Hilti HIT-HY 170 mortar with rebar (as post-installed connection)

Injection mortar system	Benefits
 Hilti HIT-HY 170 500 ml foil pack (also available as 330 ml foil pack)  Static mixer  Steel element	- suitable for concrete C12/15 to C50/60 - suitable for dry and water saturated concrete - high loading capacity and fast cure - high corrosion resistant - for rebar diameters up to 25 mm - in service temperature range up to 80°C short term/50°C long term - manual cleaning for drill hole sizes ≤ 20 mm and embedment depth $h_{ef} \leq 10d$ - Suitable for embedment depth up to 1000 mm depending on the rebar diameter

Base material	Load conditions
 Concrete (uncracked)	 Static/quasi-static  Fire ETA
Installation conditions	**Other informations**
 Hammer drilled holes  Dry concrete  Water saturated concrete	 European Technical Approval  CE conformity  High corrosion resistence

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment [a)]	DIBt, Berlin	ETA-15/0297 / 2015-12-11

[a)] All data given in this section according ETA-15/0297 issue 2015-12-11.

Materials

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

Setting details

Working time and curing time

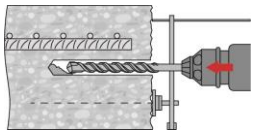
Temperature of the base material T_{BM}	Maximum working time t_{work}	Minimum curing time t_{cure} [a)]
-5°C ≤ T_{BM} ≤ 0°C	10 min	12 h
0°C < T_{BM} ≤ 5°C	10 min	5 h
5°C < T_{BM} ≤ 10°C	8 min	2,5 h
10°C < T_{BM} ≤ 20°C	5 min	1,5 h
20°C < T_{BM} ≤ 30°C	3 min	45 min
30°C < T_{BM} ≤ 40°C	2 min	30 min

[a)] The curing time data are valid for dry base material only. In wet base material the curing times must be doubled.

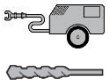
Installation equipment

Anchor size	8	10	12	14	16	18	20	22	24	25
Rotary hammer	TE 2 – TE 40					TE 40 – TE 70				
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser									

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)**	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

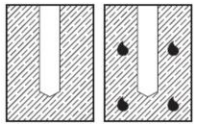
Rebar	Hammer drilling (HD)	Compressed air drilling (CA)	Brush HIT-RB	Air nozzle HIT-DL	Extension for air nozzle
					
Diameter [mm]	**Drill bit diameters d_0 [mm]**		**Size**		**[-]**
8	10 [a]	-	10	10	HIT-DL 10/0,8 or HIT-DL V10/1
	12	-	12	12	
10	12 [a]	-	12	12	
	14	-	14	14	
12	14 [a]	-	14	14	
	16	-	16	16	
	-	17	18	16	
14	18	-	18	18	
	-	17	18	16	
16	20	20	20	20	HIT-DL 16/0,8 or HIT-DL B and/or HIT-VL 16/0,7 and/or HIT-VL 16
18	22	22	22	22	
20	25	-	25	25	
	-	26	28	25	
22	28	28	28	28	
24	32	32	32	32	
25	32	32	32	32	

[a] Values in brackets valid for maximum drilling depth of 250 mm

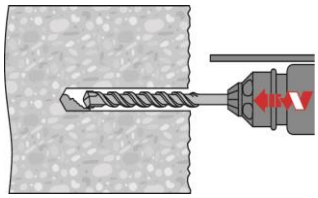
Dispensers and corresponding maximum embedment depth $\ell_{v,max}$

Rebar (mm)	Dispenser HDM 330, HDM 500, HDE 500
Ø d_s [mm]	$\ell_{v,max}$ [mm]
8 to 16	1000
18 to 25	700

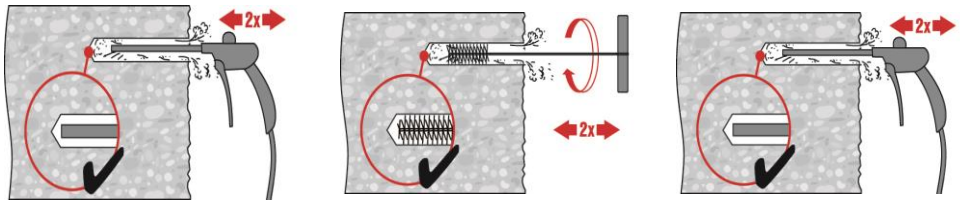
Setting instruction



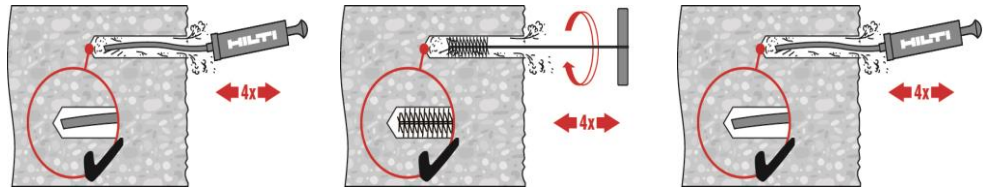

Dry and w ater saturated concrete, hammer drilling



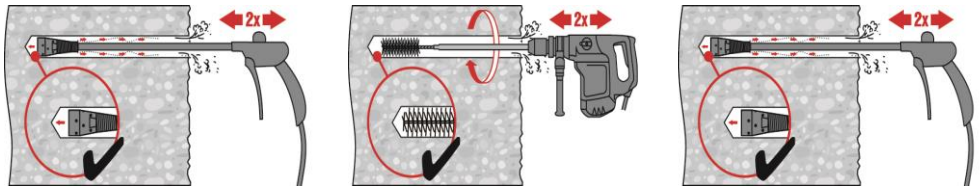
Drill hole



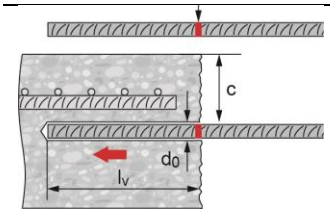
Compressed air cleaning



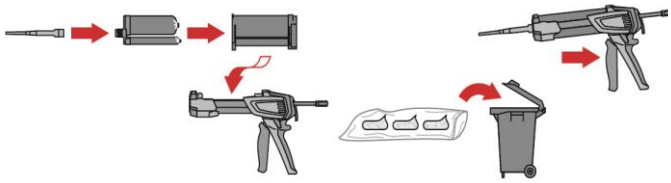
Manual cleaning for diameters $d_0 \leq 20$ mm and bore hole depth $h_0 \leq 10 \cdot d$.



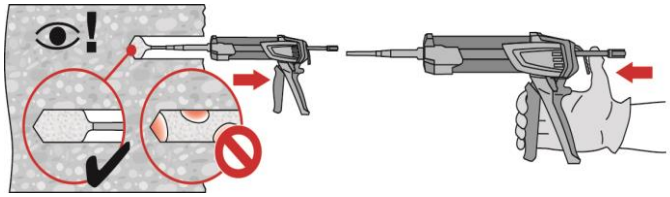
Compressed air cleaning for drill holes deeper than 250 mm (for ϕ 8 to ϕ 12) or deeper than $20 \cdot \phi$ (for $\phi > 12$ mm)



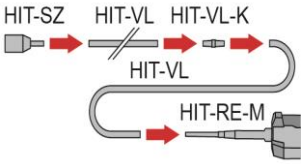
Rebar preparation

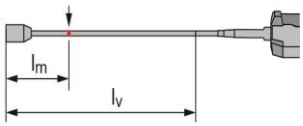


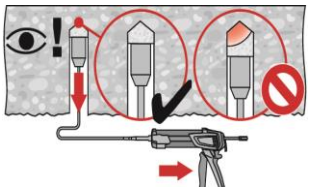
Injection system preparation

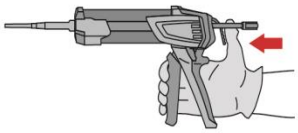


Injection method for drill hole depth ≤ 250 mm (w ithout overhead applications)

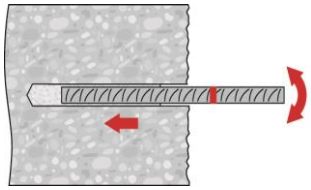




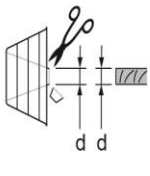


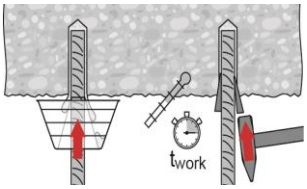


Injection method for drill hole depth > 250 mm or overhead applications

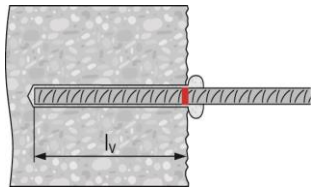


Setting the element for easy installation

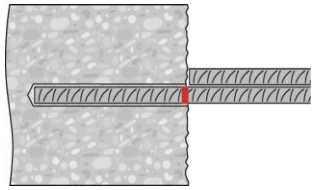




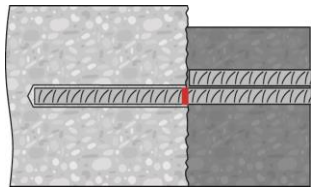
Setting the element for overhead applications



Annular gap filled with mortar



Observe the working time "t_{work}"



Full load may be applied only after the curing time "t_{cure}"

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

Basic design data for rebar design

Bond strength in N/mm² for good bond conditions for all drilling methods [a)]

Bar diameter (mm)	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 - 12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7
14 - 25	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4

[a)] For all other bond conditions multiply the values by 0,7.

Minimum anchorage length and minimum lap length

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

Bar diameter (mm)	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 - 25	1,0								

Service temperature range

Hilti HIT-HY 170 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.

	Base material temperature	Maximum long term base material temperature	Maximum short term base material temperature
Temperature range	-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.

Fitness for use

Creep behaviour
Creep tests have been conducted in accordance with ETAG guideline 001 part 5 and EAD 330087-00-0601 in the following conditions: in dry environnement at 50 °C during 90 days.

These tests show an excellent behaviour of the post-installed connection made with HIT-HY 170: low displacements with long term stability, failure load after exposure above reference load.

Resistance to chemical substances

Chemical substance	Comment	Resistance
Sulphuric acid	23°C	+
Alkaline medium	pH = 13,2, 23°C	+

Precalculated values

Example of pre-calculated values

Rebar yield strength f_{yk} = 500 N/mm², concrete C25/30, good bond conditions

Rebar [mm]	Anchorage length l_{bd} [mm]	Design value N_{Rd} [kN]	Mortar volume [ml]	Anchorage length l_{bd} [mm]	Design value N_{Rd} [kN]	Mortar volume [ml]
	$\alpha_1=\alpha_2=\alpha_3=\alpha_4=\alpha_5=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_4 = 1,0$		
8	100	6,8	8	100	9,7	8
	170	11,5	13	140	13,6	11
	250	17,0	19	180	17,4	14
	322	**21,9**	24	**226**	**21,9**	17
10	121	10,3	11	121	14,7	11
	220	18,7	20	170	20,6	15
	310	26,3	28	230	27,9	21
	403	**34,2**	36	**281**	**34,1**	25
12	145	14,8	15	145	21,1	15
	260	26,5	27	210	30,5	22
	370	37,7	39	270	39,3	29
	483	**49,2**	51	**338**	**49,1**	36
14	169	20,1	20	169	28,7	20
	300	35,6	36	240	40,7	29
	430	51,1	52	320	54,3	39
	564	**67,0**	68	**394**	**66,8**	48
16	193	26,2	26	193	37,4	26
	340	46,1	46	280	54,3	38
	490	66,5	67	370	71,7	50
	644	**87,4**	87	**451**	**87,4**	61
18	217	33,1	33	217	47,3	33
	380	58,0	57	310	67,6	47
	540	82,4	81	410	89,4	62
	700	**106,9**	106	**507**	**110,6**	76
20	242	41,1	51	242	58,6	51
	390	66,2	83	350	84,8	74
	550	93,3	117	460	111,5	98
	700	**118,8**	148	**564**	**136,7**	120
22	266	49,6	75	266	70,9	75
	410	76,5	116	380	101,3	107
	560	104,5	158	500	133,3	141
	700	**130,6**	198	**620**	**165,3**	175
24	290	59,0	122	290	84,3	122
	430	87,5	182	420	122,1	177
	560	114,0	236	550	160,0	232
	700	**142,5**	296	**676**	**196,6**	285
25	302	64,0	114	302	91,5	114
	430	91,2	162	430	130,3	162
	570	120,9	214	570	172,7	214
	700	**148,4**	263	**700**	**212,1**	263

* Values corresponding to the minimum anchorage length. The maximum permissible load is valid for "good bond conditions" as described in EN 1992-1-1. For all other conditions multiply by the value by 0,7. The volume of mortar correspond to the formula "$1,2 * (d_0^2 - d_s^2) * \pi * l_b/4$" for hammer drilling

Example of pre-calculated values for "overlap joints"

Rebar yield strength f_{yk} = 500 N/mm², concrete C25/30, good bond conditions

Rebar [mm]	Anchorage length l_{bd} [mm]	Design value N_{Rd} [kN]	Mortar volume [ml]	Anchorage length l_{bd} [mm]	Design value N_{Rd} [kN]	Mortar volume [ml]
	$\alpha_1=\alpha_2=\alpha_3=\alpha_5=\alpha_6=1,0$			α_2 or α_5= 0,7 $\alpha_1 = \alpha_3 = \alpha_6 = 1,0$		
8	200	13,6	15	200	19,4	15
	240	16,3	18	210	20,4	16
	280	19,0	21	220	21,3	17
	322	**21,9**	24	**226**	**21,9**	17
10	200	17,0	18	200	24,2	18
	270	22,9	24	230	27,9	21
	340	28,8	31	250	30,3	23
	403	**34,2**	36	**281**	**34,1**	25
12	200	20,4	21	200	29,1	21
	290	29,5	31	250	36,4	26
	390	39,7	41	290	42,2	31
	483	**49,2**	51	**338**	**49,1**	36
14	210	24,9	25	210	35,6	25
	330	39,2	40	270	45,8	33
	450	53,4	54	330	56,0	40
	564	**67,0**	68	**394**	**66,8**	48
16	240	32,6	33	240	46,5	33
	370	50,2	50	310	60,1	42
	510	69,2	69	380	73,7	52
	644	**87,4**	87	**451**	**87,4**	61
18	270	41,2	41	270	58,9	41
	410	62,6	62	350	76,3	53
	560	85,5	84	430	93,8	65
	700	**106,9**	106	**507**	**110,6**	76
20	300	50,9	64	300	72,7	64
	430	72,9	91	390	94,5	83
	570	96,7	121	480	116,3	102
	700	**118,8**	148	**564**	**136,7**	120
22	330	61,6	93	330	88,0	93
	450	84,0	127	430	114,6	122
	580	108,2	164	520	138,6	147
	700	**130,6**	198	**620**	**165,3**	175
24	360	73,3	152	360	104,7	152
	470	95,7	198	470	136,7	198
	590	120,1	249	570	165,8	241
	700	**142,5**	296	**676**	**196,6**	285
25	375	79,5	141	375	113,6	141
	480	101,8	181	480	145,4	181
	590	125,1	222	590	178,7	222
	700	**148,4**	263	**700**	**212,1**	263

* Values corresponding to the minimum anchorage length. The maximum permissible load is valid for "good bond conditions" as described in EN 1992-1-1. For all other conditions multiply by the value by 0,7. The volume of mortar correspond to the formula "$1,2 * (d_0^2 - d_s^2) * \pi * l_b/4$" for hammer drilling