HIT-RE 500 V3 injection mortar

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

Injection mortar system

Foil pack: HIT-RE 500 V3

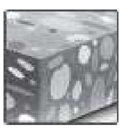
(available in 330, 500 and 1400 ml cartridges)

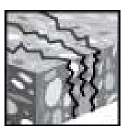
Rebar B500 B
(ϕ8 - ϕ40)

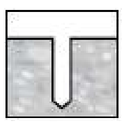
Benefits

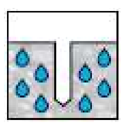
- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Suitable for concrete C 12/15 to C 50/60
- High loading capacity
- Suitable for dry and water saturated concrete
- Non-corrosive to rebar elements
- Long working time at elevated temperatures
- Cures down to -5°C
- Odourless epoxy
- Fire time exposure up to 4h

Base material

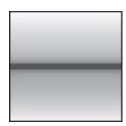

Concrete (non-cracked)

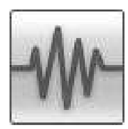

Concrete (cracked)


Dry concrete


Wet concrete

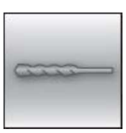
Load conditions

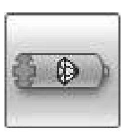

Static/ quasi-static


Seismic, ETA-C1


Fire resistance

Installation conditions


Hammer drilling


Diamond coring

SAFESET
Hilti **SafeSet** technology

Other informations

European Technical Assessment

CE conformity

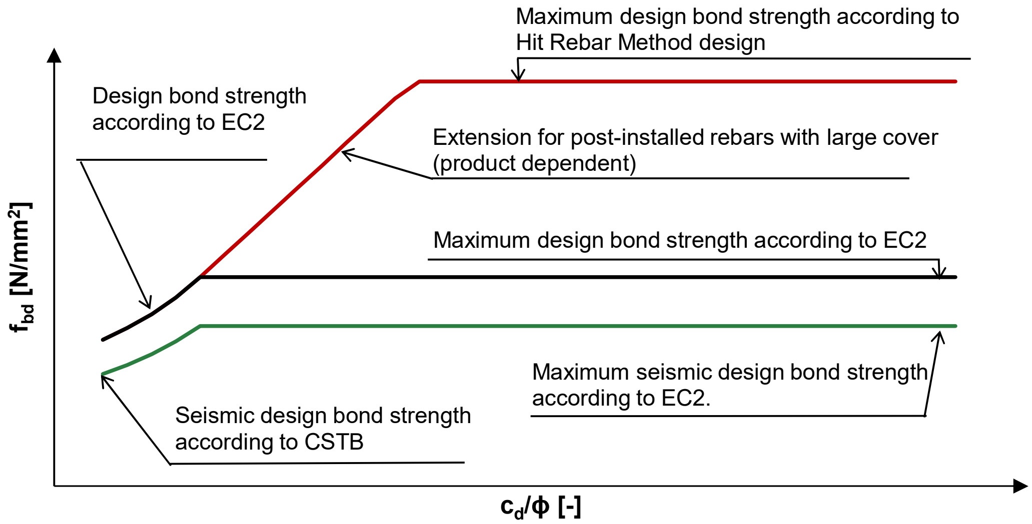
PROFIS Rebar design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment a)	CSTB, Marne la Vallée	ETA-16/0142 / 2018-07-04
Fire evaluation	CSTB, Marne la Vallée	MRF 1526054277/B

b) All data given in this section according to ETA-16/0142 issue 2018-07-04.

Static and quasi-static loading



Effective limit on bond stress for post-installed rebar using Hilti mortar systems and design bond strength values as provided by the EC2.

Static EC2 design, small concrete cover (see section 3.2.1)

Design bond strength in N/mm² according to ETA 16/0142 for good bond conditions

All allowed hammer drilling methods									
Rebar - size	**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
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
Diamond coring wet									
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
ϕ20 - ϕ32	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4
ϕ36	1,6	2,0	2,2	2,6	2,9	3,2	3,2	3,2	3,2
ϕ40	1,6	2,0	2,1	2,5	2,8	2,8	2,8	2,8	2,8

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

Static Hit Rebar design method, large concrete cover (see section 3.2.2)

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

Temperature range	Drilling method	Rebar - size											
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete C20/25, all allowed drilling methods													
I: 40°C/24° C	Hammer drilled holes	6,3	9,5	9,5	9,5	9,5	9,5	8,7	8,7	8,7	8,7	6,7	7,9
	Hammer drilled holes with hollow drill bit	-	-	9,5	9,5	9,5	9,5	8,7	8,7	-	-	-	-
	Diamond cored holes with roughening tool	-	-	-	9,5	9,5	9,5	8,7	8,7	-	-	-	-
	Diamond cored holes	5	5	5	5	5	5	5	5,3	5,3	5,3	-	-
	Hammer drilled holes in water filled holes	3,8	5,7	5,7	5,7	5,7	5,7	5,2	5,2	5,2	5,2	-	-
II: 70°C/43° C	Hammer drilled holes	4,7	7,3	7,3	7,3	6,7	6,7	6,7	6,3	6,3	6,3	5,7	5,0
	Hammer drilled holes with hollow drill bit	-	-	7,3	7,3	6,7	6,7	6,7	6,3	-	-	-	-
	Diamond cored holes with roughening tool	-	-	-	7,3	6,7	6,7	6,7	6,3	-	-	-	-
	Diamond cored holes	3,6	3,6	3,6	3,6	3,1	3,3	3,3	3,3	3,3	3,3	-	-
	Hammer drilled holes in water filled holes	2,6	4,3	4,3	4,3	4,3	4,0	4,0	4,0	3,8	3,8	-	-
Cracked concrete C20/25, all allowed drilling methods													
I: 40°C/24° C	Hammer drilled holes	3	5,7	6,3	6,3	6,3	6,7	6,7	7,3	7,3	7,3		
	Hammer drilled holes with hollow drill bit	-	-	6,3	6,3	6,3	6,7	6,7	7,3	-	-	-	-
	Diamond cored holes with roughening tool	-	-	-	6,3	6,3	6,7	6,7	7,3	-	-	-	-
II: 70°C/43° C	Hammer drilled holes	2,7	4,7	5,3	5,3	5,3	5,3	5,3	5,3	5,3	5,3		
	Hammer drilled holes with hollow drill bit	-	-		5,3	5,3	5,3	5,3	5,3	-	-	-	-
	Diamond cored holes with roughening tool	-	-	-	5,3	5,3	5,3	5,3	5,3	-	-	-	-

For poor bond conditions multiply values by 0,7.

Increasing factors in concrete for $f_{bd,po}$

Dilling method	Concrete class	Rebar-size											
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Hammer drilled holes Hammer drilled holes with hollow drill bit Diamond cored holes	C 30/37	1,04											
	C40/50	1,07											
	C50/60	1,09											
Diamond cored holes with roughening tool	C 30/37 - C50/60	1,0										-	

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

Rebar - size	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
All allowed hammer drilling methods									
ϕ8 - ϕ40	1,0								
Diamond coring dry and wet									
ϕ8 -ϕ12	1,0								
ϕ14 -ϕ36	Linear interpolation between diameter								
ϕ40	1,0	1,0	1,0	1,0	1,2	1,3	1,4	1,4	1,4

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

Hammer drilling

Rebar-size	Concrete class	f_{bd} [N/mm²]	$f_{bd,p}$ [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]	$l_{bd,y,HRM,\alpha2<0.7}$ 5) [mm]	l_{max} 6) [mm]
ϕ8	C20/25	2,3	6,3	200	113	378	265	138	1000
	C50/60	4,3	6,9	200	100	202	142	126	1000
ϕ10	C20/25	2,3	9,3	213	142	473	331	142	1000
	C50/60	4,3	10,2	200	100	253	177	107	1000
ϕ12	C20/25	2,3	9,3	255	170	567	397	170	1200
	C50/60	4,3	10,2	200	120	303	212	128	1200
ϕ14	C20/25	2,3	9,3	298	198	662	463	198	1400
	C50/60	4,3	10,2	210	140	354	248	149	1400
ϕ16	C20/25	2,3	9,3	340	227	756	529	234	1600
	C50/60	4,3	10,2	240	160	404	283	171	1600
ϕ20	C20/25	2,3	9,3	435	284	945	662	356	2000
	C50/60	4,3	10,2	300	200	506	354	213	2000
ϕ25	C20/25	2,3	8,7	532	354	1181	827	539	2500
	C50/60	4,3	9,4	375	250	632	442	289	2500
ϕ28	C20/25	2,3	8,7	595	397	1323	926	663	2800
	C50/60	4,3	9,4	420	280	708	495	354	2800
ϕ30	C20/25	2,3	8,7	638	425	1418	992	751	3000
	C50/60	4,3	9,4	450	300	758	531	402	3000
ϕ32	C20/25	2,3	8,7	681	454	1512	1059	844	3200
	C50/60	4,3	9,4	480	320	809	566	451	3200
ϕ36	C20/25	2,2	5,2	534	540	1779	1245	753	3200
	C50/60	3,2	5,7	367	540	1223	856	686	3200
ϕ40	C20/25	2,1	4,8	621	621	2070	1449	906	3200
	C50/60	2,8	5,2	466	600	1553	1087	836	3200

1) Minimum anchorage length for overlap joint
2) Minimum anchorage length for simply supported connections
3) Anchorage length for simply supported connections in case of: α_1= α_2= α_3= α_4= α_5= 1. - (design for yielding)
4) Anchorage length for simply supported connections in case of: α_1= α_3= α_4= α_5= 1; α_2= 0.7 - (design for yielding)
5) Anchorage length with HIT Rebar design Method (HRM) for simply supported connections in case of: α_1= α_3= α_4= α_5= 1; α_2< 0.7. Only if an adequate concrete cover is applied.
6) Maximum feasible embedment depth due to mortar installation limitations.

Concrete

Chemical anchors

Mechanical anchors

Plastic/Light duty metal anchors

Insulation anchors

Seismic loading

Seismic data according to ETA-16/0142

Design bond strength in N/mm^2 for good bond conditions

All allowed hammer drilling methods and diamond coring with Hilti roughening tool TE-YRT								
Rebar - size	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ12 - ϕ32	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
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

For poor bond conditions multiply the values 0,7.

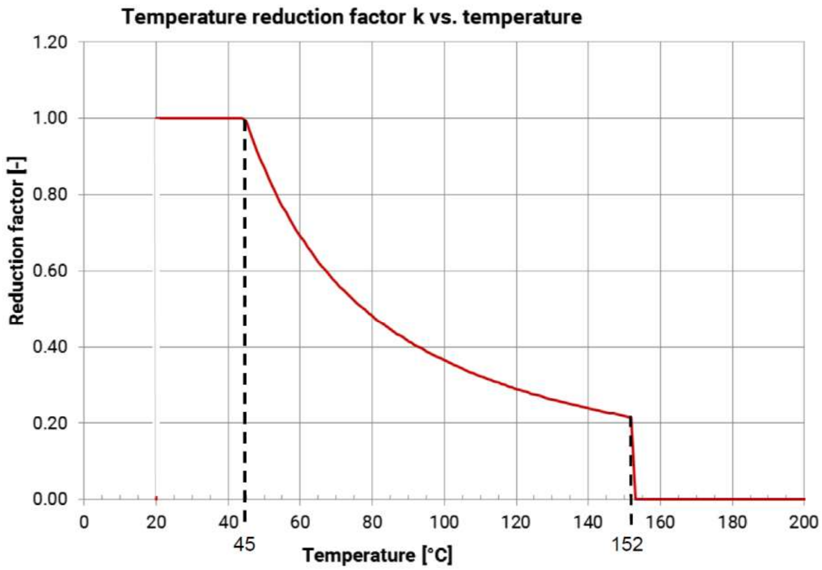
Design bond strength in N/mm^2 for good bond conditions

Values for diamond coring dry and wet								
Rebar - size	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	4,3
ϕ14-ϕ32	2,0							
ϕ36	1,9	2,0						
ϕ40	1,8	2,0						

For poor bond conditions multiply the values 0,7.

Fire resistance

Temperature reduction factor $k_{fi}(\theta)$



The analytic equation that describe the variation of $k_{fi}(\theta)$ with temperature is given by the following function:

If 45ºC ≤ θ ≤ 152ºC: $k_{fi}(\theta) = \frac{f_{bm}(\theta)}{f_{bm,rqd,d}} \leq 1{,}0$ in ºC

If θ < 45ºC $k_{fi}(\theta) = 1{,}0$

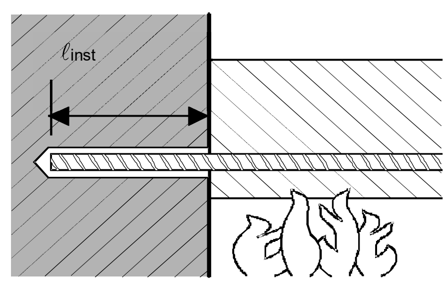
If θ > 152ºC $k_{fi}(\theta) = 0{,}0$

With:

$f_{bm}(\theta) = 1178{,}2 \cdot \theta^{-1{,}255}$ θ in ºC

According to MRF 1526054277 / B

a) **Anchoring application**



Anchoring application beam-wall connection with a concrete cover of 20 mm

Maximum force in rebar in conjunction with HIT-RE 500 V3 as a function of embedment depth for the fire resistance classes F30 to F240 (yield strength f_{yk} = 500 N/mm² and concrete class C20/25) according EC2

<table>
<tr><th rowspan="2">Rebar-size</th><th rowspan="2">Max. F_{s,T} [kN]</th><th rowspan="2">l_{inst} [mm]</th><th colspan="6">Fire resistance of bar in [kN]</th></tr>
<tr><th>R30</th><th>R60</th><th>R90</th><th>R120</th><th>R180</th><th>R240</th></tr>
<tr><td rowspan="10">ϕ8</td><td rowspan="10">16,8</td><td>100</td><td>3,8</td><td>1,3</td><td>0,5</td><td>0,2</td><td>0,0</td><td>0,0</td></tr>
<tr><td>140</td><td>7,2</td><td>4,3</td><td>2,3</td><td>1,5</td><td>0,7</td><td>0,2</td></tr>
<tr><td>180</td><td>10,7</td><td>7,8</td><td>5,6</td><td>3,9</td><td>2,1</td><td>1,3</td></tr>
<tr><td>220</td><td>14,2</td><td>11,2</td><td>9,1</td><td>7,4</td><td>4,6</td><td>2,9</td></tr>
<tr><td>250</td><td rowspan="6">16,8</td><td>13,8</td><td>11,7</td><td>10,0</td><td>7,1</td><td>4,8</td></tr>
<tr><td>290</td><td rowspan="5">16,8</td><td>15,1</td><td>13,5</td><td>10,6</td><td>8,1</td></tr>
<tr><td>310</td><td rowspan="4">16,8</td><td>15,2</td><td>12,3</td><td>9,8</td></tr>
<tr><td>330</td><td rowspan="3">16,8</td><td>14,0</td><td>11,6</td></tr>
<tr><td>370</td><td rowspan="2">16,8</td><td>15,0</td></tr>
<tr><td>390</td><td>16,8</td></tr>
</table>

Maximum force in rebar in conjunction with HIT-RE 500 V3 as a function of embedment depth for the fire resistance classes F30 to F240 (yield strength f_{yk} = 500 N/mm² and concrete class C20/25) according EC2

Rebar-size	Max. $F_{s,T}$ [kN]	l_{inst} [mm]	Fire resistance of bar in [kN]					
			R30	R60	R90	R120	R180	R240
ϕ10	26,2	110	5,8	2,4	1,1	0,6	0,0	0,0
		150	10,1	6,5	3,8	2,5	1,2	0,5
		190	14,5	10,8	8,1	6,0	3,3	2,0
		230	18,8	15,1	12,4	10,3	6,7	4,4
		300	*26,2*	22,7	20,0	17,9	14,3	11,2
		340		*26,2*	24,3	22,2	18,6	15,6
		360			*26,2*	24,4	20,8	17,7
		380				*26,2*	23,0	19,9
		410					*26,2*	23,1
		440						*26,2*
ϕ12	37,7	140	10,9	6,5	3,5	2,3	1,0	0,3
		200	18,7	14,3	11,0	8,5	4,8	3,0
		260	26,5	22,1	18,8	16,3	12,0	8,3
		320	34,3	29,9	26,6	24,1	19,8	16,1
		350	*37,7*	33,8	30,5	28,0	23,7	20,0
		390		*37,7*	35,7	33,2	28,9	25,2
		410			*37,7*	35,8	31,5	27,8
		430				*37,7*	34,1	30,4
		460					*37,7*	34,3
		490						*37,7*
ϕ14	51,3	160	15,7	10,6	6,7	4,4	2,3	1,1
		220	24,8	19,7	15,8	12,9	8,0	5,1
		280	33,9	28,8	24,9	22,0	17,0	12,7
		340	43,0	37,9	34,1	31,1	26,1	21,8
		400	*51,3*	47,0	43,2	40,2	35,2	30,9
		430		*51,3*	47,7	44,8	39,7	35,4
		460			*51,3*	49,3	44,3	40,0
		480				*51,3*	47,3	43,0
		510					*51,3*	47,6
		540						*51,3*
ϕ16	67	180	21,4	15,5	11,2	7,8	4,3	2,5
		240	31,8	25,9	21,6	18,2	12,5	8,2
		300	42,2	36,3	32,0	28,6	22,9	18,0
		360	52,6	46,8	42,4	39,0	33,3	28,4
		450	*67,0*	62,4	58,0	54,6	48,9	44,0
		480		*67,0*	63,2	59,8	54,1	49,2
		510			*67,0*	65,1	59,3	54,4
		530				*67,0*	62,8	57,8
		560					*67,0*	63,0
		590						*67,0*
ϕ20	104,7	220	35,5	28,1	22,6	18,5	11,4	7,3
		280	48,5	41,1	35,6	31,5	24,3	18,1
		340	61,5	54,1	48,6	44,5	37,3	31,1
		400	74,5	67,1	61,7	57,5	50,3	44,1
		460	87,5	80,1	74,7	70,5	63,3	57,1
		540	*104,7*	97,5	92,0	87,8	80,6	74,5
		580		*104,7*	100,7	96,5	89,3	83,1
		600			*104,7*	100,8	93,6	87,5
		620				*104,7*	98,0	91,8
		660					*104,7*	100,5
		680						*104,7*

Anchoring application beam-wall connection with a concrete cover of 40 mm

Rebar-size	Max. $F_{s,T}$ [kN]	l_{inst} [mm]	Fire resistance of bar in [kN]					
			R30	R60	R90	R120	R180	R240
ϕ8	16,8	100	4,9	1,8	0,8	0,4	0,0	0,0
		140	8,4	5,0	2,9	1,9	0,7	0,2
		180	11,9	8,5	6,2	4,5	2,3	1,3
		220	15,4	11,9	9,7	8,0	4,9	3,1
		240	*16,8*	13,7	11,4	9,7	6,6	4,3
		280		*16,8*	14,9	13,2	10,1	7,6
		310			*16,8*	15,8	12,7	10,2
		330				*16,8*	14,4	11,9
		360					*16,8*	14,5
		390						*16,8*
ϕ10	26,2	110	7,3	3,1	1,5	0,9	0,0	0,0
		150	11,6	7,3	4,5	3,0	1,3	0,6
		190	15,9	11,7	8,9	6,7	3,5	2,1
		230	20,3	16,0	13,2	11,0	7,2	4,6
		290	*26,2*	22,5	19,7	17,5	13,7	10,5
		330		*26,2*	24,0	21,9	18,0	14,9
		350			*26,2*	24,0	20,2	17,0
		370				*26,2*	22,3	19,2
		410					*26,2*	23,6
		440						*26,2*
ϕ12	37,7	140	12,6	7,5	4,3	2,8	1,1	0,3
		200	20,4	15,3	11,9	9,3	5,2	3,2
		260	28,2	23,1	19,7	17,1	12,5	8,8
		320	36,0	30,9	27,6	25,0	20,3	16,6
		340	*37,7*	33,5	30,2	27,6	22,9	19,2
		380		*37,7*	35,4	32,8	28,1	24,4
		400			*37,7*	35,4	30,7	27,0
		420				*37,7*	33,3	29,6
		460					*37,7*	34,8
		490						*37,7*
ϕ14	51,3	160	17,8	11,8	7,9	5,2	2,5	1,2
		220	26,9	20,9	17,0	13,9	8,5	5,5
		280	36,0	30,0	26,1	23,0	17,6	13,2
		340	45,1	39,1	35,2	32,1	26,7	22,4
		390	*51,3*	46,7	42,8	39,7	34,3	29,9
		430		*51,3*	48,8	45,8	40,4	36,0
		450			*51,3*	48,8	43,4	39,0
		470				*51,3*	46,4	42,1
		510					*51,3*	48,1
		540						*51,3*
ϕ16	67	180	23,8	16,9	12,5	9,0	4,6	2,7
		240	34,2	27,3	22,9	19,4	13,2	8,7
		300	44,6	37,7	33,3	29,8	23,6	18,6
		360	55,0	48,2	43,7	40,2	34,0	29,0
		430	*67,0*	60,3	55,8	52,3	46,1	41,2
		470		*67,0*	62,7	59,3	53,1	48,1
		500			*67,0*	64,5	58,3	53,3
		520				*67,0*	61,7	56,8
		560					*67,0*	63,7
		580						*67,0*

Rebar-size	Max. $F_{s,T}$ [kN]	l_{inst} [mm]	Fire resistance of bar in [kN]					
			R30	R60	R90	R120	R180	R240
ϕ20	104,7	220	38,4	29,8	24,2	19,9	12,2	7,8
		300	55,7	47,2	41,6	37,3	29,5	23,3
		380	73,1	64,5	58,9	54,6	46,8	40,6
		460	90,4	81,9	76,3	71,9	64,2	57,9
		530	*104,7*	97,0	91,4	87,1	79,3	73,1
		570		*104,7*	100,1	95,8	88,0	81,8
		600			*104,7*	102,3	94,5	88,3
		620				*104,7*	98,9	92,6
		650					*104,7*	99,1
		680						104,7
ϕ25	163,6	280	64,2	53,6	46,6	41,1	31,4	23,7
		370	88,6	77,9	70,9	65,5	55,8	48,0
		460	113,0	102,3	95,3	89,9	80,2	72,4
		550	137,4	126,7	119,7	114,3	104,6	96,8
		650	*163,6*	153,8	146,8	141,4	131,7	123,9
		690		*163,6*	157,7	152,2	142,5	134,7
		720			*163,6*	160,4	150,7	142,9
		740				*163,6*	156,1	148,3
		770					*163,6*	156,4
		800						*163,6*
ϕ28	205,3	310	81,1	69,1	61,3	55,2	44,3	35,6
		370	99,3	87,3	79,5	73,4	62,5	53,8
		430	117,5	105,5	97,7	91,6	80,7	72,0
		490	135,7	123,7	115,9	109,8	98,9	90,2
		550	153,9	141,9	134,1	128,0	117,2	108,4
		610	172,1	160,1	152,3	146,2	135,4	126,6
		670	190,3	178,3	170,5	164,4	153,6	144,8
		720	*205,3*	193,5	185,7	179,6	168,7	160,0
		760		*205,3*	197,8	191,8	180,9	172,2
		790			*205,3*	200,9	190,0	181,3
		810				*205,3*	196,1	187,3
		850					*205,3*	199,5
		870						*205,3*
ϕ32	268,1	350	106,5	92,8	83,9	76,9	64,5	54,6
		410	127,3	113,6	104,7	97,8	85,3	75,4
		470	148,1	134,5	125,5	118,6	106,1	96,2
		530	168,9	155,3	146,3	139,4	127,0	117,0
		590	189,7	176,1	167,1	160,2	147,8	137,8
		650	210,6	196,9	187,9	181,0	168,6	158,6
		710	231,4	217,7	208,7	201,8	189,4	179,4
		820	*268,1*	255,8	246,9	240,0	227,5	217,6
		860		*268,1*	260,8	253,8	241,4	231,4
		890			*268,1*	264,2	251,8	241,8
		910				*268,1*	258,7	248,8
		940					*268,1*	259,2
		970						*268,1*

b) Overlap joint application

Max. bond stress, $f_{bd,FIRE}$, depending on actual clear concrete cover for classifying the fire resistance.

It must be verified that the actual force in the bar during a fire, $F_{s,T}$, can be taken up by the bar connection of the selected length, ℓ_{inst}. Note: Cold design for ULS is mandatory.

$F_{s,T} \le (\ell_{inst} - c_f) \cdot \phi \cdot \pi \cdot f_{bd,FIRE}$ where: $(\ell_{inst} - c_f) \ge \ell_s$;

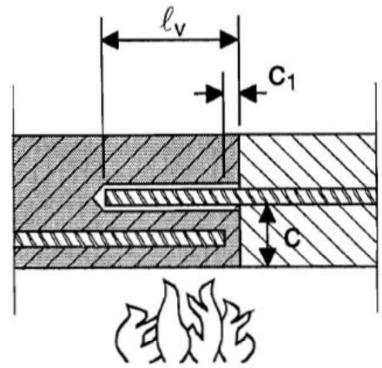
ℓ_s = lap length

ϕ = nominal diameter of bar

$\ell_{inst} - c_f$ = selected overlap joint length; this must be at least ℓ_s,

but may not be assumed to be more than 80 ϕ

$f_{bd,FIRE}$ = bond stress when exposed to fire



Critical temperature-dependent bond stress, $f_{bd,FIRE}$, concerning "overlap joint" for Hilti HIT-RE 500 V3 injection adhesive in relation to fire resistance class and required minimum concrete coverage c.

Clear concrete cover c [mm]	Max. bond stress, τ_c [N/mm²]					
	R30	R60	R90	R120	R180	R240
30						
40	0,8					
50	1,1					
60	1,5					
70	2,1	0,9				
80	2,9	1,2				
90	3,5	1,5	0,9			
100		1,8	1,1	0,8		
110		2,3	1,4	1,0		
120		2,8	1,6	1,2		
130		3,4	2,0	1,4	0,9	
140		3,5	2,3	1,6	1,0	
150			2,8	1,9	1,1	0,8
160			3,3	2,2	1,3	0,9
170			3,5	2,5	1,5	1,1
180				2,9	1,7	1,2
190				3,4	1,9	1,4
200				3,5	2,2	1,5
210					2,5	1,7
220					2,8	1,9
230					3,1	2,1
240					3,5	2,3
250						2,6
260						2,9
270						3,2
280						3,5
290						

Materials

Properties of reinforcement

Designation	Material
Reinforcing bars (rebars)	
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 ETAG guideline 001 part 5 and TR 023 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 V3: 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**

Electrical Conductivity
HIT-RE 500 V3 in the hardened state **is not conductive electrically**. Its electric resistivity is $66 \cdot 10^{12}$ Ω.m (DIN IEC 93 – 12.93). It is adapted well to realize electrically insulating anchorings (ex: railway applications, subway).

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

Setting information

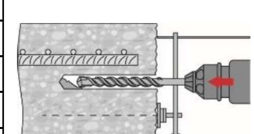
Installation equipment

Rebar – size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ18	ϕ20	ϕ25	ϕ28	ϕ32	ϕ34	ϕ36	ϕ40
Rotary hammer	TE 2 (-A)– TE 40(-A)					TE40 – TE80							
Other tools	Blow out pump (h_{ef} ≤ 10·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

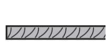
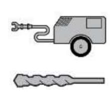
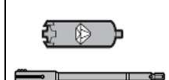
Drilling method	Bar diameter [mm]	Minimum concrete cover c_{min} [mm]	
		Without drilling aid	With drilling aid
Hammer drilling **(HD)** and **(HDB)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
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 too	**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 [mm]	HDM 330, HDM 500	HDE 500
	$\ell_{v,max}$ [mm]	
ϕ8	1000	1000
ϕ10	1000	1000
ϕ12	1000	1200
ϕ14	1000	1400
ϕ16	1000	1600
ϕ18	700	1800
ϕ20	600	2000
ϕ22	500	1800
ϕ24	300	1300
ϕ25	300	1500
ϕ26	300	1000
ϕ28	300	1000
ϕ30		1000
ϕ32		700
ϕ34	-	600
ϕ36		600
ϕ40		400

Drilling diameters

Rebar - size	Hammer drill (HD)	Hollow Drill Bit (HDB)[b)]	Compressed air drill (CA)	Diamond coring		
				Dry (PCC)[b)]	Wet (DD)	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)])	-
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	-	32	32
ϕ25	32 (30 [a)])	32 (30 [a)])	32	-	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	45	-	42	47	45	-
ϕ36	45	-	45	47	47	-
ϕ40	55	-	57	52	52	-

c) Each of two given values can be used.
d) 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

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

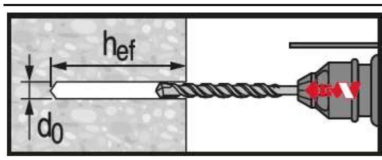
h_{ef} [mm]	$t_{roughen}$ [sec]
0 to 100	10
101 to 200	20
201 to 300	30
301 to 400	40
401 to 500	50
501 to 600	60

Setting instructions

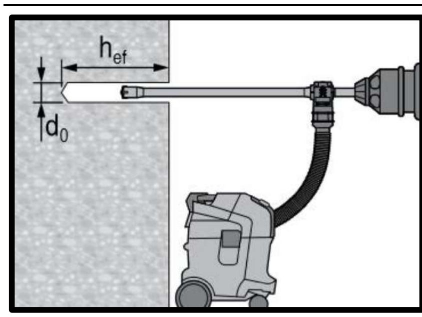
***For detailed information on installation see instruction for use given with the package of the product.**

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 V3.

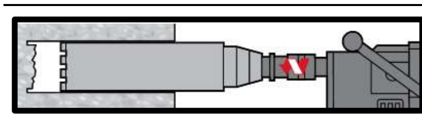


Hammer drilled hole (HD)

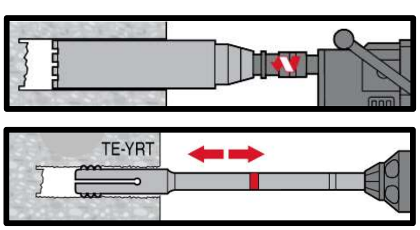


Hammer drilled hole with Hollow Drilled Bit (HDB)

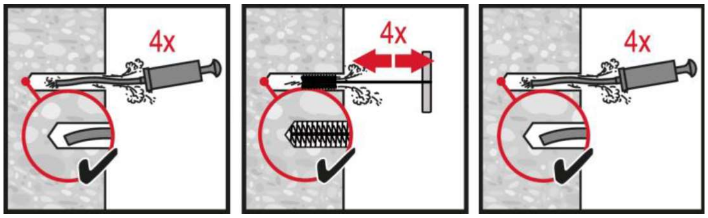
No cleaning required



Diamond Drilling (DD)

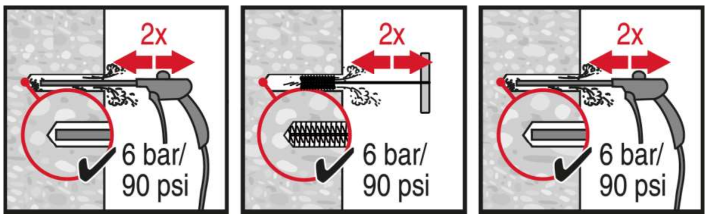


Diamond Drilling + Roughening Tool (DD+RT)



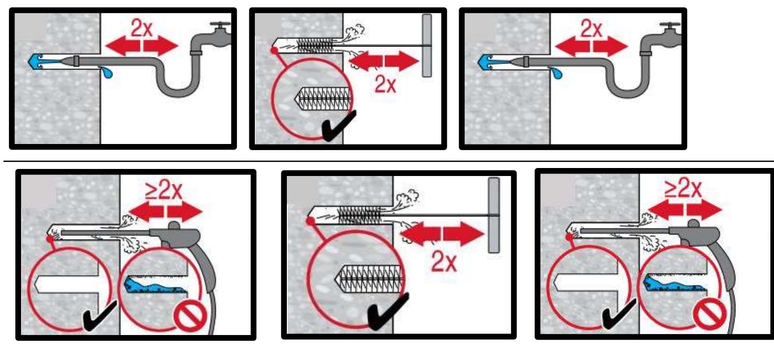
Hammer Drilling:

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



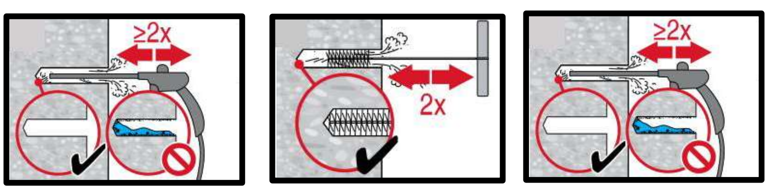
Hammer Drilling:

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



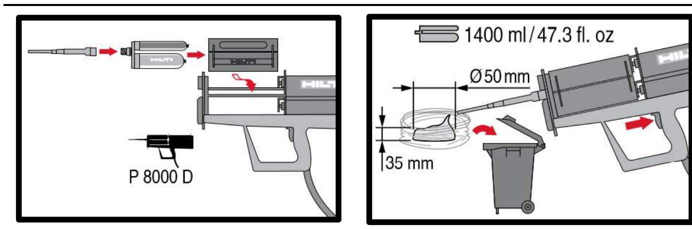
Diamond cored holes:

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

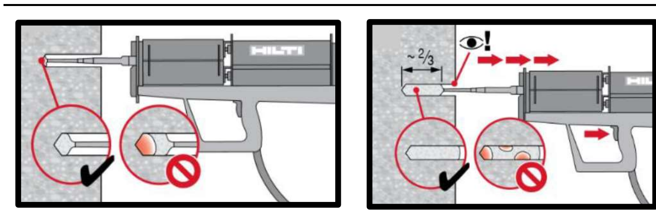


Diamond cored holes with Hilti roughening tool:

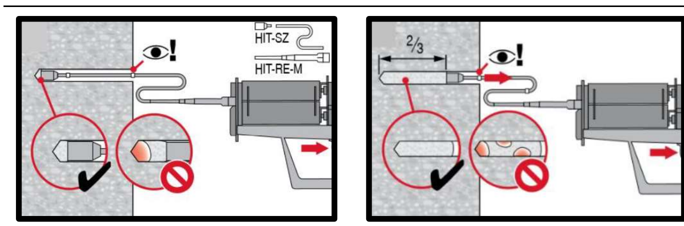
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .



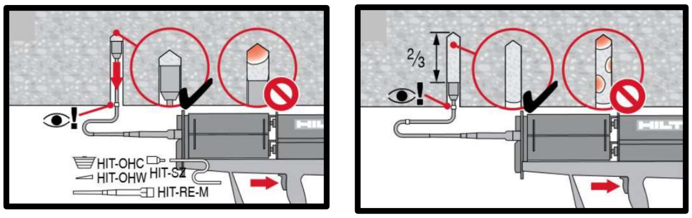
Injection system preparation.



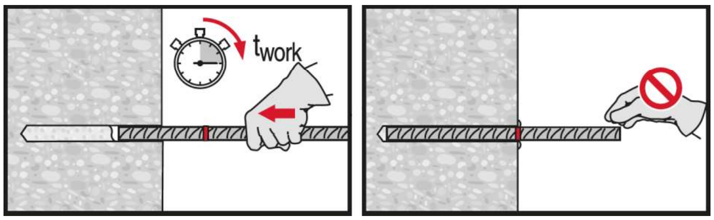
Injection method for drill hole depth $h_{ef} \leq 250$ mm.



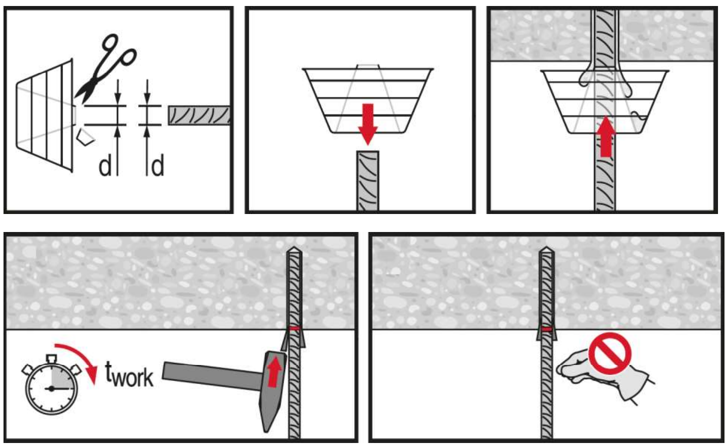
Injection method for drill hole depth $h_{ef} > 250$mm.



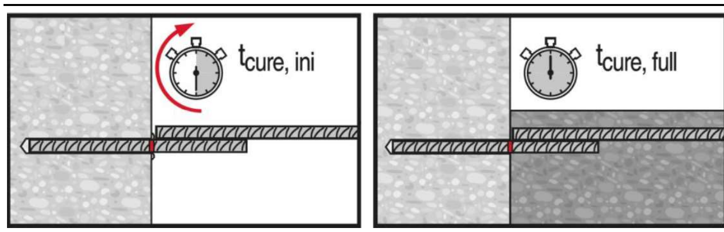
Injection method for overhead application.



Setting element, observe working time “t_{work}”.



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



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