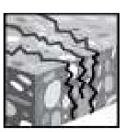
HIT-HY 200 injection mortar

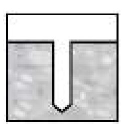
Anchor design (EN 1992-4) / Rebar elements / Concrete

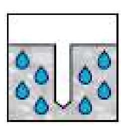
Injection mortar system		Benefits
	Hilti HIT - HY 200-A 330 ml foil pack (also available as 500 ml foil pack)	- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications - ETA seismic approval C1 - Suitable for cracked and non-cracked concrete C 20/25 to C 50/60
	Hilti HIT - HY 200-R 330 ml foil pack (also available as 500 ml foil pack)	- Suitable for dry and water saturated concrete - High loading capacity, excellent handling - Small edge distance and anchor spacing possible - In service temperature range up to 120°C short term / 72°C long term
	Rebar B500 B (ϕ8 - ϕ32)	- Large diameter applications - Two mortar versions: HY 200-R for slow cure applications and HY 200-A for fast cure applications

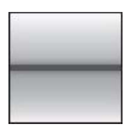
Base material / Load conditions


Concrete (non-cracked)


Concrete (cracked)


Dry concrete

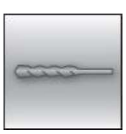

Wet concrete

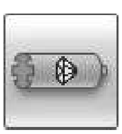

Static/ quasi-static

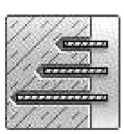

Seismic, ETA-C1


Fire resistance

Installation conditions / Other informations

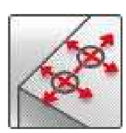

Hammer drilling


Diamond drilled holes [a]


Variable embedment depth

SAFESET

Hilti **SafeSet** technology


Small edge distance and spacing

European Technical Assessment

CE conformity


PROFIS Rebar design Software

a) Diamond drilling only with Roughening Tool (RT).

HILTI

Approvals / certificates

Description	Product	Authority / Laboratory	No. / date of issue
European Technical Assessment [a)]	HY 200-A (Anchor)	DIBt, Berlin	ETA-11/0493 / 2019-08-30
European Technical Assessment [a)]	HY 200-R (Anchor)	DIBt, Berlin	ETA-12/0084 / 2019-08-28

a) All data given in this section according to ETA-11/0493 issue 2019-08-30 and to ETA-12/0084 issue 2019-08-28.

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

All data in this section applies to
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Base material thickness, as specified in the table
- One typical embedment depth, as specified in the table
- One anchor material, as specified in the tables
- Concrete C 20/25
- Temperate range I
(min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Short term loading. For long term loading please apply ψ_{sus} = 0.74

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

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Typical embedment depth	[mm]	80	90	110	125	125	170	210	240	270	270	300
Base material thickness	[mm]	110	120	145	165	165	220	275	305	340	345	380

Characteristic resistance

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Non-cracked concrete												
Tensile N_{Rk}	[kN]	24,1	33,9	49,8	66,0	68,7	109	150	183	218	218	256
Shear V_{Rk}	[kN]	*14,0*	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*146*	*169*	*194*	*221*
Cracked concrete												
Tensile N_{Rk}	[kN]	-	14,1	29,0	38,5	44,0	74,8	105	128	153	153	179
Shear V_{Rk}	[kN]	-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*146*	*169*	*194*	*221*

Design resistance

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Non-cracked concrete												
Tensile N_{Rd}	[kN]	16,1	22,6	33,2	44,0	45,8	72,7	99,8	122	146	146	170
Shear V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	97,3	113	129	147
Cracked concrete												
Tensile N_{Rd}	[kN]	-	9,4	19,4	25,7	29,3	49,8	69,9	85,4	102	102	119
Shear V_{Rd}	[kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	97,3	113	129	147

Seismic loading (for a single anchor)

All data in this section applies to:

- Correct setting (See setting)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25
- Temperate range I

(min, base material temperature -40°C, max, long term/short term base material temperature: +24°C/40°C)

- α_{gap} = 1,0

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

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Typical embedment depth	[mm]	-	90	110	125	125	170	210	240	270	270	300
Base material thickness	[mm]	-	120	145	165	165	220	275	305	340	345	380

Characteristic resistance in case of seismic performance category C1

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Tensile $N_{Rk, seis}$	[kN]	-	12,4	25,3	33,5	38,3	65,2	99,6	120	145	145	170
Shear $V_{Rk, seis}$	[kN]	-	*15,0*	*22,0*	*29,0*	*39,0*	*60,0*	*95,0*	*102*	*118*	*136*	*155*

Design resistance in case of seismic performance category C1

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Tensile $N_{Rd, seis}$	[kN]	-	8,3	16,9	22,4	25,6	43,4	66,4	79,7	96,6	96,8	113
Shear $V_{Rd, seis}$	[kN]	-	10,0	14,7	19,3	26,0	40,0	63,3	68,0	78,7	90,7	103

Materials

Mechanical properties

Anchor size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Nominal tensile strength f_{uk}	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	[N/mm²]	500	500	500	500	500	500	500	550	500	550	500
Stressed cross-section A_s	[mm²]	50,3	78,5	113	154	201	314	491	531	616	707	804
Moment of resistance W	[mm³]	50,3	98,2	170	269	402	785	1534	1726	2155	2651	3217

Material quality

Part	Material
Rebar EN 1992-1-1:2004 and AC:2010	Bars and de-coiled rods class B or C according to NDP or NCL of EN 1992-1-1/NA:2013

Setting information

Installation temperature range
- 10°C to + 40°C

Service temperature range

Hilti HIT-HY 200 injection mortar may be applied in the temperature ranges given below, An elevated base material temperature may lead to a reduction of the design bond resistance,

Temperature range	Base material temperature	Max, long term base material temperature	Max, short term base material temperature
Temperature range I	-40 °C to + 40 °C	+ 24 °C	+ 40 °C
Temperature range II	-40 °C to + 80 °C	+ 50 °C	+ 80 °C
Temperature range III	-40 °C to + 120 °C	+ 72 °C	+ 120 °C

Max, short term base material temperature
Short term elevated base material temperatures are those that occur over brief intervals, e,g, as a result of diurnal cycling,
Max, long term base material temperature
Long term elevated base material temperatures are roughly constant over significant periods of time,

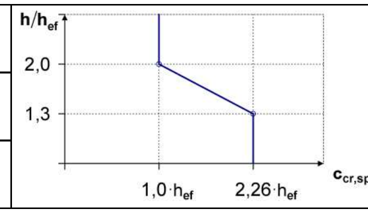
Curing and working time

Temperature of the base material	HIT-HY 200-A		HIT-HY 200-R	
	Maximum working time t_{work}	Minimum curing time t_{cure}	Maximum working time t_{work}	minimum curing time t_{cure}
- 10°C < T_{BM} ≤ - 5°C	1,5 h	7 h	3 h	20 h
- 5°C < T_{BM} ≤ 0°C	50 min	4 h	2 h	8 h
0°C < T_{BM} ≤ 5°C	25 min	2 hour	1 h	4 h
5°C < T_{BM} ≤ 10°C	15 min	75 min	40 min	2,5 h
10°C < T_{BM} ≤ 20°C	7 min	45 min	15 min	1,5 h
20°C < T_{BM} ≤ 30°C	4 min	30 min	9 min	1 h
30°C < T_{BM} ≤ 40°C	3 min	30 min	6 min	1 h

Installation equipment

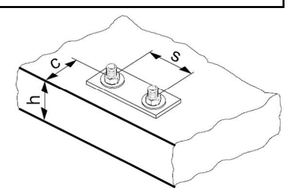
Anchor size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ26	ϕ28	ϕ30	ϕ32
Rotary hammer	TE 2 (-A) – TE 16 (-A)					TE 40 – TE 80					
Other tools	Compressed air gun, blow out pump Set of cleaning brushes, dispenser										

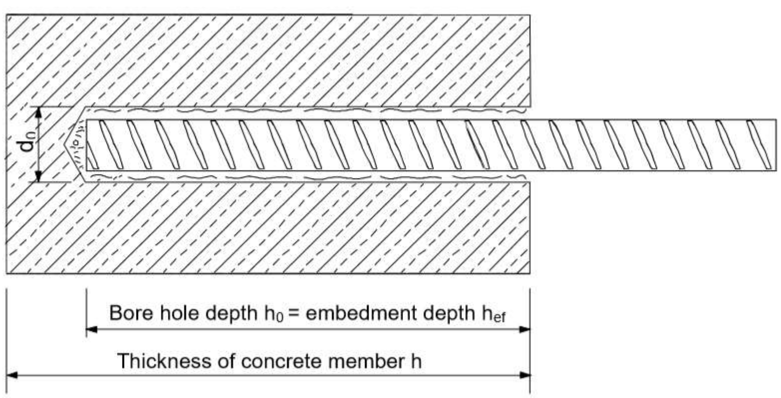
Setting details / Design parameters

Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø26	Ø28	Ø30	Ø32
Nominal diameter of drill bit	d_0	[mm]	10 / 12 [a)]	12 / 14 [a)]	14 / 16 [a)]	18	20	25	32	32	35	37	40
Effective anchorage and drill hole depth range [b)]	$h_{ef,min}$	[mm]	60	60	70	75	80	90	100	104	112	120	128
	$h_{ef,max}$	[mm]	160	200	240	280	320	400	500	520	560	600	640
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			$h_{ef} + 2\ d_0$							
Minimum spacing	s_{min}	[mm]	40	50	60	70	80	100	125	130	140	150	160
Minimum edge distance	c_{min}	[mm]	40	45	45	50	50	65	70	75	75	80	80
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$										
Critical edge distance for splitting failure [c)]	$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef}$				for $h / h_{ef} \geq 2{,}0$						
			$4{,}6\ h_{ef} - 1{,}8\ h$				for $2{,}0 > h / h_{ef} > 1{,}3$						
			$2{,}26\ h_{ef}$				for $h / h_{ef} \leq 1{,}3$						
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	$2\ c_{cr,N}$										
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$										

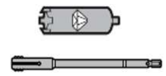
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced,

a) Both given values for drill bit diameter can be used.
b) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef}: embedment depth).
c) h: base material thickness ($h \geq h_{min}$).





Drilling and cleaning diameters

Rebar	Hammer drill (HD)	Hollow Drill Bit (HDB)	Diamond coring with Roughening Tool (RT)	Brush HIT-RB
	d_0 [mm]			size [mm]
				
ϕ8	12 / 10 [a)]	12	-	12 / 10 [a)]
ϕ10	14 / 12 [a)]	14 / 12 [a)]	-	14 / 12 [a)]
ϕ12	16 / 14 [a)]	16 / 14 [a)]	-	16 / 14 [a)]
ϕ14	18	18	18	18
ϕ16	20	20	20	20
ϕ20	25	25	25	25
ϕ25	32	32	32	32
ϕ26	32	32	35	32
ϕ28	35	35	35	35
ϕ30	37	-	-	37
ϕ32	40	-	-	40

a) Both given values can be used.

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

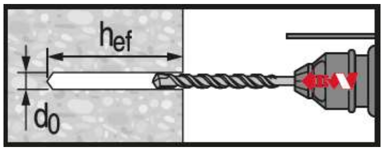
h_{ef} [mm]	Minimum roughening time $t_{roughen}$ [sec] ($t_{roughen}$ [sec] = h_{ef} [mm] /10)	Minimum blowing time $t_{blowing}$ [sec] ($t_{blowing}$ [sec] = $t_{roughen}$ [sec] + 20)
0 to 100	10	30
101 to 200	20	40
201 to 300	30	50
301 to 400	40	60
401 to 500	50	70
501 to 600	60	80

Setting instructions

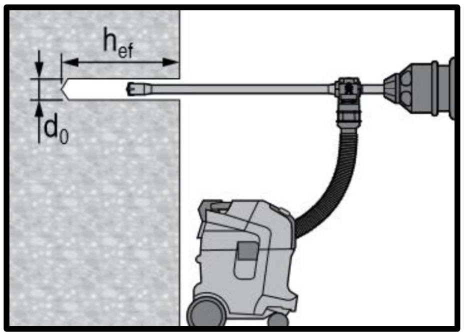
***For detailed information on installation see instruction for use given with the package of the product,**

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-HY 200.

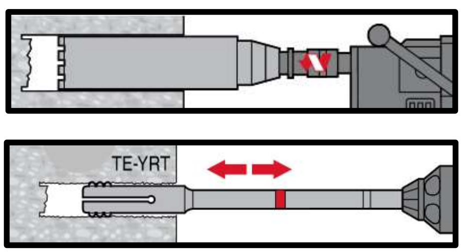


Hammer drilled hole (HD)

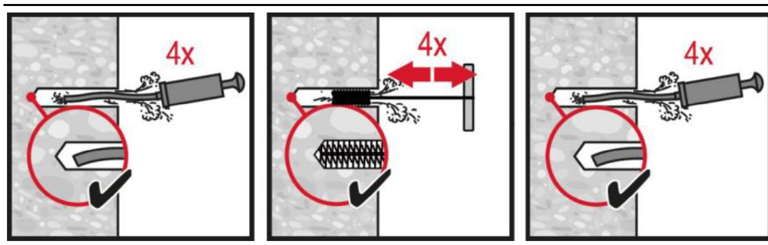


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required

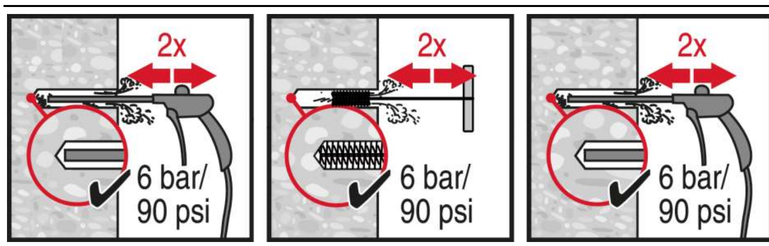


Diamond Drilling + Roughening Tool (DD+RT)



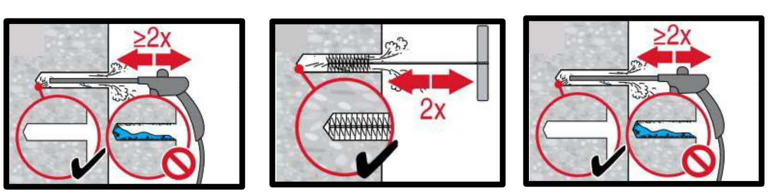
Hammer drilling:

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



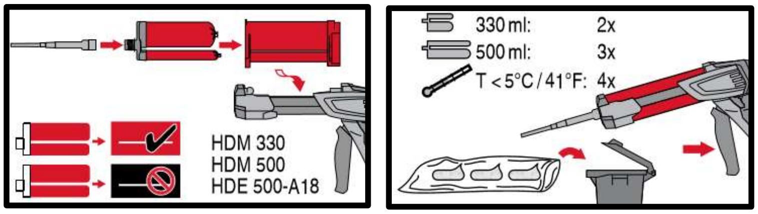
Hammer drilling:

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

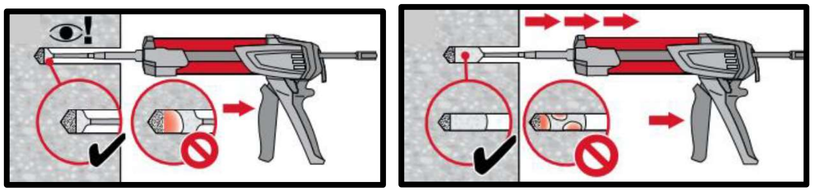


Diamond cored holes with Hilti roughening tool:

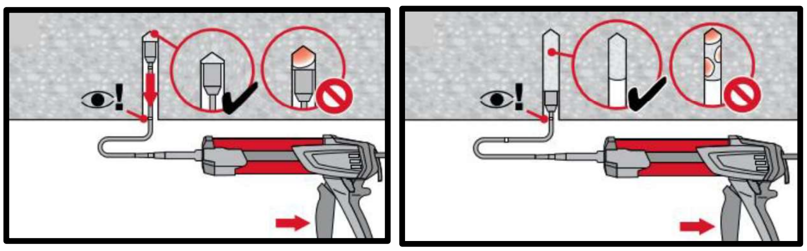
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0.



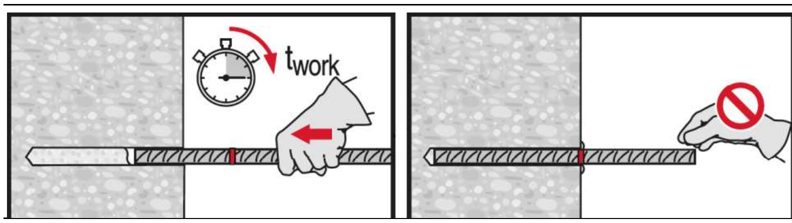
Injection system preparation.



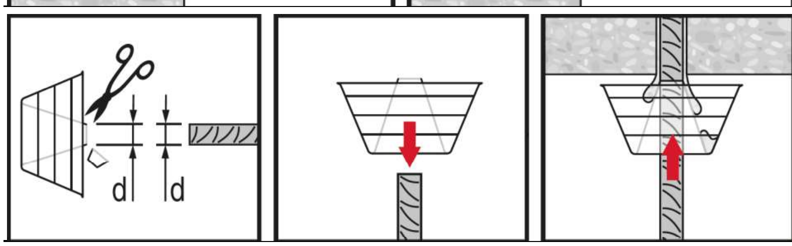
Injection method for drill hole depth h_{ef} ≤ 250 mm.



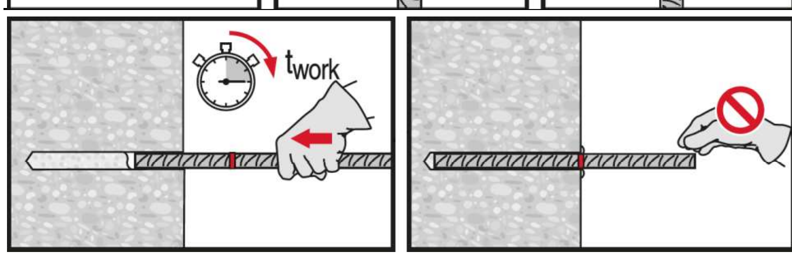
Injection method for overhead application and/or installations with embedment depth h_{ef} ≥ 250 mm.



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



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



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

HIT-HY 200 injection mortar

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

Injection mortar system

Hilti HIT-HY 200-R
330 ml foil pack
(also available as
500 ml foil pack)

Hilti HIT-HY 200-A
330 ml foil pack
(also available as
500 ml foil pack)

Rebar

(ϕ8 - ϕ32)

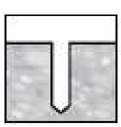
Benefits

- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- HY 200-R version is formulated for best handling and cure time specifically for rebar applications
- Approved for ETA seismic C1 approval for post-installed-rebar
- Suitable for concrete C 12/15 to C 50/60
- Suitable for dry and water saturated concrete
- For rebar diameters up to 32 mm
- Non corrosive to rebar elements
- Good load capacity at elevated temperatures
- Suitable for embedment length up to 1000 mm
- Suitable for applications down to -10 °C
- Two mortar versions: HY 200-A for slow cure applications and HY 200-R for fast cure applications

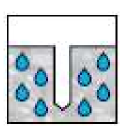
Base material

Concrete (non-cracked)

Concrete (cracked)

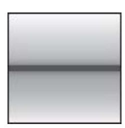


Dry concrete



Wet concrete

Load conditions

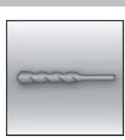


Static/ quasi-static

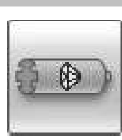
Seismic, CSTB[a)]/ETA-C1[b)]

Fire resistance

Installation conditions



Hammer drilling



Diamond drilled holes[c)]

SAFESET

Hilti SafeSet technology

Other informations

European Technical Assessment

CE conformity

PROFIS Rebar design Software

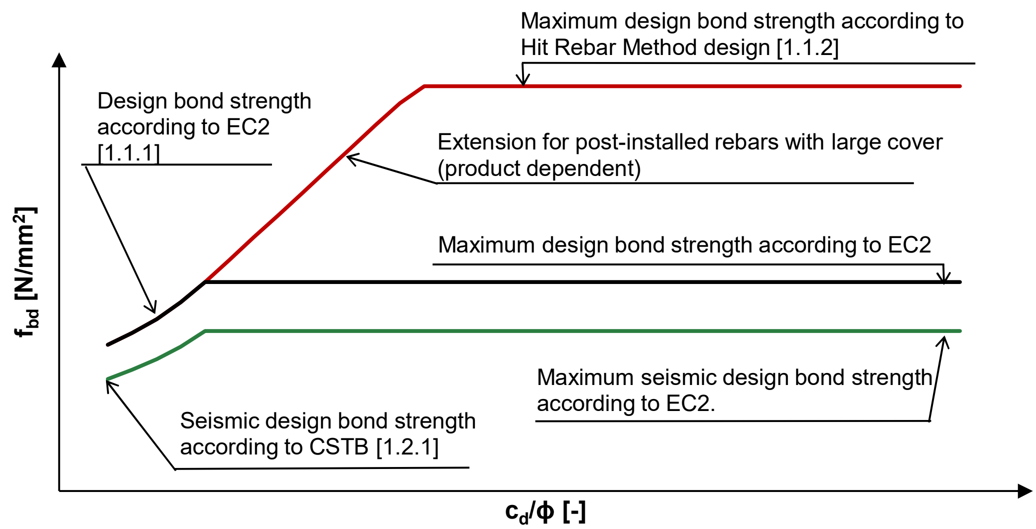
a) Seismic data only valid for HY 200-A.
b) Seismic data only valid for HY 200-R.
c) Diamond drilling only with Roughening Tool (RT).

Approvals / certificates

Description	Product	Authority / Laboratory	No. / date of issue
European Technical Assessment [a)]	HY 200-A (Rebar)	DIBt, Berlin	ETA-11/0492 / 2014-06-26
European Technical Assessment [a)]	HY 200-R (Rebar)	DIBt, Berlin	ETA-12/0083 / 2019-06-21
Assessment (fire)	HY 200-A	CSTB, Marne la Vallée	Z-21.8-1948 / 2013-11-14
Assessment (fire)	HY 200-R	CSTB, Marne la Vallée	Z-21.8-1947 / 2014-07-22

a) All data given in this section according to ETA-11/0492, issue 2014-06-26 and ETA-12/0083, issue 2019-06-21.

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)

Design bond strength in N/mm² for good bond conditions

All allowed 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

For poor bond conditions multiply the values by 0,7. Values valid for non-cracked and cracked concrete.

Maximum design bond strength in N/mm² for good bond conditions

Non-cracked concrete, all allowed drilling methods								
Temperature range	Rebar - size	Concrete class						
		C20/25	C25/30	C30/37	C35/45	C40/45	C45/55	C50/60
I: 40°C/24°C	**ϕ8 - ϕ32**	8	8,2	8,3	8,4	8,6	8,7	8,8
II: 58°C/35°C		6,7	6,8	6,9	7,0	7,1	7,2	7,3
III: 70°C/43°C		5,7	5,8	5,9	6,0	6,1	6,1	6,2
Cracked concrete, all allowed drilling methods								
I: 40°C/24°C	**ϕ12 - ϕ32**	4,7	4,8	4,8	4,9	5,0	5,1	5,1
II: 58°C/35°C		3,7	3,7	3,8	3,9	3,9	4,0	4,0
III: 70°C/43°C		3,3	3,4	3,5	3,5	3,6	3,6	3,7

For poor bond conditions multiply the values by 0,7. *The reduction factor for rebar diameter equal to 10 mm is 0,72.

Additional Hilti Technical Data:

Reduction factor for splitting with large concrete cover: δ = 0,306 (Hilti additional data)

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

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	1,0								

Anchorage length for characteristic steel strength f_{yk}=500 N/mm^2 for good conditions

All allowed drilling methods									
Rebar-size	**Concrete class**	**Yielding load** [kN]	**$l_{b,min}$ 1)** [mm]	**$l_{0,min}$ 1)** [mm]	**$l_{bd,y}$ (α2=1) 2)** [mm]	**$l_{bd,y}$ (α2=0.7) 3)** [mm]	**$l_{bd,y,HRM}$ (α2<0.7) 4)** [mm]	**l_{max} -10°C ≤ Ct 5) ≤ 0°C** [mm]	**l_{max} Ct 5) > 0°C** [mm]
ϕ8	**C20/25**	21,9	113	200	378	265	109	700	1000
ϕ8	**C50/60**	21,9	100	200	202	142	99	700	1000
ϕ10	**C20/25**	34,1	142	200	473	331	136	700	1000
ϕ10	**C50/60**	34,1	100	200	253	177	124	700	1000
ϕ12	**C20/25**	49,2	170	200	567	397	163	700	1000
ϕ12	**C50/60**	49,2	120	200	303	212	148	700	1000
ϕ14	**C20/25**	66,9	198	210	662	463	190	700	1000
ϕ14	**C50/60**	66,9	140	210	354	248	173	700	1000
ϕ16	**C20/25**	87,4	227	240	756	529	217	700	1000
ϕ16	**C50/60**	87,4	160	240	404	283	198	700	1000
ϕ18	**C20/25**	110,6	255	270	851	595	245	700	1000
ϕ18	**C50/60**	110,6	180	270	455	319	222	700	1000
ϕ20	**C20/25**	136,6	284	300	945	662	272	700	1000
ϕ20	**C50/60**	136,6	200	300	506	354	247	700	1000
ϕ22	**C20/25**	165,3	312	330	1040	728	299	700	1000
ϕ22	**C50/60**	165,3	220	330	556	389	272	700	1000
ϕ24	**C20/25**	196,7	340	360	1134	794	326	700	1000
ϕ24	**C50/60**	196,7	240	360	607	425	296	700	1000
ϕ25	**C20/25**	213,4	354	375	1181	827	340	700	1000
ϕ25	**C50/60**	213,4	250	375	632	442	309	700	1000
ϕ26	**C20/25**	230,8	369	390	1229	860	353	700	1000
ϕ26	**C50/60**	230,8	260	390	657	460	321	700	1000
ϕ28	**C20/25**	267,7	397	420	1323	926	380	700	1000
ϕ28	**C50/60**	267,7	280	420	708	495	346	700	1000
ϕ30	**C20/25**	307,3	425	450	1418	992	408	700	1000
ϕ30	**C50/60**	307,3	300	450	758	531	371	700	1000
ϕ32	**C20/25**	349,7	454	480	1512	1059	435	700	1000
ϕ32	**C50/60**	349,7	320	480	809	566	395	700	1000

1) According to EC2: EN 1992-1-1:2004 $l_{b,min}$ (8.6) and $l_{0,min}$ (8.11) are calculated for good bond conditions with characteristic yield strength f_{yk} = 500 N/mm², γ_M=1,15 and α_6 = 1,0.
2) Embedment depth for yield of the rebar and for c_d/ϕ = 1 (characteristic yield strength f_{yk} = 500 N/mm²).
3) Embedment depth for yield of the rebar and for c_d/ϕ = 3 (characteristic yield strength f_{yk} = 500 N/mm²).
4) Embedment depth according to Hit Rebar design for yield of the rebar and for c_d/ϕ > 8 (Temperature range I, characteristic yield strength f_{yk} = 500 N/mm²).
5) c_t=concrete temperature.

Seismic data

Seismic data according to ETA-12/0083 assessment

Seismic reduction factor $k_{b,seis}$ for hammer drilling (HD) and (HDB) and compressed air drilling (CA)

Rebar - size	Reduction factor $k_{b,seis}$							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ12 - ϕ18	1,0				0,90	0,82	0,76	0,71
ϕ20 - ϕ30	1,0						0,92	0,86
ϕ32	1,0							

For poor bond conditions multiply the values 0,7.

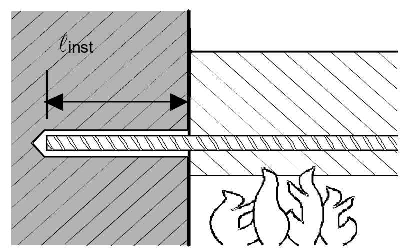
Design values for the ultimate bond resistance $f_{bd,seis}$ [1] in N/mm² for seismic loading for hammer drilling (HD) and (HDB) and compressed air drilling (CA)

Rebar - size		Bond resistance $f_{bd,seis}$						
		Concrete class						
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ12 - ϕ18	2,0	2,3	2,7	3,0				
ϕ20 - ϕ30	2,0	2,3	2,7	3,0	3,4	3,7		
ϕ32	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3

1) **According to EN 1992-1-1:2004 for good bond conditions. For all other bond conditions multiply the values by 0.7.**

Fire resistance

a) Anchoring application



Maximum force ($F_{s,T,max}$) in rebar in conjunction with HIT-HY 200 as a function of embedment depth (ℓ_{inst}) for the fire resistance classes F30 to F180 according to EC2.

Rebar-size	$F_{s,T,max}$ [kN]	ℓ_{inst} [mm]	Fire resistance of bar [kN]				
			R30	R60	R90	R120	R180
ϕ8	16,19	80	3,0	0,7	0,2	0,0	0,0
		120	7,0	2,2	1,3	0,7	0,2
		170	16,2	10,2	9,2	4,0	1,7
		210		16,2	16,2	11,0	7,5
		230				14,5	10,9
		250				16,2	14,5
		300					16,2
ϕ10	25,29	100	6,1	2,0	1,0	0,4	0,0
		150	19,3	9,3	7,1	2,2	1,0
		190	25,3	18,0	15,9	9,3	4,9
		230		25,3	24,7	18,1	13,7
		260			25,3	24,7	20,3
		280				25,3	24,7
		320					25,3
ϕ12	36,42	120	15,3	6,0	1,9	1,1	0,3
		180	31,0	19,0	17,8	8,5	7,0

Maximum force ($F_{s,T,max}$) in rebar in conjunction with HIT-HY 200 as a function of embedment depth (ℓ_{inst}) for the fire resistance classes F30 to F180 according to EC2

ϕ12	**36,42**	220	*36,4*	29,6	27,0	19,1	13,8
		260		*36,4*	*36,4*	29,7	24,4
		280				35,0	29,6
		300				*36,4*	34,9
		340					*36,4*
ϕ14	**49,58**	140	24,0	9,9	6,9	2,6	1,0
		210	45,0	31,4	28,5	25,7	13,0
		240	*49,6*	40,6	37,7	32,8	22,3
		280		*49,6*	*49,6*	40,7	34,6
		300				44,7	40,7
		330				*49,6*	48,1
		360					*49,6*
ϕ16	**64,75**	160	34,5	18,4	14,9	4,4	2,3
		240	62,6	46,4	43,0	37,7	25,5
		260	*64,8*	53,5	50,0	44,7	32,5
		300		*64,8*	57,0	51,7	49,6
		330			*64,8*	61,3	57,2
		360				*64,8*	62,7
		400					*64,8*
ϕ20	**101,18**	200	60,7	40,0	36,3	29,3	14,3
		250	78,3	62,5	58,3	51,3	36,3
		310	*101,2*	88,9	84,6	77,6	62,6
		350		*101,2*	*101,2*	94,2	80,2
		370				*101,2*	83,5
		390					97,8
		430					*101,2*
ϕ25	**158,09**	250	97,9	78,1	72,6	64,7	45,3
		280	126,5	94,6	89,4	81,2	61,8
		370	*158,1*	144,0	127,9	119,7	111,2
		410		*158,1*	150,0	141,8	123,2
		430			*158,1*	150,0	144,2
		450				*158,1*	155,2
		500					*158,1*
ϕ32	**158,09**	250	97,9	78,1	72,6	64,7	45,3
		280	126,5	94,6	89,4	81,2	61,8
		370	*158,1*	144,0	127,9	119,7	111,2
		410		*158,1*	150,0	141,8	123,2
		430			*158,1*	150,0	144,2
		450				*158,1*	155,2
		500					*158,1*

Characteristic yield strength f_{yk} = 500 N/mm²

Steel failure

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.

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

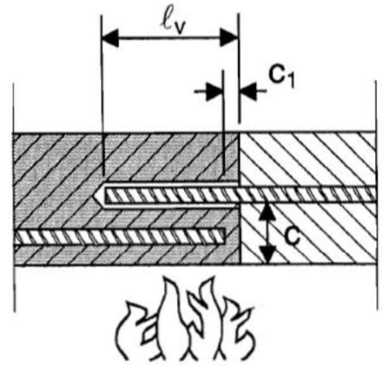
ℓ_s = lap length

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, τ_c, concerning “overlap joint” for Hilti HIT-HY 200 injection adhesive in relation to fire resistance class and required minimum concrete coverage c.

<table>
<tr><th>Clear concrete cover c</th><th colspan="5">Max. bond stress, τc [N/mm²]</th></tr>
<tr><th>[mm]</th><th>R30</th><th>R60</th><th>R90</th><th>R120</th><th>R180</th></tr>
<tr><td>30</td><td>0,6</td><td>0,3</td><td rowspan="2">-</td><td rowspan="5">-</td><td rowspan="9">-</td></tr>
<tr><td>35</td><td>0,7</td><td>0,3</td></tr>
<tr><td>40</td><td>0,9</td><td>0,4</td><td>0,2</td></tr>
<tr><td>45</td><td>1,0</td><td>0,4</td><td>0,2</td></tr>
<tr><td>50</td><td>1,2</td><td>0,5</td><td>0,3</td></tr>
<tr><td>55</td><td>1,5</td><td>0,6</td><td>0,3</td><td>0,2</td></tr>
<tr><td>60</td><td>1,8</td><td>0,8</td><td>0,4</td><td>0,3</td></tr>
<tr><td>65</td><td rowspan="16">2,2</td><td>0,9</td><td>0,5</td><td>0,3</td></tr>
<tr><td>70</td><td>1,0</td><td>0,5</td><td>0,3</td></tr>
<tr><td>75</td><td>1,2</td><td>0,6</td><td>0,4</td><td>0,2</td></tr>
<tr><td>80</td><td>1,5</td><td>0,7</td><td>0,5</td><td>0,3</td></tr>
<tr><td>85</td><td>1,7</td><td>0,8</td><td>0,5</td><td>0,3</td></tr>
<tr><td>90</td><td>2,0</td><td>1,0</td><td>0,6</td><td>0,3</td></tr>
<tr><td>95</td><td rowspan="10">2,2</td><td>1,1</td><td>0,7</td><td>0,4</td></tr>
<tr><td>100</td><td>1,3</td><td>0,8</td><td>0,4</td></tr>
<tr><td>105</td><td>1,5</td><td>0,9</td><td>0,5</td></tr>
<tr><td>110</td><td>1,7</td><td>1,1</td><td>0,5</td></tr>
<tr><td>115</td><td>2,0</td><td>1,2</td><td>0,6</td></tr>
<tr><td>120</td><td rowspan="5">2,2</td><td>1,4</td><td>0,6</td></tr>
<tr><td>125</td><td>1,6</td><td>0,7</td></tr>
<tr><td>130</td><td>1,9</td><td>0,8</td></tr>
<tr><td>135</td><td rowspan="2">2,1</td><td>0,9</td></tr>
<tr><td>200</td><td>2,3</td></tr>
</table>

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 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-HY 200: low displacements with long term stability, failure load after exposure above reference load.

Resistance to chemical substances

Chemical	Resistance
Air	+
Acetic acid 10%	+
Acetone	o
Ammonia 5%	+
Benzyl alcohol	-
Chloric acid 10%	o
Chlorinated lime 10%	+
Citric acid 10%	+
Concrete plasticizer	+
De-icing salt (Calcium chloride)	+
Demineralized water	+
Diesel fuel	+
Drilling dust suspension pH 13,2	+
Ethanol 96%	-
Ethylacetate	-
Formic acid 10%	+
Formwork oil	+

Chemical	Resistance
Gasoline	+
Glycole	o
Hydrogen peroxide 10%	o
Lactic acid 10%	+
Maschinery oil	+
Methylethylketon	o
Nitric acid 10%	o
Phosphoric acid 10%	+
Potassium Hydroxide pH 13,2	+
Sea water	+
Sewage sludge	+
Sodium carbonate 10%	+
Sodium hypochlorite 2%	+
Sulfuric acid 10%	+
Sulfuric acid 30%	+
Toluene	o
Xylene	o

+ resistant
o resistant in short term (max. 48h) contact
- not resistant

Electrical Conductivity
HIT-HY 200 in the hardened state **is not conductive electrically**. Its electric resistivity is $15{,}5 \cdot 10^9\ \Omega \cdot cm$ (DIN IEC 93 – 12.93). It is adapted well to realize electrically insulating anchoring (ex: railway applications, subway).

Setting information

Installation temperature range
-10°C to +40°C

Service temperature range
Hilti HIT-HY 200 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 a result of diurnal cycling.
Max long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Curing and working time

Temperature of the base material	HIT-HY 200-A		HIT-HY 200-R	
	Maximum working time t_{work}	Minimum curing time t_{cure}	Maximum working time t_{work}	minimum curing time t_{cure}
- 10°C < T_{BM} ≤ - 5°C	1,5 h	7 h	3 h	20 h
- 5°C < T_{BM} ≤ 0°C	50 min	4 h	2 h	8 h
0°C < T_{BM} ≤ 5°C	25 min	2 hour	1 h	4 h
5°C < T_{BM} ≤ 10°C	15 min	75 min	40 min	2,5 h
10°C < T_{BM} ≤ 20°C	7 min	45 min	15 min	1,5 h
20°C < T_{BM} ≤ 30°C	4 min	30 min	9 min	1 h
30°C < T_{BM} ≤ 40°C	3 min	30 min	6 min	1 h

Setting information

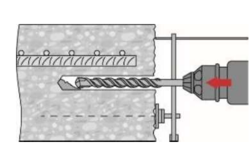
Installation equipment

Rebar – size	ϕ8 - ϕ16	ϕ18 - ϕ32
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	

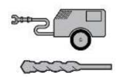
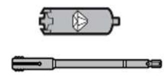
a) Compressed air gun with extension hose for all drill holes deeper than 250 mm (for ϕ 8 to ϕ 12) or deeper than 20·ϕ (for ϕ > 12 mm).
b) Automatic brushing with round brush for all drill holes deeper than 250 mm (for ϕ 8 to ϕ 12) or deeper than 20·ϕ (for ϕ > 12 mm).

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 · l_v ≥ 2 · ϕ	30 + 0,02 · l_v ≥ 2 · ϕ
	ϕ ≥ 25	40 + 0,06 · l_v ≥ 2 · ϕ	40 + 0,02 · l_v ≥ 2 · ϕ
Compressed air drilling **(CA)**	ϕ < 25	50 + 0,08 · l_v	50 + 0,02 · l_v
	ϕ ≥ 25	60 + 0,08 · l_v ≥ 2 · ϕ	60 + 0,02 · l_v ≥ 2 · ϕ



Drilling and cleaning diameters

Rebar [mm]	Hammer drill (HD)	Hollow Drill Bit (HDB) [b)]	Compressed air drill (CA)	Diamond coring with roughening tool (RT)	Brush HIT-RB	Air nozzle HIT-RB
	d_0 [mm]				size [mm]	
						
ϕ8	12 / 10 [a)]	12	-	-	12 / 10 [a)]	12 / 10 [a)]
ϕ10	14 / 12 [a)]	14 / 12 [a)]	-	-	14 / 12 [a)]	14 / 12 [a)]
ϕ12	16 / 14 [a)]	16 / 14 [a)]	-	-	16 / 14 [a)]	16 / 14 [a)]
	-	-	17	-	18	16
ϕ14	18	18	17	18	18	18
ϕ16	20	20	-	-	20	20
	-	-	20	20	22	20
ϕ18	22	22	22	22	22	22
ϕ20	25	25	-	-	25	25
	-	-	26	25	28	25
ϕ22	28	28	28	28	28	28
ϕ24	32	32	32	32	32	
ϕ25	32	32	32	32	32	
ϕ26	35	-	35	35	35	
ϕ28	35	-	35	35	35	32
ϕ30	-	-	35	-	35	
	37	-	-	-	37	
ϕ32	40	-	40	-	40	

a) Maximum installation length l=250 mm.

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

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

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

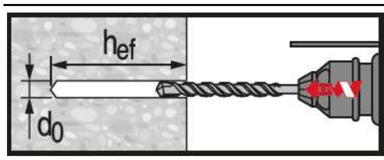
Rebar	Dispenser	
	HDM 330, HDM 500, HDE 500	HDE 500
	Concrete temp. ≥ -10°C	Concrete temp. ≥ 0°C
	$\ell_{v,max}$ [mm]	$\ell_{v,max}$ [mm]
ϕ8 - ϕ32	700	1000

Setting instructions

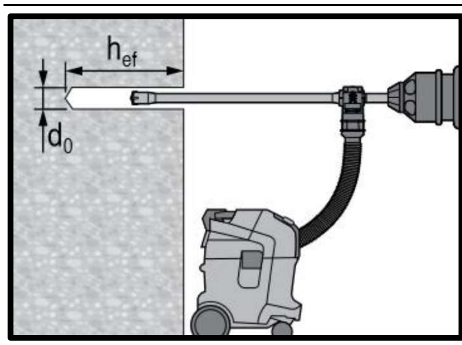
***For detailed information on installation see instruction for use given with the package of the product.**

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-HY 200.

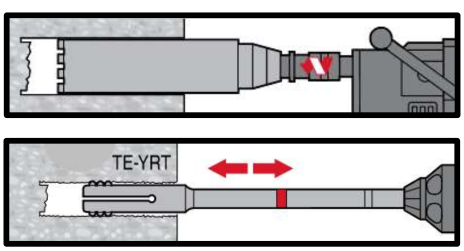


Hammer drilled hole (HD)

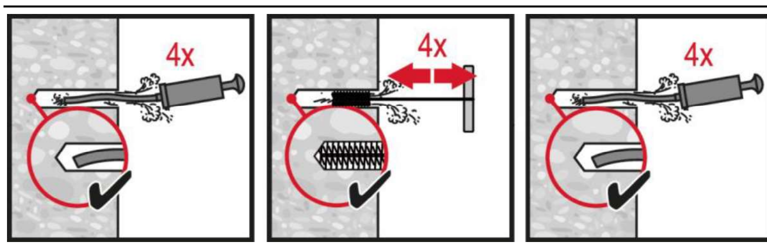


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required

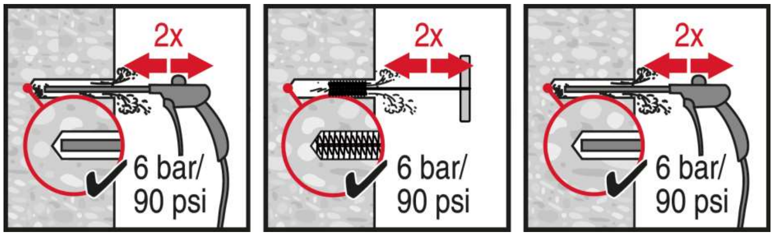


Diamond Drilling + Roughening Tool (DD+RT)



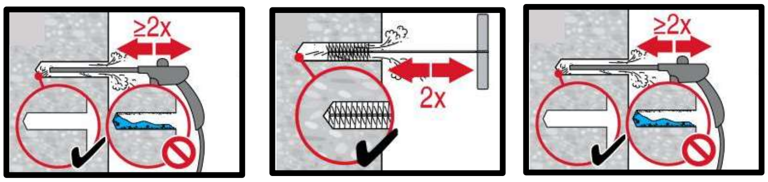
Hammer drilling:

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



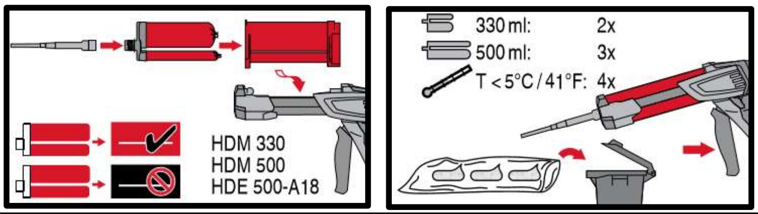
Hammer drilling:

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

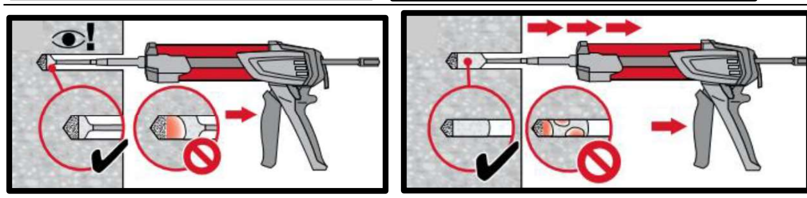


Diamond cored holes with Hilti roughening tool:

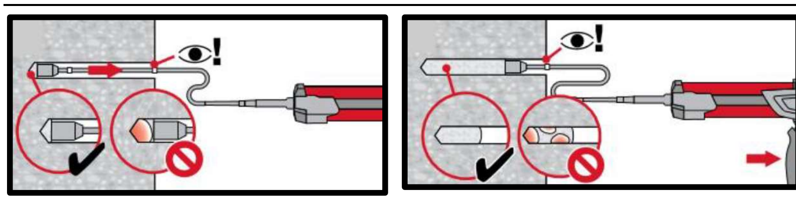
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0.



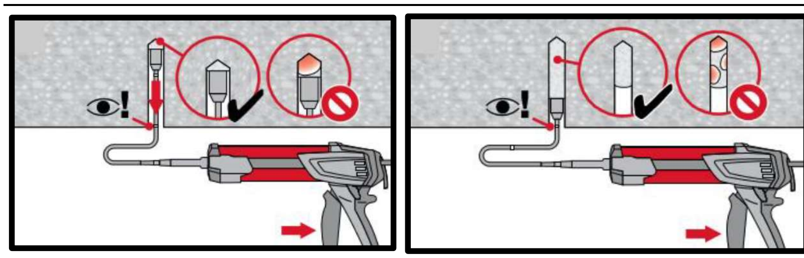
Injection system preparation.



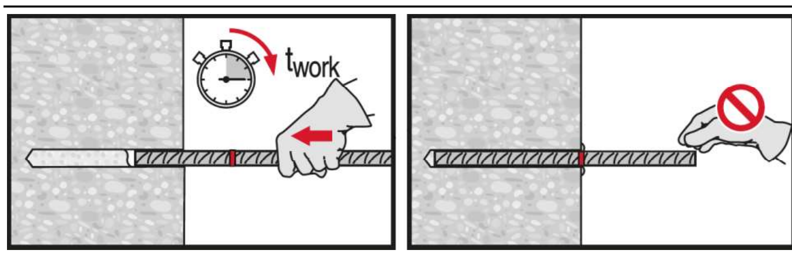
Injection method for drill hole depth $h_{ef} \leq 250$ mm.



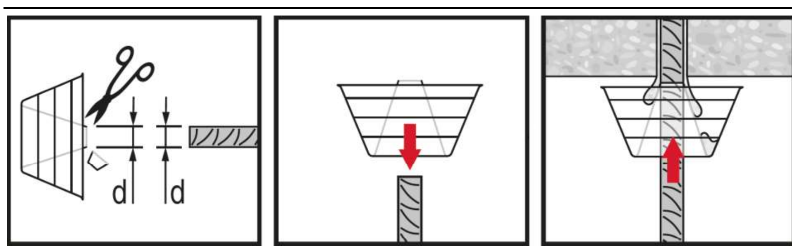
Injection method for drill hole depth $h_{ef} > 250$mm.



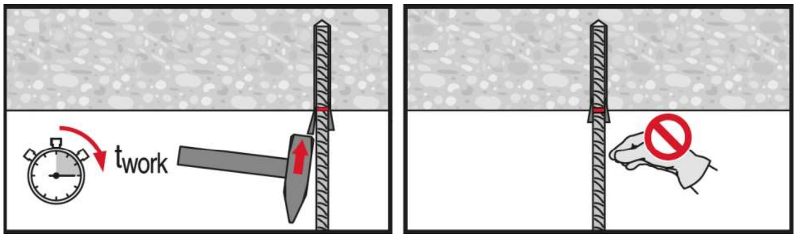
Injection method for overhead application.

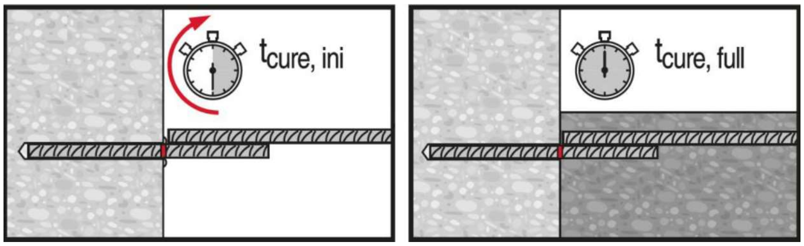


Setting element, observe working time "t_{work}".



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





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