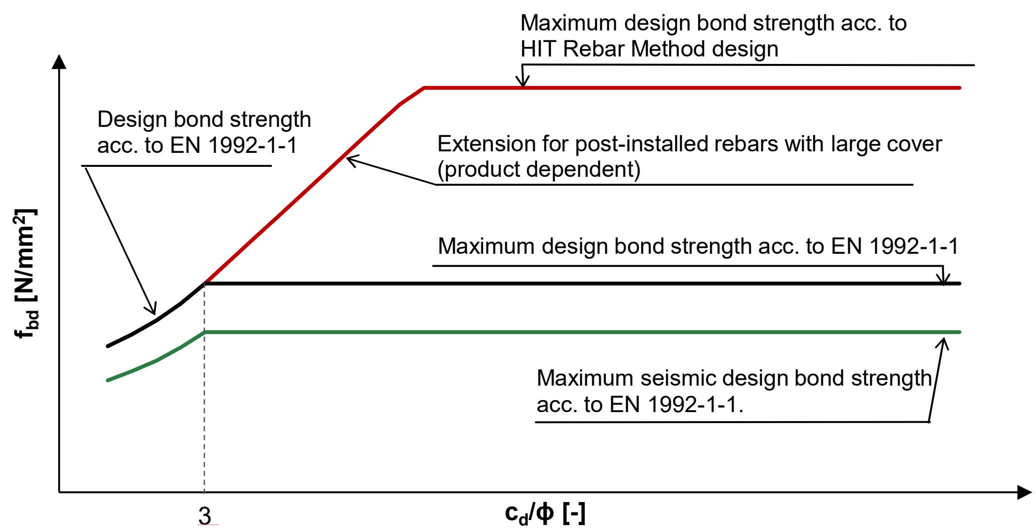
*only for EN 1992-1-1 design

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [a]	CSTB, Marne la Vallée	ETA-20/0539 / 2021-07-09
European technical assessment [b]	CSTB, Marne la Vallée	ETA-20/0540 / 2021-07-09

[a] All data given in this section according to ETA-20/0539 issue 2021-07-09 (if not stated otherwise).
[b] All data given in this section according to ETA-20/0540 issue 2021-07-09 (if not stated otherwise).

Static and quasi-static loading



Effective limit on bond stress for post-installed rebar using Hilti mortar systems and design bond strength values acc. to EN 1992-1-1 and HIT Rebar Method.

Static design acc. to EN 1992-1-1 (small concrete cover)

Design bond strength 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	ETA 20/0540, issued 2021-07-09								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ32	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
ϕ34	1,6	2,0	2,3	2,6	2,9	3,3	3,6	3,9	4,2
ϕ36	1,6	1,9	2,2	2,6	2,9	3,2	3,5	3,8	4,1
ϕ40	1,5	1,8	2,1	2,5	2,8	3,1	3,4	3,7	3,9

1) For poor bond conditions multiply the values by 0,7.
2) Hilti hollow drill bit available for element size ϕ10-ϕ28.
3) Roughening tools are available for element size ϕ14-ϕ28.

For diamond cored holes (wet):

Rebar size	ETA 20/0540, issued 2021-07-09								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
ϕ14 - ϕ 16	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7
ϕ18 - ϕ32	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4
ϕ34	1,6	2,0	2,3	2,6	2,9	3,3	3,3	3,3	3,3
ϕ36	1,6	1,9	2,2	2,6	2,9	3,2	3,2	3,2	3,2
ϕ40	1,5	1,8	2,1	2,5	2,8	2,8	2,8	2,8	2,8

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

Increasing factors in concrete

<table>
<tr><th rowspan="3">Drilling method</th><th rowspan="3">Concrete class</th><th colspan="12">ETA 20/0540, issued 2021-07-09</th></tr>
<tr><th colspan="12">Rebar size</th></tr>
<tr><th>ϕ8</th><th>ϕ10</th><th>ϕ12</th><th>ϕ14</th><th>ϕ16</th><th>ϕ20</th><th>ϕ25</th><th>ϕ28</th><th>ϕ30</th><th>ϕ32</th><th>ϕ36</th><th>ϕ40</th></tr>
<tr><td rowspan="3">Hammer drilled holes
Hammer drilled holes with hollow drill bit
Diamond cored holes</td><td>C30/37</td><td colspan="12">1,04</td></tr>
<tr><td>C40/50</td><td colspan="12">1,07</td></tr>
<tr><td>C50/60</td><td colspan="12">1,09</td></tr>
<tr><td>Diamond cored holes with roughening tool</td><td>C30/37 - C50/60</td><td colspan="3">-</td><td colspan="7">1,0</td><td colspan="2">-</td></tr>
</table>

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)]

<table>
<tr><th rowspan="3">Rebar size</th><th colspan="9">ETA 20/0540, issued 2021-07-09</th></tr>
<tr><th colspan="9">Concrete class</th></tr>
<tr><th>C12/15</th><th>C16/20</th><th>C20/25</th><th>C25/30</th><th>C30/37</th><th>C35/45</th><th>C40/50</th><th>C45/55</th><th>C50/60</th></tr>
<tr><td>ϕ8 - ϕ40</td><td colspan="9">1,0</td></tr>
</table>

1) Hilti hollow drill bit available for element size ϕ10-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Diamond cored holes (wet)

<table>
<tr><th rowspan="3">Rebar size</th><th colspan="9">ETA 20/0540, issued 2021-07-09</th></tr>
<tr><th colspan="9">Concrete class</th></tr>
<tr><th>C12/15</th><th>C16/20</th><th>C20/25</th><th>C25/30</th><th>C30/37</th><th>C35/45</th><th>C40/50</th><th>C45/55</th><th>C50/60</th></tr>
<tr><td>ϕ8 - ϕ12</td><td colspan="9">1,0</td></tr>
<tr><td>ϕ14 - ϕ36</td><td colspan="9">Linear interpolation between diameters</td></tr>
<tr><td>ϕ40</td><td>1,0</td><td>1,0</td><td>1,0</td><td>1,0</td><td>1,2</td><td>1,3</td><td>1,4</td><td>1,4</td><td>1,4</td></tr>
</table>

Static design acc. to HIT Rebar method (large concrete cover)

Pullout design bond strength [$f_{bd,po} = \tau_{Rk,ucr}/\gamma_{Mp}$] in N/mm² for good bond conditions for 50 years[1)2)]

For hammer drilled holes, hammer drilled holes with hollow drill bit[3)] and diamond cored with Hilti roughening tool TE-YRT[4)]:

Rebar size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete C20/25	6,7	10,0	10,0	10,0	10,0	9,3	9,3	9,3	8,7	8,7	6,1	5,6
Cracked concrete C20/25	3,7	6,7	8,0	8,0	8,0	8,0	7,3	7,3	7,3	7,3	-	-

1) For poor bond conditions multiply the values by 0,7.
2) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).
3) Hilti hollow drill bit available for element size ϕ10-ϕ28.
4) Roughening tools are available for element size ϕ14- ϕ28.

For diamond cored holes:

Rebar size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete C20/25	5,3	5,3	5,3	5,3	4,5	4,5	4,5	4,8	4,8	4,8	-	-
Cracked concrete C20/25	-	-	-	-	-	-	-	-	-	-	-	-

1) For poor bond conditions multiply the values by 0,7.
2) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).

Pullout design bond strength [$f_{bd,po} = \tau_{Rk,ucr}/\gamma_{Mp}$] in N/mm² for good bond conditions for 100 years[1)2)]

For hammer drilled holes, hammer drilled holes with hollow drill bit[3)] and diamond cored with Hilti roughening tool TE-YRT[4)]:

Rebar size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete C20/25	6,7	10,0	10,0	10,0	10,0	9,3	9,3	9,3	8,7	8,7
Cracked concrete C20/25	1,7	5,0	5,3	5,3	5,3	5,0	5,0	5,0	4,7	4,7

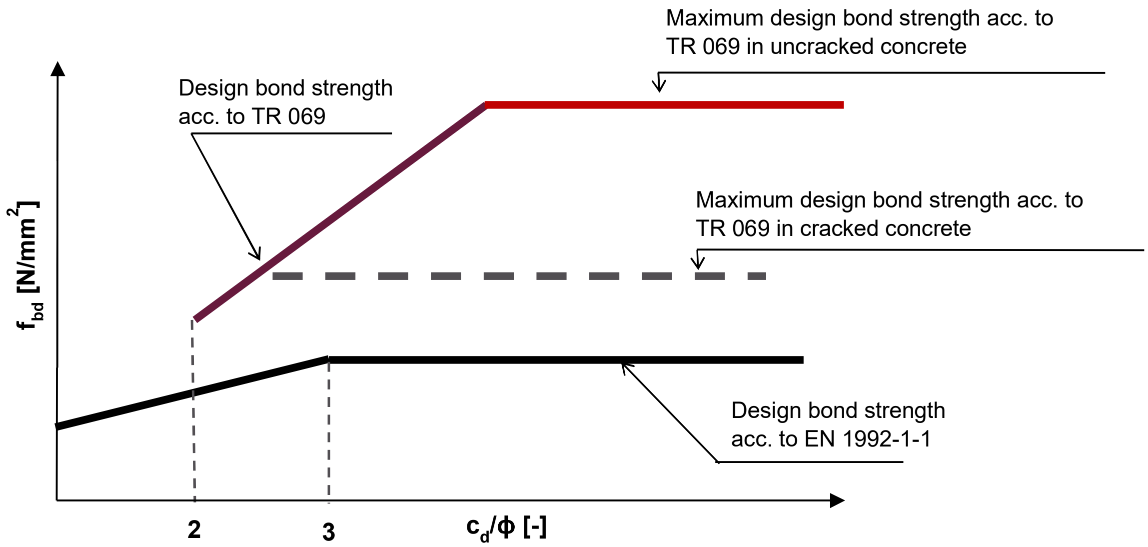
1) For poor bond conditions multiply the values by 0,7.
2) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).
3) Hilti hollow drill bit available for element size ϕ10-ϕ28.
4) Roughening tools are available for element size ϕ14- ϕ28.

For diamond cored holes:

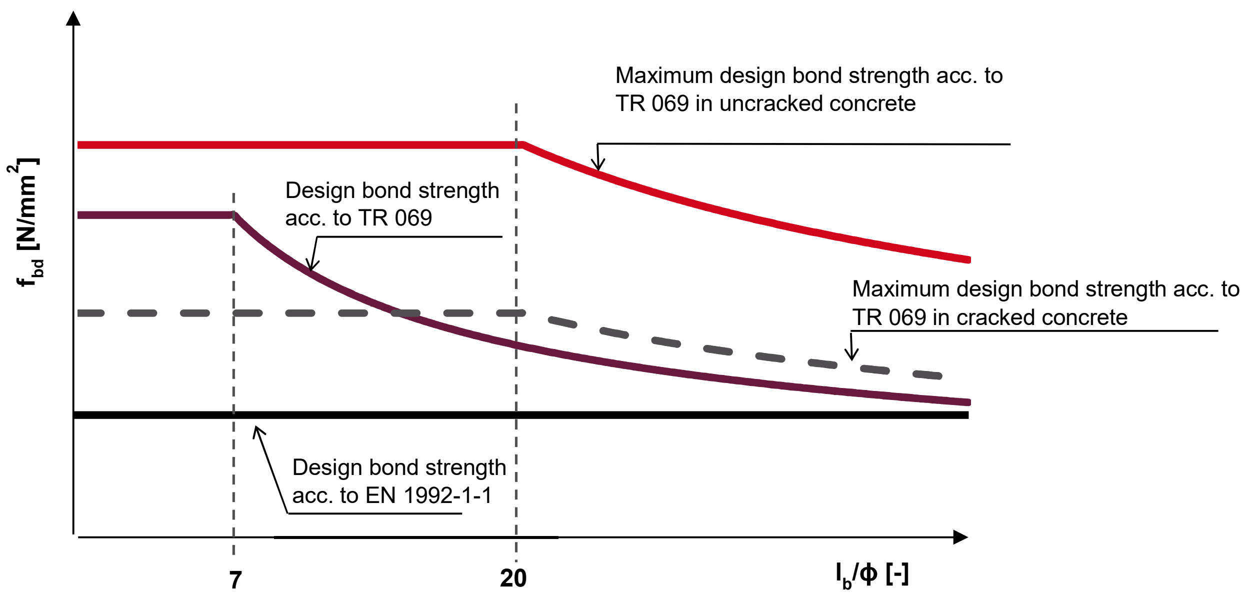
Rebar size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete C20/25	5,0	5,0	5,0	5,0	4,3	4,3	4,3	4,5	4,5	4,5
Cracked concrete C20/25	-	-	-	-	-	-	-	-	-	-

1) For poor bond conditions multiply the values by 0,7.
2) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).

Static design acc. to EOTA TR 069



Influence of concrete cover/ rebar diameter on the design bond strength values for post-installed rebar acc. to TR 069 and EN 1992-1-1.



Influence of anchorage length/ rebar diameter on the design bond strength values for post-installed rebar acc. to TR 069 and EN 1992-1-1.

Characteristic bond-splitting resistance according to EOTA TR 069 (for 7ϕ ≤ l_b ≤ 20ϕ) for a working life of 50 and 100 years:

$$\tau_{Rk,sp} = A_k \cdot \left(\frac{f_{ck}}{25}\right)^{sp1} \cdot \left(\frac{25}{\phi}\right)^{sp2} \cdot \left[\left(\frac{c_d}{\phi}\right)^{sp3} \cdot \left(\frac{c_{max}}{c_d}\right)^{sp4} + k_m \cdot K_{tr}\right] \cdot \left(\frac{7\phi}{l_b}\right)^{lb1} \cdot \Omega_{p,tr} \leq \tau_{Rk,ucr} \cdot \Omega_{cr} | \Omega_{p,tr} \cdot \psi_{sus}$$

$\tau_{Rk,sp}$	= characteristic bond-splitting resistance in [N/mm²] (service life 50 or 100 years).
f_{ck}	= characteristic cylinder concrete compressive strength in [N/mm²].
ϕ	= rebar diameter in [mm].
c_d	= min. clear concrete cover in [mm].
c_{max}	= max. clear concrete cover in [mm].
k_m	= factor of effectiveness of transverse reinforcement.
K_{tr}	= normalized ratio of transverse reinforcement.
l_b	= effective embedment length of the rebar [mm].
$\Omega_{p,tr}$	= factor to account for transverse pression in concrete.
ψ_{sus}	= factor to account for effect of sustained loads on the bond strength acc. to EN 1992-4. Hammer drilled holes, hammer drilled holes with hollow drill bit and diamond cored holes with Hilti roughening tool: ψ^0_{sus} = 0,88 (recommendation: $\psi^0_{sus,100}$ = 0,6).

$\tau_{Rk,ucr}$ or $\tau_{Rk,100,ucr}$, A_k, $sp1$, $sp2$, $sp3$, $sp4$, $lb1$ and Ω_{cr} given in Table below.

Design parameter for working 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		**ETA 20/0539, issued 2021-07-09**													
		ϕ8	**ϕ10**	**ϕ12**	**ϕ13**	**ϕ14**	**ϕ16**	**ϕ18**	**ϕ20**	**ϕ22**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Combined pullout and concrete cone failure in non-cracked concrete C20/25															
Characteristic resistance $\tau_{Rk,ucr}$	[N/mm²]	10	15	15	15	15	15	14	14	14	14	14	14	13	13
Characteristic resistance $\tau_{Rk,100,ucr}$	[N/mm²]	10	15	15	15	15	15	14	14	14	14	14	14	13	13
Bond-splitting failure															
Product basic factor A_k	[-]	4,2													
Exponent for influence of concrete compressive strength sp1	[-]	0,35													
Exponent for influence of rebar diameter ϕ sp2	[-]	0,19													
Exponent for influence of concrete cover sp3	[-]	0,67													
Exponent for influence of side concrete cover sp4	[-]	0,33													
Exponent for influence of anchorage length lb1	[-]	0,60													
Influence of cracked concrete on combined pullout and concrete cone failure															
Factor for influence of cracked concrete Ω_{cr}	[-]	1,00	0,94	0,90	0,89	0,87	0,85	0,82	0,80	0,79	0,77	0,76	0,74	0,73	0,72

1) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).
2) Hilti hollow drill bit available for element size ϕ10-ϕ28.
3) Hilti Roughening tools are available for element size ϕ14-ϕ28.

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

For hammer drilled holes and hammer drilled holes with hollow drill bit[1]:

Rebar size	Concrete class	f_{bd} [N/mm²]	$f_{bd,po}$ [N/mm²]	$l_{0,min}$[2] [mm]	$l_{b,min}$[3] [mm]	$l_{bd,\alpha2=1}$[4] [mm]	$l_{bd,\alpha2=0.7}$[5] [mm]	$l_{bd,HRM,\ \alpha2<0,7}$[6] [mm]	l_{max}[7] [mm]
ϕ8	C20/25	2,3	6,7	200	113	378	265	130	1000
	C50/60	4,3	7,3	200	100	202	142	119	1000
ϕ10	C20/25	2,3	10,0	213	142	473	331	109	1000
	C50/60	4,3	10,9	200	100	253	177	100	1000
ϕ12	C20/25	2,3	10,0	255	170	567	397	131	1200
	C50/60	4,3	10,9	200	120	303	212	120	1200
ϕ14	C20/25	2,3	10,0	298	198	662	463	152	1400
	C50/60	4,3	10,9	210	140	354	248	140	1400
ϕ16	C20/25	2,3	10,0	340	227	756	529	174	1600
	C50/60	4,3	10,9	240	160	404	283	160	1600
ϕ20	C20/25	2,3	9,3	435	284	945	662	234	2000
	C50/60	4,3	10,1	300	200	506	354	215	2000
ϕ25	C20/25	2,3	9,3	532	354	1181	827	292	2500
	C50/60	4,3	10,1	375	250	632	442	268	2500
ϕ28	C20/25	2,3	9,3	595	397	1323	926	327	2800
	C50/60	4,3	10,1	420	280	708	495	300	2800
ϕ30	C20/25	2,3	8,7	638	425	1418	992	375	3000
	C50/60	4,3	9,5	450	300	758	531	344	3000
ϕ32	C20/25	2,3	8,7	681	454	1512	1059	400	3200
	C50/60	4,3	9,5	480	320	809	566	367	3200
ϕ36	C20/25	2,2	6,1	534	540	1779	1245	642	3200
	C50/60	3,2	6,6	367	540	1223	856	589	3200
ϕ40	C20/25	2,1	5,6	621	621	2070	1449	777	3200
	C50/60	2,8	6,1	466	600	1553	1087	713	3200

1) Hilti hollow drill bit available for element size ϕ10-ϕ28.
2) Minimum anchorage length for overlap joint.
3) Minimum anchorage length for simply supported connections
4) Anchorage length for simply supported connections in case of: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 1$ - (design for yielding).
5) 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).
6) Anchorage length with HIT Rebar design Method (HRM) for simply supported connections in case of: $\alpha_1 = \alpha_3 = \alpha_4 = \alpha_5 = 1$; $\alpha_2 < 0,7$. Only if an adequate concrete cover is applied.
7) Maximum feasible embedment depth due to mortar installation limitations.

Seismic loading

Design bond strength according to in N/mm² for good bond conditions for working 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	ETA-20/0540, issued 2021-07-09							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ32	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
ϕ34	2,0	2,3	2,6	2,9	3,3	3,6	3,9	4,2
ϕ36	1,9	2,2	2,6	2,9	3,2	3,5	3,8	4,1
ϕ40	1,8	2,1	2,5	2,8	3,1	3,4	3,7	3,9

1) For poor bond conditions multiply the values by 0,7.
2) Hilti hollow drill bit available for element size ϕ10-ϕ28.
3) Hilti Roughening tools are available for element size ϕ14-ϕ28.

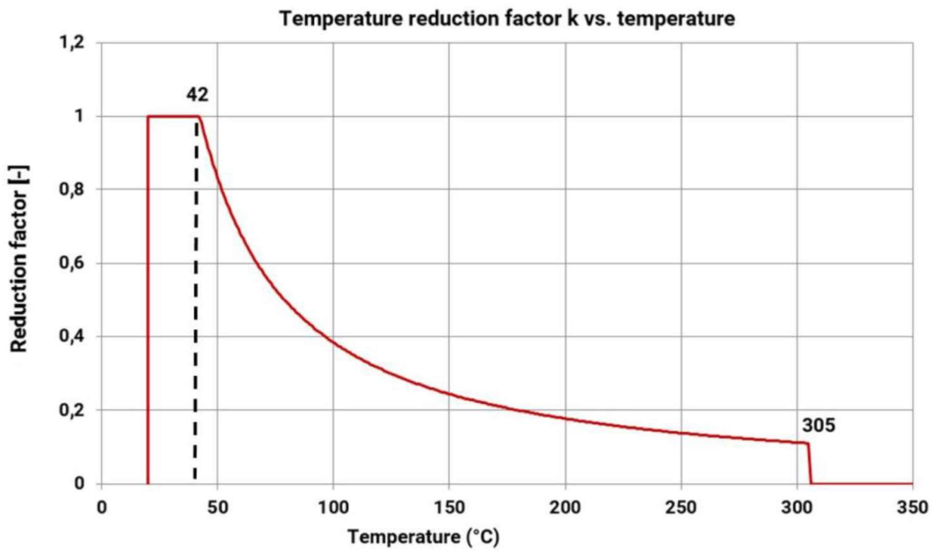
For diamond cored holes:

Rebar size	ETA-20/0540, issued 2021-07-09							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ12	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
ϕ13 - ϕ32	2,0	2,3	2,7	3,0	3,3	3,4	3,4	3,4
ϕ34	1,9	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ36	1,9	2,2	2,2	2,2	2,2	2,2	2,2	2,2
ϕ40	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.

Fire resistance

Temperature reduction factor $k_{fi}(\theta)$ for concrete class C20/25 for good bond conditions according to ETA-20/0540 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 $\theta \leq 305$°C:

$$k_{b,fi}(\theta) = \frac{651{,}24 \cdot \theta^{-1{,}115}}{f_{bd,PIR} \cdot 4{,}3} \leq 1{,}0$$ for a working life of 50 years

$$k_{b,fi,100y}(\theta) = \frac{651{,}24 \cdot \theta^{-1{,}115}}{f_{bd,PIR,100y} \cdot 4{,}3} \leq 1{,}0$$ for a working life of 100 years

$\theta > 305$°C: $$k_{b,fi}(\theta) = k_{b,fi,100y}(\theta) = 0{,}0$$

$f_{bd,fi,50y}$	= Design value of the bond resistance in case of fire in N/mm² (service life 50 years).
$f_{bd,fi,100y}$	= Design value of the bond resistance in case of fire in N/mm² (service life 100 years).
(θ)	= Temperature in °C in the mortar layer.
$k_{b,fi}(\theta)$	= Reduction factor under fire exposure.
$k_{b,fi,100y}(\theta)$	= Reduction factor under fire exposure for a working life of 100 years.
$f_{bd,PIR}$	= Design value of the bond resistance in N/mm² in cold condition according to Table C3 or C6 of ETA 20/0540 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1.
$f_{bd,PIR,100y}$	= 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 safety factor according to EN 1992-1-1
$\gamma_{M,fi}$	= Partial safety 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

Mechanical properties

Rebar size		$\phi 8$	$\phi 10$	$\phi 12$	$\phi 13$	$\phi 14$	$\phi 16$	$\phi 18$	$\phi 20$	$\phi 24$	$\phi 25$	$\phi 28$	$\phi 30$	$\phi 32$	$\phi 36$	$\phi 40$
Nominal tensile strength f_{uk}	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	[mm²]	50,3	78,5	113	133	154	201	254	314	452	491	616	707	804	1018	1257
Moment of resistance W	[mm³]	50,3	98,2	170	216	269	402	573	785	1357	1534	2155	2650	3217	4580	6283

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 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Fitness for use

Some creep tests have been conducted in accordance with EAD 330087 in the following conditions: **in dry environment at 50 °C during 90 days**.
These tests show an excellent behaviour of the post-installed connection made with HIT-RE 500 V4: low displacements with long term stability, failure load after exposure above reference load.

Resistance to chemical substances

Chemicals tested	Content (%)	Resistance
Toluene	47,5	+
Iso-octane	30,4	+
Heptane	17,1	+
Methanol	3	+
Butanol	2	+
Toluene	60	+
Xylene	30	+
Methylnaphthalene	10	+
Diesel	100	+
Petrol	100	+
Methanol	100	-
Dichloromethane	100	-
Mono-chlorobenzene	100	o
Ethylacetat	50	+
Methylisobutylketone	50	+
Salicylic acid-	50	+
Acetophenon	50	+
Acetic acid	50	-
Propionic acid	50	-
Sulfuric acid	100	-
Nitric acid	100	-
Hydrochloric acid	36	-
Potassium hydroxide	100	-

Chemical tested	Content (%)	Resistance
Sodium hydroxide 20%	100	-
Triethanolamine	50	-
Butylamine	50	-
Benzyl alcohol	100	-
Ethanol	100	-
Ethyl acetate	100	-
Methyl ethyl ketone (MEK)	100	-
Trichlorethylene	100	-
Lutensit TC KLC 50	3	+
Marlophen NP 9,5	2	+
Water	95	+
Tetrahydrofurane	100	-
Demineralized water	100	+
Salt water	saturated	+
Salt spray testing	-	+
SO_2	-	+
Enviroment/wheather	-	+
Oil for formwork (forming oil)	100	+
Concentrate plasticizer	-	+
Concrete potash solution	-	+
Concrete potash solution	-	+
Saturated suspension of borehole cuttings	-	+

+ Resistant
- Not resistant
o Partially Resistant

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

Service temperature range

Hilti HIT-RE 500 V4 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.

ETA-20/0540

Temperature range	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range I	-40 °C to +80 °C	+50 °C	+80 °C

ETA-20/0539

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 +55 °C	+43 °C	+55 °C
Temperature range III	-40 °C to +75 °C	+55 °C	+75 °C

Max. 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.

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[1)]

Temperature of the base material T[2)]	Working time in which rebar can be inserted and adjusted t_{gel}	Initial curing time $t_{cure,ini}$	Curing time before rebar can be fully loaded t_{cure}
5 °C ≤ T_{BM} < -1 °C	2 h	48 h	168 h
0 °C ≤ T_{BM} < 4 °C	2 h	24 h	48 h
5 °C ≤ T_{BM} < 9 °C	2 h	16 h	24 h
10 °C ≤ T_{BM} < 14 °C	1,5 h	12 h	16 h
15 °C ≤ T_{BM} < 19 °C	1 h	8 h	16 h
20 °C ≤ T_{BM} < 24 °C	30 min	4 h	7 h
25 °C ≤ T_{BM} < 29 °C	20 min	3,5 h	6 h
30 °C ≤ T_{BM} < 34 °C	15 min	3 h	5 h
35 °C ≤ T_{BM} < 39 °C	12 min	2 h	4,5 h
T_{BM} = 40 °C	10 min	2 h	4 h

1) The curing time data are valid for dry base material only. In wet base material, the curing times must be doubled.
2) The minimum temperature of the foil pack is +5° C.

Setting information

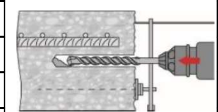
Installation equipment															
Rebar size	**ϕ8**	**ϕ10**	**ϕ12**	**ϕ13**	**ϕ14**	**ϕ16**	**ϕ18**	**ϕ20**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ32**	**ϕ34**	**ϕ36**	**ϕ40**
Rotary hammer	TE 2 (-A)– TE 40(-A)						TE40 – TE80								
Other tools	Blow out pump ($h_{ef} \leq 10 \cdot d$)						-								
	Compressed 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)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
Compressed air drilling **(CA)**	**ϕ < 25**	$50 + 0{,}08 \cdot l_v$	$50 + 0{,}02 \cdot l_v$
	ϕ ≥ 25	$60 + 0{,}08 \cdot l_v \geq 2 \cdot \phi$	$60 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
Diamond coring in wet **(PCC)** dry **(DD)**	**ϕ < 25**	Drill stand works like a drilling aid	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	ϕ ≥ 25		$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
Diamond coring with Roughening tool TE-YRT **(RT)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$



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

Rebar size	HDM 330, HDM 500	HDE 500	HIT-P8000D
	$\ell_{v,max}$ [mm]		
ϕ8	1000	1000	-
ϕ10		1000	-
ϕ12		1200	1200
ϕ13		1300	1300
ϕ14		1400	1400
ϕ16		1600	1600
ϕ18	700	1800	1800
ϕ20	600	2000	2000
ϕ22	500	1800	2200
ϕ24	300	1300	2400
ϕ25	300	1500	2500
ϕ26	300	1000	2600
ϕ28	300	1000	2800
ϕ30	-	1000	3000
ϕ32		700	3200
ϕ34		600	
ϕ36		600	
ϕ40		400	

Drilling diameters

Rebar size	Hammer drill (HD)	Hollow Drill Bit (HDB)[b]	Compressed air drill (CA)[c]	Diamond coring		
				Dry (PCC)[b)c)]	Wet (DD)[c]	With roughening tool (RT)[b]
	d_0 [mm]					
ϕ8	12 (10 [a])	-	-	-	12 (10 [a])	-
ϕ10	14 (12 [a])	14 (12 [a])	-	-	14 (12 [a])	-
ϕ12	16 (14 [a])	16 (14 [a])	17	-	16 (14 [a])	-
ϕ12/ HZA(-R) M12	16	16	-	-	16	-
ϕ13	16	16	17	-	16	-
ϕ14	18	18	17	-	18	18
ϕ16	20	20	20	-	20	20
ϕ18	22	22	22	-	22	22
ϕ20	25	25	26	-	25	25
ϕ22	28	28	28	-	28	28
ϕ24	32 (30 [a])	32 (30 [a])	32	35	32	32
ϕ25	32 (30 [a])	32 (30 [a])	32	35	32	32
ϕ26	35	35	35	35	35	35
ϕ28	35	35	35	35	35	35
ϕ30	37	-	37	35	37	-
ϕ32	40	-	40	47	40	-
ϕ34[c]	45	-	42	47	45	-
ϕ36[c]	45	-	45	47	47	-
ϕ40[c]	55	-	57	52	52	-

a) Each of two given values can be used.
b) No cleaning required.
c) Only for EN 1992-1-1 design, not available for TR 069 design.

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

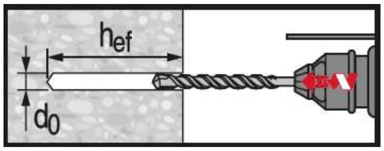
Setting instructions

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

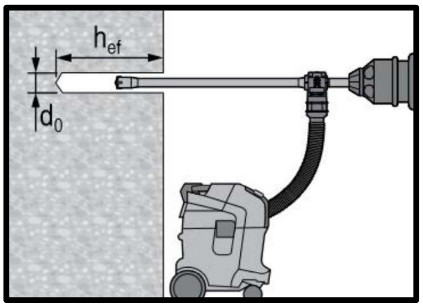
Safety regulations.

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 V4.

Drilling

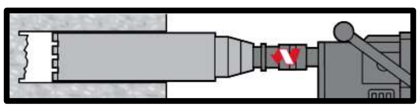


Hammer drilled hole (HD)

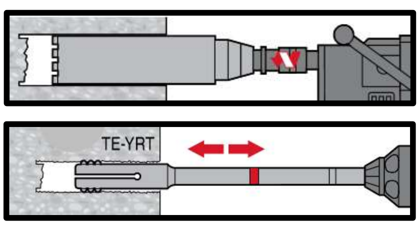


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required.

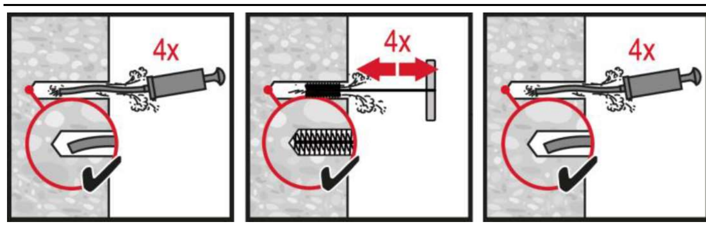


Diamond Drilling (DD)



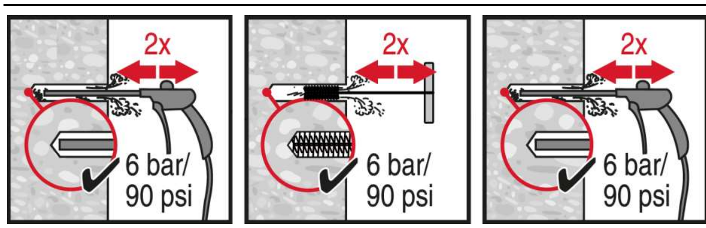
Diamond Drilling + Roughening Tool (DD+RT)

Cleaning (Inadequate hole cleaning=poor load values.)



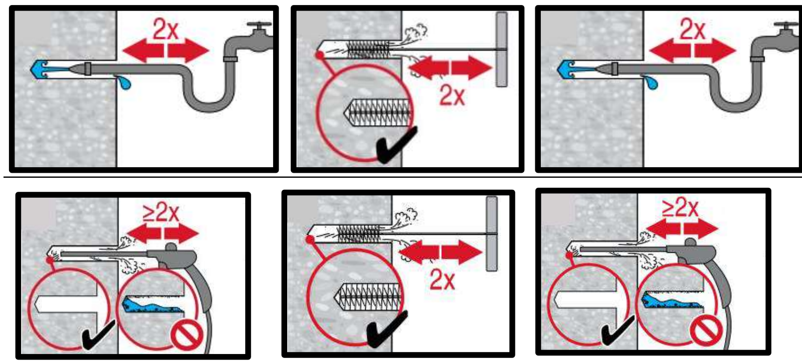
Hammer Drilling:

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



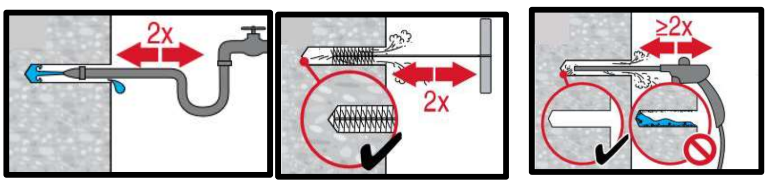
Hammer Drilling:

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



Diamond cored holes:

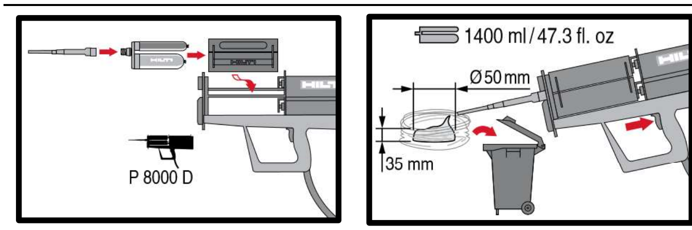
For all drill hole diameters d_0 and drill hole depths h_0.



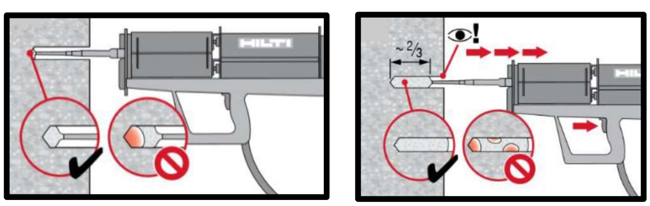
Diamond cored holes with Hilti roughening tool:

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

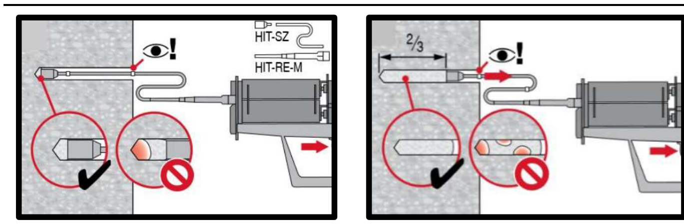
Injection preparation



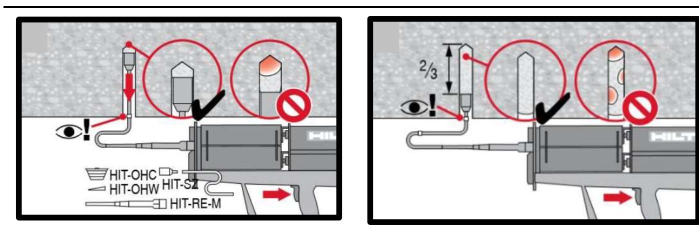
Injection system preparation.



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

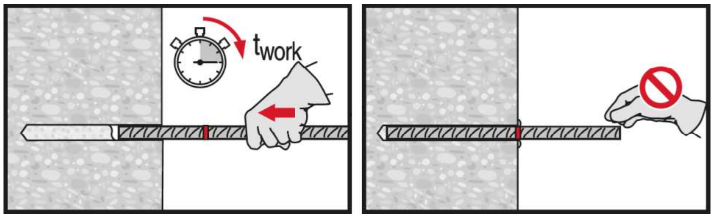


Injection method for drill hole depth $h_{ef} > 250$mm.

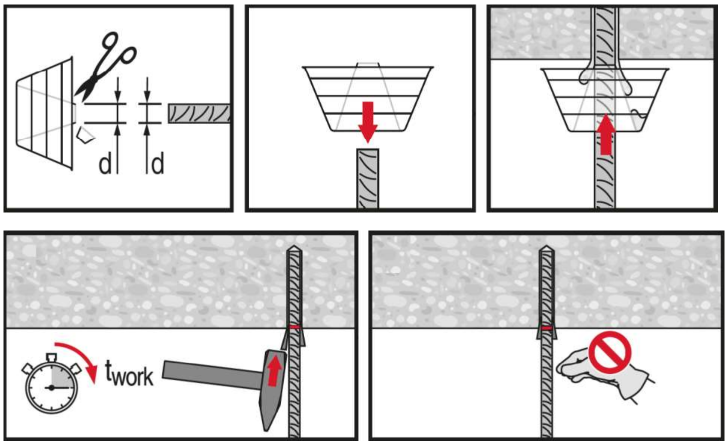


Injection method for overhead application.

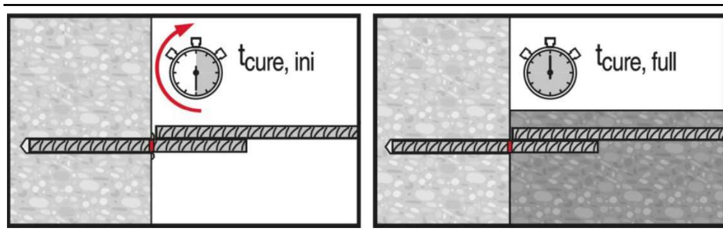
Setting the element



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



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



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