HIT-RE 500 V4
INJECTION MORTAR

Product Technical Datasheet
Concrete-to-concrete
Update: July 24

HIT-RE 500 V4 injection mortar

Rebar design (EN 1992-1-1, EOTA TR 069, EN 1998-1) / Rebar elements / Concrete

Injection mortar system

HIT-RE 500 V4

(Available in 330-, 500- and 1400-ml Foil pack)

Rebar
(ϕ8 - ϕ40)

Benefits

- safe set 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 100 years working 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 concrete temperature.
- Odourless epoxy

Application condition

Base material

Concrete (non-cracked)

Concrete (cracked)

Load conditions

Static/ quasi-static

Seismic

Fire resistance

Fatigue

Installation conditions

Hammer drilling

Diamond cored

Hollow drill bit drilling

Water-filled boreholes

Other information

100 YEARS

ETA Working life 100 years

PROFIS Engineering design Software

Concrete-to-Concrete connections Handbook

Linked Approvals/Certificates and Instructions for use.

Approvals / Certificates

Approval no.	Application / Loading condition	Authority / Laboratory	Date of issue	Date of expiry
ETA-20/0540	Static and quasi-static / Seismic / Fire	CSTB, Marne la Vallée	13-12-2023	-
ETA-20/0539	Static and quasi-static / Seismic	CSTB, Marne la Vallée	13-12-2023	-
Z-21.8-2123	Fatigue loading- German National Approval	DIBt, Berlin	28-01-2021	28-01-2026
No.: 07/2021	Engineering Judgement (120-y working life based on EAD 330087-01-0601)	BERMEIGSTER, Vienna	19-07-2021	-
No.: 04/2022	Engineering Judgement (120-y working life based on EAD 332402-00-0601-v01)	BERMEIGSTER, Vienna	08-03-2022	-

Instructions for use(IFU)

Material				
Injection mortar	IFU Hilti HIT-RE 500 V4 (330/500 ml)			IFU Hilti HIT-RE 500 V4 (1400 ml)
Dispenser	IFU HDM	IFU HDE 500-22	IFU HDE 500-A12	IFU HIT-P8000D

Link to Hilti Webpage

Injection mortars / Dispenser				
Hilti HIT-RE 500 V4	HDE 500-22	HDE 500-A12	HDM 500	P8000D

Mechanical properties and dimensions rebar

Mechanical properties and dimensions of the rebars are standardized and can be taken from the ETA.

Material quality

Part	Material
Rebar EN 1992-1-1:2004	Bars and de-coiled rods class B or C according to NDP or NCL of EN 1992-1-1/NA

Static and quasi-static loading as per ETA 20/0540. Design according to EN 1992-1-1

All data in this section applies to:

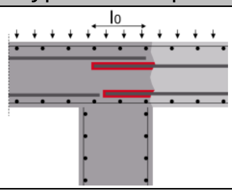
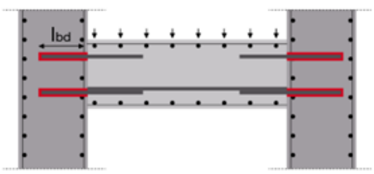
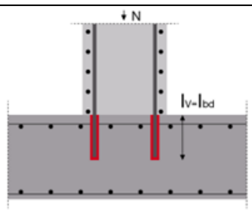
- According to EN 1992-1-1 for good bond conditions. For all other bond conditions multiply the values by 0,7
- Hammer drilling, Hammer drilling with Hilti hollow drill bit (TE-CD, TE-YD), Compressed air drilling
- Diamond coring (dry) ,Diamond coring with roughening with Hilti Roughening tool TE-YRT
- Design values of the bond strength for a working life of 50 Years

For specific design cases refer to PROFIS Engineering

Design bond strength in N/mm² for above methods of drilling techniques according to mortar IFU & ETA-20/0540.

Rebar size	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
[mm]	$f_{bd,PIR}$ [N/mm²]								
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

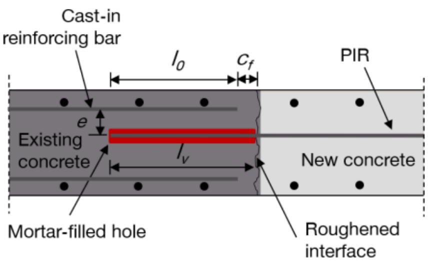
Minimum anchorage length and minimum lap length

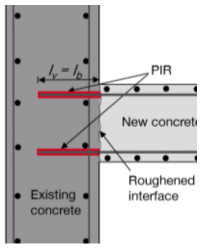
Post-installed rebar applications as per EN 1992-1-1	Typical examples
Lap splice applications	
End anchorage applications – simply supported / compression load-only connections	 

The minimum anchorage length $\ell_{b,min}$ and the minimum lap length $\ell_{0,min}$ according for applications designed as per 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 according to mortar IFU & ETA-20/0540.

Rebar size	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
[mm]	α_{lb} [-]								
ϕ8 - ϕ40	1,0								





Refer to the table for data on dispensers and corresponding maximum embedment depth $\ell_{v,max}$ due to mortar installation limitations

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

$l_{b,min}$	Minimum anchorage length for simply supported connections under tension loading assuming $\sigma_{sd} = f_{yd}$
$l_{o,min}$	Minimum anchorage length for overlap splice joint
$l_{bd,y}$	Anchorage length for simply supported connections (design for yielding)
$l_{o,PIR,y}$	Anchorage length for overlap joint (design for yielding)
α_2	Coefficient of Concrete Cover

For specific design cases refer to PROFIS Engineering

For detailed technical contents, refer to Concrete-to-Concrete connections Handbook

Rebar-size [mm]	Concrete class	Design Resistance (Yielding) [kN]	$l_{b,min}$ [mm]	$l_{o,min}$ [mm]	$l_{bd,y}$ (α_2=1) [mm]	$l_{bd,y}$ (α_2=0,7) [mm]	$l_{o,PIR,y}$ (α_2=1) [mm]	$l_{o,PIR,y}$ (α_2=0,7) [mm]
ϕ8	C20/25	21,9	113	200	378	265	567	398
	C50/60		100	200	202	142	303	213
ϕ10	C20/25	34,1	142	213	473	331	710	497
	C50/60		100	200	253	177	380	266
ϕ12	C20/25	49,2	170	255	567	397	851	596
	C50/60		120	200	303	212	455	318
ϕ14	C20/25	66,9	198	298	662	463	993	695
	C50/60		140	210	354	248	531	372
ϕ16	C20/25	87,4	227	340	756	529	1134	794
	C50/60		160	240	404	283	606	425
ϕ20	C20/25	136,6	284	426	945	662	1418	993
	C50/60		200	300	506	354	759	531
ϕ25	C20/25	213,4	354	532	1181	827	1772	1241
	C50/60		250	375	632	442	948	663
ϕ28	C20/25	267,7	397	596	1323	926	1985	1389
	C50/60		280	420	708	495	1062	743
ϕ30	C20/25	307,3	425	638	1418	992	2127	1488
	C50/60		300	450	758	531	1137	797
ϕ32	C20/25	349,7	454	681	1512	1059	2268	1589
	C50/60		320	480	809	566	1214	849
ϕ34	C20/25	394,7	482	723	1608	1125	2411	1688
	C50/60		340	510	880	616	1321	924
ϕ36	C20/25	442,6	534	801	1779	1245	2669	1868
	C50/60		360	540	954	668	1431	1002
ϕ40	C20/25	546,4	621	932	2070	1449	3105	2174
	C50/60		400	600	1115	780	1673	1170

Seismic loading based on ETA-20/0540. Seismic design according to EN 1998-1

All data in this section applies to:

- According to EN 1992-1-1 for good bond conditions. For all other bond conditions multiply the values by 0,7
- Hammer drilling, Hammer drilling with Hilti hollow drill bit (TE-CD, TE-YD) ,Compressed air drilling
- Diamond coring (dry),Diamond coring with roughening with Hilti Roughening tool TE-YRT
- Design values of the bond strength for a working life of 50 Years

For specific design cases refer to PROFIS Engineering

For detailed technical contents, refer to Concrete-to-Concrete connections Handbook

Design bond strength in N/mm² for good bond conditions for above methods of drilling techniques according to mortar IFU & ETA-20/0540

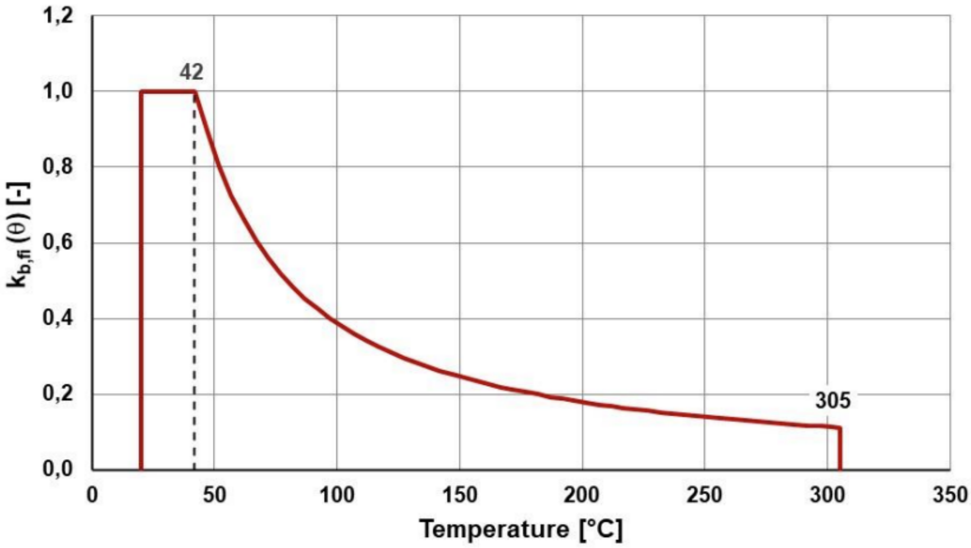
Rebar Size	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
[mm]	$f_{bd,PIR,seis}$ [N/mm²]							
ϕ8 - ϕ32	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
ϕ34	2,0	2,3	2,6	2,9	3,3	3,6	3,9	4,2
ϕ36	1,9	2,2	2,6	2,9	3,2	3,5	3,8	4,1
ϕ40	1,8	2,1	2,5	2,8	3,1	3,4	3,7	3,9

Fire resistance based on ETA-20/0540 for working life of 50 years

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 $f_{bd,fi}$.

For specific design cases refer to PROFIS Engineering

Temperature reduction factor k_{fi} (θ) for concrete class C20/25 for good bond conditions



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

$$f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd,PIR} \cdot \frac{\gamma_c}{\gamma_{M,fi}}$$

With θ ≤305°C: $k_{bfi}(\theta) = \frac{651,24 \cdot \theta^{-1,115}}{f_{bd,PIR} \cdot 4,3} \leq 1,0$

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

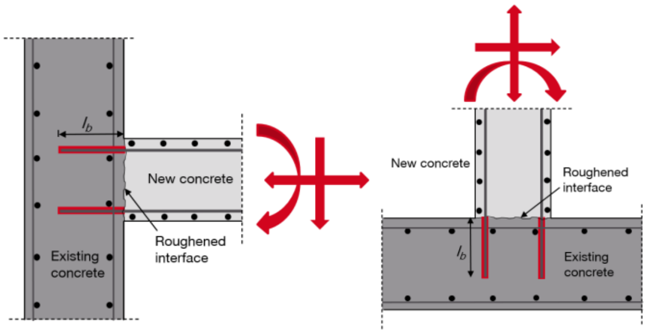
$f_{bd,fi}$	=	Design value of the bond resistance in case of fire in N/mm²
θ	=	Temperature in °C in the mortar layer
$k_{b,fi}(\theta)$	=	Reduction factor under fire exposure
$f_{bd,PIR}$	=	Design value of the bond resistance in N/mm² in cold condition considering the concrete classes, rebar diameter, the drilling method, and the bond conditions according to EN 1992-1-1
γ_c	=	Partial safety factor according to EN 1992-1-1
$\gamma_{M,fi}$	=	Partial safety factor according to EN 1992-1-2

Bond strength $f_{bd,fi}$ in N/mm^2 for fire design for concrete classes C20/25 to C50/60

Rebar Temperature	50°C	100°C	150°C	200°C	250°C	305°C (θ_{max})
$f_{bd,fi}$ [N/mm²]	2,90	1,34	0,85	0,62	0,48	0,39

Static and quasi-static loading as per ETA 20/0539. Design according to EOTA TR 069

For post-installed rebar solutions beyond provisions of EN 1992-1-1, such as end-anchorage applications with bi-axial and uni-axial bending and shear loads with compression or tension forces without the limitation of using strut-and-tie design approach can be designed using EOTA TR 069



Anchorage length $l_{bd,y}$ as per EOTA TR 069 design provisions (Improved bond-splitting failure mode) for characteristic steel strength f_{yk}=500 N/mm^2 for good bond conditions

All data in this section applies to

- Hammer drilling,
- Effect of transverse reinforcement is not considered
- Effect of sustained loads are not considered
- Minimum spacing between rebars considered as 100 mm
- Minimum anchorage length $l_{b,min}$ shall apply as per EN 1992-1-1
- The maximum recommended installation length shall be applicable
- Concrete breakout resistance is not considered (it shall be calculated depending on the boundary conditions of the actual concrete application)
- In-service temperature range I (min. base material temperature -40ºC, max. long/short term base material temperature: +24ºC/+40ºC)
- Material and installation factors: γ_{Ms}=1,15 , γ_{Mc}=1,5 , γ_{inst}=1,0
- Minimum concrete cover shall apply as per EOTA TR 069 and EN 1992-1-1
- Working life of 50 years

For specific design cases refer to PROFIS Engineering

Rebar-size	Concrete class	Design Resistance (Yielding)	Cracked concrete bond resistance as per ETA			Uncracked concrete bond resistance as per ETA		
mm		[kN]	$l_{bd,y}$ ($c_d=3\phi$)) [mm]	$l_{bd,y}$ ($c_d=5\phi$) [mm]	$l_{bd,y}$ ($c_d=8\phi$) [mm]	$l_{bd,y}$ ($c_d=3\phi$) [mm]	$l_{bd,y}$ ($c_d=5\phi$) [mm]	$l_{bd,y}$ ($c_d=8\phi$) [mm]
ϕ8	**C20/25**	21,9	-	149	131	-	149	131
	C50/60		-	119	119	-	119	119
ϕ10	**C20/25**	34,1	-	209	113	-	209	109
	C50/60		-	108	103	-	108	100
ϕ12	**C20/25**	49,2	-	252	145	-	252	131
	C50/60		-	132	132	-	132	119
ϕ13	**C20/25**	57,7	-	288	146	-	288	130
	C50/60		-	148	146	-	148	129
ϕ14	**C20/25**	66,9	759	325	179	759	325	152
	C50/60		390	168	163	390	168	139
ϕ16	**C20/25**	87,4	970	407	212	970	407	183
	C50/60		500	210	193	500	210	158
ϕ18	**C20/25**	110,6	1180	495	244	1180	495	223
	C50/60		608	255	244	608	255	191

Rebar-size mm	Concrete class	Design Resistance (Yielding) [kN]	Cracked concrete bond resistance as per ETA			Uncracked concrete bond resistance as per ETA		
			$l_{bd,y}$ (c_d=3ϕ)) [mm]	$l_{bd,y}$ (c_d=5ϕ) [mm]	$l_{bd,y}$ (c_d=8ϕ) [mm]	$l_{bd,y}$ (c_d=3ϕ) [mm]	$l_{bd,y}$ (c_d=5ϕ) [mm]	$l_{bd,y}$ (c_d=8ϕ) [mm]
ϕ20	**C20/25**	136,6	1410	592	307	1410	592	266
	C50/60		726	305	279	726	305	212
ϕ22	**C20/25**	165,3	1655	695	320	1655	695	313
	C50/60		852	358	320	852	358	233
ϕ24	**C20/25**	196,7	1765	712	358	1765	712	310
	C50/60		907	367	358	907	367	255
ϕ25	**C20/25**	213,4	1940	794	416	1940	794	349
	C50/60		998	408	378	998	408	265
ϕ28	**C20/25**	267,7	2480	1040	480	2480	1040	468
	C50/60		1275	535	436	1275	535	297
ϕ30	**C20/25**	307,3	2780	1167	570	2780	1167	525
	C50/60		1432	601	519	1432	601	342
ϕ32	**C20/25**	349,7	3100	1300	618	3100	1300	585
	C50/60		1595	670	561	1595	670	365
ϕ36	**C20/25**	442,6	3780	1585	718	3780	1585	713
	C50/60		1945	816	718	1945	816	445
ϕ40	**C20/25**	546,4	4505	1890	1070	4505	1890	850
	C50/60		2320	1070	1070	2320	973	539

The highlighted values exceed the maximum length given in ETA-20/0539 and IFU.

Seismic loading based on ETA-20/0539. Seismic design according EOTA TR 069

All data in this section applies to:

- Hammer drilling, Hammer drilling with Hilti hollow drill bit
- working life of 50 years

For specific design cases refer to PROFIS Engineering

Rebar Size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ13**	**ϕ14**	**ϕ16**	**ϕ18**	**ϕ20**	**ϕ22**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Pull-out failure																	
Reduction factor for pull-out resistance under seismic action $\alpha_{eq,p}$	[-]	0,61	0,83													0,65	
Influence of cracked concrete on bond resistance τ_{Rd}																	
Factor for influence of cracked concrete $\Omega_{cr,03}$	[-]	1,00	0,96	0,90	0,88	0,85	0,82	0,78	0,76	0,73	0,71	0,70	0,68	0,66	0,65	0,62	0,60
Factor for influence of cracked concrete $\Omega_{cr,05}$	[-]	0,79	0,81	0,82	0,83	0,84	0,82	0,78	0,76	0,73	0,71	0,70	0,68	0,66	0,65	0,62	0,60
Factor for influence of cracked concrete $\Omega_{cr,08}$	[-]	0,59	0,61	0,63	0,64	0,65	0,67	0,69	0,71	0,72	0,71	0,70	0,68	0,66	0,65	0,62	0,60
Bond-splitting failure																	
Reduction factor for bond-splitting resistance under seismic action $\alpha_{eq,sp}$	[-]	0,95															

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

Setting information

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

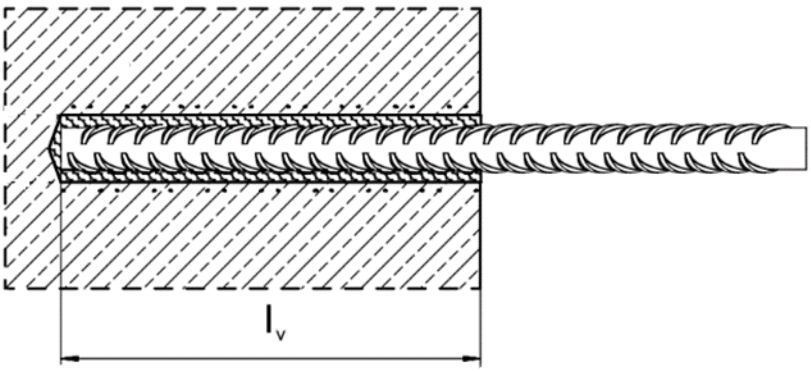
Working time and curing time[1) 2)]

Temperature of the base material	Maximum working time	Initial curing time	Minimum curing time
T [2)]	t_{work}	$t_{cure,ini}$	t_{cure}
-5 °C to -1 °C	2 h	48 h	168 h
> -1 °C to 4 °C	2 h	24 h	48 h
> 5 °C to 9 °C	2 h	16 h	24 h
> 9 °C to 14 °C	1,5 h	12 h	16 h
> 14 °C to 19 °C	1 h	8 h	16 h
> 19 °C to 24 °C	30 min	4 h	7 h
> 24 °C to 29 °C	20 min	3,5 h	6 h
> 29 °C to 34 °C	15 min	3 h	5 h
> 34 °C to 39 °C	12 min	2 h	4,5 h
> 39 °C to 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.

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	



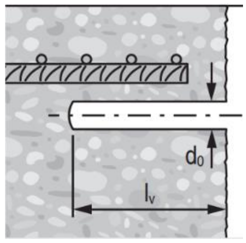
For detailed setting information on installation see instructions for use given with the product.

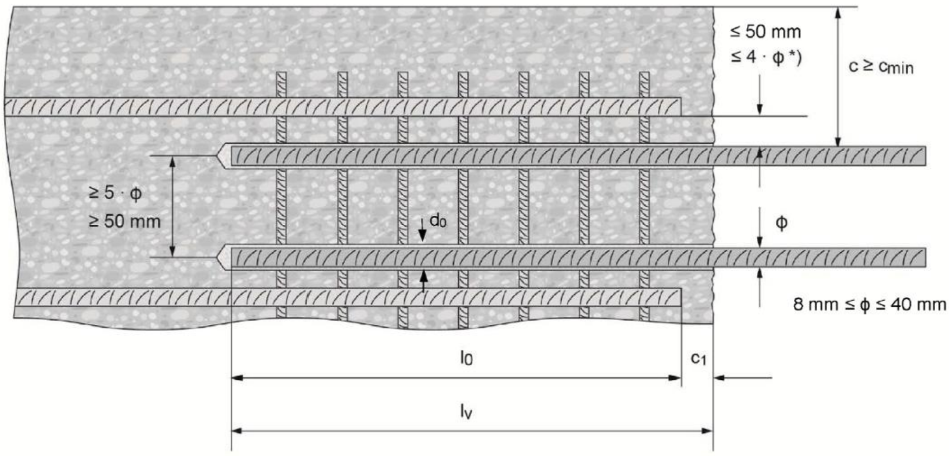
Approved installation methods can be found in the specific ETA/Certificate definitions.

Drilling and Installation equipment

Rotary Hammers (Corded and Cordless)		TE 2 - TE 70
Diamond Coring Machines		DD EC-1, DD 100 … DD 160
Dispenser		HDE HDM PE-8000D
Other tools		Blow out pump, Compressed air gun Set of cleaning brushes
		Hammer drill bit TE-CX, TE-YX, TE-C, TE-Y
		Hollow drill bit TE-CD, TE-YD
		Diamond core bit SP-L, SP-HX, SP-H, P-U
		Roughening tools TE-YRT
		Piston plug

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

Drilling method	**Bar diameter [mm]**	**Minimum concrete cover c_{min} [mm]**		
		Without drilling aid	**With drilling aid**	
Hammer drilling **(HD)** and **(HDB)**	$\phi < 25$	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
	$\phi \geq 25$	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
Compressed air drilling **(CA)**	$\phi < 25$	$50 + 0{,}08 \cdot l_v$	$50 + 0{,}02 \cdot l_v$	
	$\phi \geq 25$	$60 + 0{,}08 \cdot l_v \geq 2 \cdot \phi$	$60 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
Diamond coring with roughening with Hilti Roughening tool TE-YRT **(RT)**	$\phi < 25$	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
	$\phi \geq 25$	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	



*) If the clear distance between lapped bars exceeds 4 · ϕ or 50 mm, then the lap length shall be increased by the difference between the clear bar distance and the smaller of 4 · ϕ or 50 mm.

Where, c is concrete cover of post-installed rebar

$c_1 = c_f$ is the end-cover of existing rebar

d_o is the nominal drill bit diameter

ϕ diameter of reinforcement bar

l_0 is the lap length

l_v is the installation length