HIT-RE 500 V4
INJECTION MORTAR

Technical Data Sheet

Update: August-21

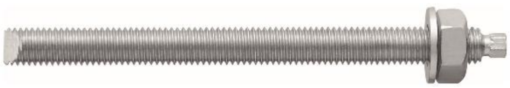
HIT-RE 500 V4 injection mortar

Anchor design (EN 1992-4) / Rods&Sleeves / Concrete

Injection mortar system

Foil pack: HIT-RE 500 V4

(available in 330, 500 and 1400 ml cartridges)



Anchor rod:
HAS-U
HAS-U HDG
HAS-U A4
HAS-U HCR
AM 8.8 (HDG)
(M8-M39)

Internally threaded sleeve:
HIS-N
HIS-RN
(M8-M20)

Benefits

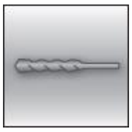
- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Suitable for non-cracked and cracked concrete C 20/25 to C 50/60
- High loading capacity
- Suitable for dry and water saturated concrete
- Hilti Technical Data for under water application
- Hilti Technical Data for service life of 100 years
- High corrosion resistance
- Long working time at elevated temperatures
- Cures down to -5 °C
- Odourless epoxy

Base material


Concrete (non-cracked)

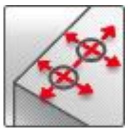

Concrete (cracked)

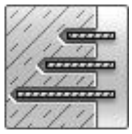
Installation conditions


Hammer drilled holes

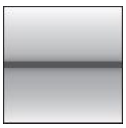

Diamond drilled holes

SAFESET
Hilti **SafeSet** technology


Small edge distance and spacing


Variable embedment depth

Load conditions


Static/ quasi-static

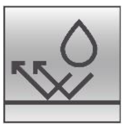

Seismic, ETA-C1, C2

Other information

Service life 100y, Hilti Tech. Data


European Technical Assessment

CE
CE conformity


Corrosion resistance

High corrosion resistance [1)]


PROFIS design Software

1) High Corrosion Resistant (HCR) rods available only for HAS-U.

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment[a)]	CSTB	ETA-20/0541 / 2020-11-21

a) All data given in this section according to ETA-20/0541, issue 2020-11-21 (if not stated otherwise).

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

All data in this section applies to:

- Correct setting (see setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- HAS-U anchor rod with strength class 5.8 and 8.8, AM anchor rod with strength class 8.8, HIS-N internally threaded insert with screw 8.8
- Base material thickness and one typical embedment depth, as specified in the table
- Concrete C 20/25
- Service life: 50 years
- Temperature range I: -40 °C to +40 °C
  (min. base material temperature -40 °C, max. long/short term base material temperature: +24 °C/40 °C)
- Short term loading. For long term loading apply ψ_{sus} acc. to EN 1992-4
  Hammer drilled holes, hammer drilled holes with hollow drill bit and diamond cored holes with Hilti roughening tool: $\psi^0_{sus} = 0,88$; diamond cored holes: $\psi^0_{sus} = 0,89$

Embedment depth[a] and base material thickness

Anchor size		ETA-20/0541, issued 2020-11-21								Hilti tech. data		
		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
HAS-U												
Eff. anchorage depth	[mm]	80	90	110	125	170	210	240	270	300	330	360
Base material thickness	[mm]	110	120	140	161	214	266	300	340	374	410	444
HIS-N												
Eff. anchorage depth	[mm]	90	110	125	170	205	-	-	-	-	-	-
Base material thickness	[mm]	120	150	170	230	270	-	-	-	-	-	-

a) The allowed range of embedment depth is shown in the setting.

For hammer drilled holes, hammer drilled holes with hollow drill bit[1] and diamond cored with Hilti roughening tool TE-YRT[2]:
Characteristic resistance

Anchor size			ETA-20/0541, issued 2020-11-21								Hilti tech. data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Non-cracked concrete													
Tension N_{Rk}	HAS-U 5.8	[kN]	*18,0*	*29,0*	*42,0*	76,9	122	167	205	244	286	330	376
	HAS-U 8.8, AM 8.8		*29,0*	*46,0*	63,5	76,9	122	167	205	244	286	330	376
	HAS-U A4		*26,0*	*41,0*	*59,0*	76,9	122	167	205	244	286	330	376
	HAS-U HCR		*29,0*	*46,0*	63,5	76,9	122	167	205	244	286	330	376
	HIS-N 8.8		*25,0*	*46,0*	*67,0*	122	*116*	-	-	-	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*	*174*	*204*	*244*
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*	*278*	*327*	*390*
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*	*174*	*204*	*244*
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*	*174*	*204*	*244*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rk}	HAS-U 5.8	[kN]	15,1	25,4	*42,0*	53,8	85,3	117	143	171	-	-	-
	HAS-U 8.8, AM 8.8		15,1	25,4	44,4	53,8	85,3	117	143	171	-	-	-
	HAS-U A4		15,1	25,4	44,4	53,8	85,3	117	143	171	-	-	-
	HAS-U HCR		15,1	25,4	44,4	53,8	85,3	117	143	171	-	-	-
	HIS-N 8.8		*25,0*	44,4	53,8	85,3	113	-	-	-	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*	-	-	-
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*	-	-	-
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*	-	-	-
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*	-	-	-
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-	-	-	-

1) Hilti hollow drill bit available for element size M12-M30.
2) Hilti Roughening tools are available for element size M16-M30.

Design resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
			ETA-20/0541, issued 2020-11-21								Hilti tech. data		
Non-cracked concrete													
Tension N_{Rd}	HAS-U 5.8	[kN]	12,0	19,3	28,0	45,8	72,7	99,8	122	146	142	164	187
	HAS-U 8.8, AM 8.8		19,3	28,0	37,8	45,8	72,7	99,8	122	146	142	164	187
	HAS-U A4		13,9	21,9	31,6	45,8	72,7	99,8	80,4	98,3	121	143	171
	HAS-U HCR		19,3	28,0	37,8	45,8	72,7	99,8	122	146	142	164	187
	HIS-N 8.8		16,7	30,7	44,7	72,7	77,3	-	-	-	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112	139	163	195
	HAS-U 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	113	147	179	222	262	312
	HAS-U A4		8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8	73,1	85,7	103
	HAS-U HCR		12,0	18,4	27,2	50,4	78,4	70,9	92,0	112	87,0	102	122
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rd}	HAS-U 5.8	[kN]	10,1	17,0	26,5	32,1	50,9	69,9	85,4	102	-	-	-
	HAS-U 8.8, AM 8.8		10,1	17,0	26,5	32,1	50,9	69,9	85,4	102	-	-	-
	HAS-U A4		10,1	17,0	26,5	32,1	50,9	69,9	80,4	98,3	-	-	-
	HAS-U HCR		10,1	17,0	26,5	32,1	50,9	69,9	85,4	102	-	-	-
	HIS-N 8.8		16,7	26,5	32,1	50,9	67,4	-	-	-	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112	-	-	-
	HAS-U 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	113	147	179	-	-	-
	HAS-U A4		8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8	-	-	-
	HAS-U HCR		12,0	18,4	27,2	50,4	78,4	70,9	92,0	112	-	-	-
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-

Recommended loads[a)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
			ETA-20/0541, issued 2020-11-21								Hilti tech. data		
Non-cracked concrete													
Tension N_{Rec}	HAS-U 5.8	[kN]	8,6	13,8	20,0	32,7	51,9	71,3	87,1	104	101	117	133
	HAS-U 8.8, AM 8.8		13,8	20,0	27,0	32,7	51,9	71,3	87,1	104	101	117	133
	HAS-U A4		9,9	15,7	22,5	32,7	51,9	71,3	57,4	70,2	86,7	102	122
	HAS-U HCR		13,8	20,0	27,0	32,7	51,9	71,3	87,1	104	101	117	133
	HIS-N 8.8		11,9	21,9	31,9	51,9	55,2	-	-	-	-	-	-
Shear V_{Rec}	HAS-U 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0	99,4	117	139
	HAS-U 8.8, AM 8.8		8,6	13,1	19,4	36,0	56,0	80,6	105	128	159	187	223
	HAS-U A4		6,0	9,2	13,7	25,2	39,4	56,8	34,5	42,0	52,2	61,2	73,2
	HAS-U HCR		8,6	13,1	19,4	36,0	56,0	50,6	65,7	80,0	62,1	72,9	87,1
	HIS-N 8.8		7,4	13,1	19,4	36,0	33,1	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rec}	HAS-U 5.8	[kN]	7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	HAS-U 8.8, AM 8.8		7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	HAS-U A4		7,2	12,1	18,9	22,9	36,3	49,9	57,4	70,2	-	-	-
	HAS-U HCR		7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	HIS-N 8.8		11,9	18,9	22,9	36,3	48,1	-	-	-	-	-	-
Shear V_{Rec}	HAS-U 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0	-	-	-
	HAS-U 8.8, AM 8.8		8,6	13,1	19,4	36,0	56,0	80,6	105	128	-	-	-
	HAS-U A4		6,0	9,2	13,7	25,2	39,4	56,8	34,5	42,0	-	-	-
	HAS-U HCR		8,6	13,1	19,4	36,0	56,0	50,6	65,7	80,0	-	-	-
	HIS-N 8.8		7,4	13,1	19,4	36,0	33,1	-	-	-	-	-	-

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond drilling:

Characteristic resistance

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rk}	HAS-U 5.8	[kN]	*18,0*	*29,0*	*42,0*	76,9	122	167	205	244
	HAS-U 8.8, AM 8.8		26,1	36,8	53,9	76,9	122	167	205	244
	HAS-U A4		*26,0*	36,8	53,9	76,9	122	167	205	244
	HAS-U HCR		26,1	36,8	53,9	76,9	122	167	205	244
	HIS-N 8.8		*25,0*	*46,0*	*67,0*	122	*116*	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-

Design resistance

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rd}	HAS-U 5.8	[kN]	*12,0*	*19,3*	*28,0*	32,7	51,9	71,3	87,1	104
	HAS-U 8.8, AM 8.8		14,5	20,4	29,9	32,7	51,9	71,3	87,1	104
	HAS-U A4		*13,9*	20,4	29,9	32,7	51,9	71,3	*80,4*	*98,3*
	HAS-U HCR		14,5	20,4	29,9	32,7	51,9	71,3	87,1	104
	HIS-N 8.8		*16,7*	24,4	32,7	51,9	68,8	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	*7,2*	*12,0*	*16,8*	*31,2*	*48,8*	*70,4*	*92,0*	*112*
	HAS-U 8.8, AM 8.8		*12,0*	*18,4*	*27,2*	*50,4*	*78,4*	*113*	*147*	*179*
	HAS-U A4		*8,3*	*12,8*	*19,2*	*35,3*	*55,1*	*79,5*	*48,3*	*58,8*
	HAS-U HCR		*12,0*	*18,4*	*27,2*	*50,4*	*78,4*	*70,9*	*92,0*	*112*
	HIS-N 8.8		*10,4*	*18,4*	*27,2*	*50,4*	*46,4*	-	-	-

Recommended loads[a)]

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rec}	HAS-U 5.8	[kN]	*8,6*	*13,8*	*20,0*	23,4	37,1	50,9	62,2	74,2
	HAS-U 8.8, AM 8.8		10,4	14,6	21,4	23,4	37,1	50,9	62,2	74,2
	HAS-U A4		*9,9*	14,6	21,4	23,4	37,1	50,9	*57,4*	*70,2*
	HAS-U HCR		10,4	14,6	21,4	23,4	37,1	50,9	62,2	74,2
	HIS-N 8.8		*11,9*	17,5	23,4	37,1	49,1	-	-	-
Shear V_{Rec}	HAS-U 5.8	[kN]	*5,1*	*8,6*	*12,0*	*22,3*	*34,9*	*50,3*	*65,7*	*80,0*
	HAS-U 8.8, AM 8.8		*8,6*	*13,1*	*19,4*	*36,0*	*56,0*	*80,6*	*105*	*128*
	HAS-U A4		*6,0*	*9,2*	*13,7*	*25,2*	*39,4*	*56,8*	*34,5*	*42,0*
	HAS-U HCR		*8,6*	*13,1*	*19,4*	*36,0*	*56,0*	*50,6*	*65,7*	*80,0*
	HIS-N 8.8		*7,4*	*13,1*	*19,4*	*36,0*	*33,1*	-	-	-

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

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

All data in this section applies to:

- Correct setting (see setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- HAS-U anchor rod with strength class 5.8 and 8.8, AM anchor rod with strength class 8.8, HIS-N internally threaded insert with screw 8.8
- Base material thickness and one typical embedment depth, as specified in the table
- Concrete C 20/25
- Service life: 100 years
- Temperature range I: -40 °C to +40 °C
  (min. base material temperature -40 °C, max. long/short term base material temperature: +24 °C/40 °C)
- Short term loading. For long term loading apply ψ_{sus} acc. to EN 1992-4

Embedment depth[a] and base material thickness

Anchor size		Hilti technical data							
		M8	M10	M12	M16	M20	M24	M27	M30
HAS-U									
Eff. anchorage depth	[mm]	80	90	110	125	170	210	240	270
Base material thickness	[mm]	110	120	140	161	214	266	300	340
HIS-N									
Eff. anchorage depth	[mm]	90	110	125	170	205	-	-	-
Base material thickness	[mm]	120	150	170	230	270	-	-	-

a) The allowed range of embedment depth is shown in the setting.

For hammer drilled holes, hammer drilled holes with hollow drill bit[1] and diamond cored with Hilti roughening tool[2]:

Characteristic resistance

Anchor size			Hilti technical data							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rk}	HAS-U 5.8	[kN]	*18,0*	*29,0*	*42,0*	76,9	122	167	205	244
	HAS-U 8.8, AM 8.8		*29,0*	*46,0*	63,5	76,9	122	167	205	244
	HAS-U A4		*26,0*	*41,0*	*59,0*	76,9	122	167	205	244
	HAS-U HCR		*29,0*	*46,0*	63,5	76,9	122	167	205	244
	HIS-N 8.8		*25,0*	*46,0*	*67,0*	122	*116*	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-
Cracked concrete										
Tension N_{Rk}	HAS-U 5.8	[kN]	11,1	18,4	*29,0*	40,8	69,4	95,0	112	140
	HAS-U 8.8, AM 8.8		11,1	18,4	*29,0*	40,8	69,4	95,0	112	140
	HAS-U A4		11,1	18,4	*29,0*	40,8	69,4	95,0	112	140
	HAS-U HCR		11,1	18,4	*29,0*	40,8	69,4	95,0	112	140
	HIS-N 8.8		19,4	31,4	44,3	81,4	107	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-

1) Hilti hollow drill bit available for element size M12-M30.
2) Hilti Roughening tools are available for element size M16-M30.

Design resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
			Hilti technical data							
Non-cracked concrete										
Tension N_{Rd}	HAS-U 5.8	[kN]	12,0	19,3	28,0	45,8	72,7	99,8	122	146
	HAS-U 8.8, AM 8.8		19,3	28,0	37,8	45,8	72,7	99,8	122	146
	HAS-U A4		13,9	21,9	31,6	45,8	72,7	99,8	80,4	98,3
	HAS-U HCR		19,3	28,0	37,8	45,8	72,7	99,8	122	146
	HIS-N 8.8		16,7	30,7	44,7	72,7	77,3	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112
	HAS-U 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	113	147	179
	HAS-U A4		8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HAS-U HCR		12,0	18,4	27,2	50,4	78,4	70,9	92,0	112
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-
Cracked concrete										
Tension N_{Rd}	HAS-U 5.8	[kN]	7,4	12,3	19,4	27,2	46,3	63,3	74,6	93,3
	HAS-U 8.8, AM 8.8		7,4	12,3	19,4	27,2	46,3	63,3	74,6	93,3
	HAS-U A4		7,4	12,3	19,4	27,2	46,3	63,3	74,6	93,3
	HAS-U HCR		7,4	12,3	19,4	27,2	46,3	63,3	74,6	93,3
	HIS-N 8.8		13,0	20,9	29,5	50,9	67,4	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112
	HAS-U 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	113	147	179
	HAS-U A4		8,3	12,8	19,2	35,3	55,1	79,5	48,3	58,8
	HAS-U HCR		12,0	18,4	27,2	50,4	78,4	70,9	92,0	112
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-

Recommended loads[a)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
			Hilti technical data							
Non-cracked concrete										
Tension N_{Rec}	HAS-U 5.8	[kN]	8,6	13,8	20,0	32,7	51,9	71,3	87,1	104
	HAS-U 8.8, AM 8.8		13,8	20,0	27,0	32,7	51,9	71,3	87,1	104
	HAS-U A4		9,9	15,7	22,5	32,7	51,9	71,3	57,4	70,2
	HAS-U HCR		13,8	20,0	27,0	32,7	51,9	71,3	87,1	104
	HIS-N 8.8		11,9	21,9	31,9	51,9	55,2	-	-	-
Shear V_{Rec}	HAS-U 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0
	HAS-U 8.8, AM 8.8		8,6	13,1	19,4	36,0	56,0	80,6	105	128
	HAS-U A4		6,0	9,2	13,7	25,2	39,4	56,8	34,5	42,0
	HAS-U HCR		8,6	13,1	19,4	36,0	56,0	50,6	65,7	80,0
	HIS-N 8.8		7,4	13,1	19,4	36,0	33,1	-	-	-
Cracked concrete										
Tension N_{Rec}	HAS-U 5.8	[kN]	5,3	8,8	13,8	19,4	33,1	45,2	53,3	66,6
	HAS-U 8.8, AM 8.8		5,3	8,8	13,8	19,4	33,1	45,2	53,3	66,6
	HAS-U A4		5,3	8,8	13,8	19,4	33,1	45,2	53,3	66,6
	HAS-U HCR		5,3	8,8	13,8	19,4	33,1	45,2	53,3	66,6
	HIS-N 8.8		9,3	14,9	21,1	36,3	48,1	-	-	-
Shear V_{Rec}	HAS-U 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0
	HAS-U 8.8, AM 8.8		8,6	13,1	19,4	36,0	56,0	80,6	105	128
	HAS-U A4		6,0	9,2	13,7	25,2	39,4	56,8	34,5	42,0
	HAS-U HCR		8,6	13,1	19,4	36,0	56,0	50,6	65,7	80,0
	HIS-N 8.8		7,4	13,1	19,4	36,0	33,1	-	-	-

a) With overall partial safety factor for action $\gamma=1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond coring:

Characteristic resistance

Anchor size			Hilti technical data							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rk}	HAS-U 5.8	[kN]	*18,0*	*29,0*	*42,0*	76,9	122	167	205	244
	HAS-U 8.8, AM 8.8		26,1	36,8	53,9	76,9	122	167	205	244
	HAS-U A4		*26,0*	36,8	53,9	76,9	122	167	205	244
	HAS-U HCR		26,1	36,8	53,9	76,9	122	167	205	244
	HIS-N 8.8		*25,0*	*46,0*	*67,0*	122	*116*	-	-	-
Shear V_{Rk}	HAS-U 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115*	*140*
	HAS-U 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141*	*184*	*224*
	HAS-U A4		*13,0*	*20,0*	*30,0*	*55,0*	*86,0*	*124*	*115*	*140*
	HAS-U HCR		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*124*	*161*	*196*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-

Design resistance

Anchor size			Hilti technical data							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rd}	HAS-U 5.8	[kN]	*12,0*	*19,3*	*28,0*	32,7	51,9	71,3	87,1	104
	HAS-U 8.8, AM 8.8		14,5	20,4	29,9	32,7	51,9	71,3	87,1	104
	HAS-U A4		*13,9*	20,4	29,9	32,7	51,9	71,3	*80,4*	*98,3*
	HAS-U HCR		14,5	20,4	29,9	32,7	51,9	71,3	87,1	104
	HIS-N 8.8		*16,7*	24,4	32,7	51,9	68,8	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	*7,2*	*12,0*	*16,8*	*31,2*	*48,8*	*70,4*	*92,0*	*112*
	HAS-U 8.8, AM 8.8		*12,0*	*18,4*	*27,2*	*50,4*	*78,4*	*113*	*147*	*179*
	HAS-U A4		*8,3*	*12,8*	*19,2*	*35,3*	*55,1*	*79,5*	*48,3*	*58,8*
	HAS-U HCR		*12,0*	*18,4*	*27,2*	*50,4*	*78,4*	*70,9*	*92,0*	*112*
	HIS-N 8.8		*10,4*	*18,4*	*27,2*	*50,4*	*46,4*	-	-	-

Recommended loads[a)]

Anchor size			Hilti technical data							
			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rd}	HAS-U 5.8	[kN]	*8,6*	*13,8*	*20,0*	23,4	37,1	50,9	62,2	74,2
	HAS-U 8.8, AM 8.8		10,4	14,6	21,4	23,4	37,1	50,9	62,2	74,2
	HAS-U A4		*9,9*	14,6	21,4	23,4	37,1	50,9	*57,4*	*70,2*
	HAS-U HCR		10,4	14,6	21,4	23,4	37,1	50,9	62,2	74,2
	HIS-N 8.8		*11,9*	17,5	23,4	37,1	49,1	-	-	-
Shear V_{Rd}	HAS-U 5.8	[kN]	*5,1*	*8,6*	*12,0*	*22,3*	*34,9*	*50,3*	*65,7*	*80,0*
	HAS-U 8.8, AM 8.8		*8,6*	*13,1*	*19,4*	*36,0*	*56,0*	*80,6*	*105*	*128*
	HAS-U A4		*6,0*	*9,2*	*13,7*	*25,2*	*39,4*	*56,8*	*34,5*	*42,0*
	HAS-U HCR		*8,6*	*13,1*	*19,4*	*36,0*	*56,0*	*50,6*	*65,7*	*80,0*
	HIS-N 8.8		*7,4*	*13,1*	*19,4*	*36,0*	*33,1*	-	-	-

a) With overall partial safety factor for action $\gamma=1,4$. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Seismic resistance (for a single anchor)

All data in this section applies to:
- Correct setting (see setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- HAS-U anchor rod with strength class 8.8, AM anchor rod with strength class 8.8, HIS-N internally threaded insert with screw 8.8
- Base material thickness and one typical embedment depth, as specified in the table
- Concrete C 20/25
- Temperature range I
  (min. base material temperature -40 °C, max. long/short term base material temperature: +24 °C/40 °C)
- α_{gap}=1,0 (using Hilti seismic filling set)

Embedment depth and base material thickness for seismic C2[a] and C1

Anchor size		ETA-20/0541, issued 2020-11-21							
		M8	M10	M12	M16	M20	M24	M27	M30
HAS-U									
Eff. Anchorage depth	[mm]	80	90	110	125	170	210	240	270
Base material thickness	[mm]	110	120	140	161	214	266	300	340
HIS-N									
Eff. Anchorage depth	[mm]	90	110	125	170	205	-	-	-
Base material thickness	[mm]	120	146	169	226	269	-	-	-

a) C2 seismic approval only available for HAS-U rods.

For hammer drilled holes and hammer drilled holes with Hilti hollow drill bit[1]:
Characteristic resistance in case of seismic performance category C2

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Tension $N_{Rk,seis}$	HAS-U 8.8, AM 8.8	[kN]	-	-	13,7	40,8	62,0	95,0	102	132
Shear $V_{Rk,seis}$	HAS-U 8.8, AM 8.8 w/ filling set	[kN]	-	-	*28,0*	*46,0*	*77*	*103*	-	-
	HAS-U 8.8, AM 8.8 w/o filling set	[kN]	-	-	*24,0*	*40,0*	*71,0*	*90,0*	*121*	*135*

1) Hilti hollow drill bit available for element size M12-M30.

Design resistance in case of seismic performance category C2

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Tension $N_{Rd,seis}$	HAS-U 8.8, AM 8.8	[kN]	-	-	9,1	27,2	41,3	63,3	67,9	88,2
Shear $V_{Rd,seis}$	HAS-U 8.8, AM 8.8 w/ filling set	[kN]	-	-	*22,4*	*36,8*	*61,6*	*82,4*	-	-
	HAS-U 8.8, AM 8.8 w/o filling set	[kN]	-	-	*19,2*	*32,0*	*56,8*	*72,0*	*96,8*	*108*

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

Characteristic resistance in case of seismic performance category C1

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Tension $N_{Rk,seis}$	HAS-U 8.8, AM 8.8	[kN]	13,7	23,2	37,8	45,7	72,5	99,6	122	145
	HIS-N 8.8		*25,0*	37,8	45,7	72,5	96,1	-	-	-
Shear $V_{Rk,seis}$	HAS-U 8.8, AM 8.8	[kN]	*15,0*	*23,0*	*34,0*	*53,0*	*98,0*	*141*	*184*	*224*
	HIS-N 8.8		*9,0*	*16,0*	*24,0*	*44,0*	*41,0*	-	-	-

1) Hilti hollow drill bit available for element size M12-M30.

Design resistance in case of seismic performance category C1

Anchor size			ETA-20/0541, issued 2020-11-21							
			M8	M10	M12	M16	M20	M24	M27	M30
Tension $N_{Rd,seis}$	HAS-U 8.8, AM 8.8	[kN]	9,1	15,5	25,2	30,5	48,4	66,4	81,1	96,8
	HIS-N 8.8		*16,7*	25,2	30,5	48,4	64,0	-	-	-
Shear $V_{Rd,seis}$	HAS-U 8.8, AM 8.8	[kN]	*12,0*	*18,4*	*27,2*	*50,4*	*78,4*	*113*	*147*	*179*
	HIS-N 8.8		*7,2*	*12,8*	*19,2*	*35,2*	*32,8*	-	-	-

Materials

Mechanical properties for HAS-U

Anchor size			ETA-20/0541, issued 2020-11-21								Hilti tech. data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Nominal tensile strength f_{uk}	HAS-U 5.8(F)	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500
	HAS-U 8.8(F)		800	800	800	800	800	800	800	800	800	800	800
	AM 8.8(HDG)		800	800	800	800	800	800	800	800	800	800	800
	HAS-U A4		700	700	700	700	700	700	500	500	500	500	500
	HAS-U HCR		800	800	800	800	800	700	700	700	500	500	500
Yield strength f_{yk}	HAS-U 5.8(F)	[N/mm²]	400	400	400	400	400	400	400	400	400	400	400
	HAS-U 8.8(F)		640	640	640	640	640	640	640	640	640	640	640
	AM 8.8(HDG)		640	640	640	640	640	640	640	640	640	640	640
	HAS-U A4		450	450	450	450	450	450	210	210	210	210	210
	HAS-U HCR		640	640	640	640	640	400	400	400	250	250	250
Stressed cross-section A_s	HAS-U AM 8.8	[mm²]	36,6	58,0	84,3	157	245	353	459	561	694	817	976
Moment of resistance W	HAS-U AM 8.8	[mm³]	31,2	62,3	109	277	541	935	1387	1874	2579	3294	4301

Mechanical properties for HIS-N

Anchor size			ETA-20/0541, issued 2020-11-21				
			M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HIS-N	[N/mm²]	490	490	460	460	460
	Screw 8.8		800	800	800	800	800
	HIS-RN		700	700	700	700	700
	Screw A4-70		700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm²]	410	410	375	375	375
	Screw 8.8		640	640	640	640	640
	HIS-RN		350	350	350	350	350
	Screw A4-70		450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm²]	51,5	108	169	256	238
	Screw		36,6	58	84,3	157	245
Moment of resistance W	HIS-(R)N	[mm³]	145	430	840	1595	1543
	Screw		31,2	62,3	109	277	541

Material quality for HAS-U

Part	Material
Zinc coated steel	
Threaded rod, HAS-U 5.8 (HDG)	Strength class 5.8; Elongation at fracture A5 > 8% ductile Electroplated zinc coated ≥ 5µm; (F) hot dip galvanized ≥ 50 µm
Threaded rod, HAS-U 8.8 (HDG)	Strength class 8.8; Elongation at fracture A5 > 12% ductile Electroplated zinc coated ≥ 5µm; (F) hot dip galvanized ≥ 50 µm
Hilti Meter rod, AM 8.8 (HDG)	Strength class 8.8; Elongation at fracture A5 > 12% ductile Electroplated zinc coated ≥ 5µm (HDG) hot dip galvanized ≥ 50 µm
Washer	Electroplated zinc coated ≥ 5 µm, hot dip galvanized ≥ 50 µm
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5µm, hot dip galvanized ≥ 50 µm
Stainless Steel	
Threaded rod, HAS-U A4	Strength class 70 for ≤ M24 and strength class 50 for > M24; Elongation at fracture A5 > 8% ductile Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
Washer	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
Nut	Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 EN 10088-1:2014
High corrosion resistant steel	
Threaded rod, HAS-U HCR	Strength class 80 for ≤ M20 and class 70 for > M20, Elongation at fracture A5 > 8% ductile High corrosion resistance steel 1.4529; 1.4565;
Washer	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014
Nut	High corrosion resistant steel 1.4529, 1.4565 EN 10088-1:2014

Material quality for HIS-N

Part		Material
HIS-N	Internal threaded sleeve	C-steel 1.0718; Steel galvanized ≥ 5 µm
	Screw 8.8	Strength class 8.8, A5 > 8 % ductile; Steel galvanized ≥ 5 µm
HIS-RN	Internal threaded sleeve	Stainless steel 1.4401,1.4571
	Screw 70	Strength class 70, A5 > 8 % ductile Stainless steel 1.4401; 1.4404, 1.4578; 1.4571; 1.4439; 1.4362

Setting information

Installation temperature

-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.

Temperature range	Base material temperature	Max. long term base material temperature	Max. short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +55 °C	+43 °C	+55 °C
Temperature range III	-40 °C to +75 °C	+55 °C	+75 °C

Max. short term base material temperature

Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as 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.

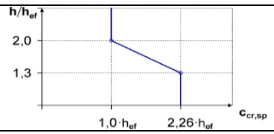
Working time and curing time

Temperature of the base material T[2)]	Working time t_{work}	Minimum curing time t_{cure}[1)]
-5 °C to -1 °C	2 h	168 h
0 °C to 4 °C	2 h	48 h
5 °C to 9 °C	2 h	24 h
10 °C to 14 °C	1,5 h	16 h
15 °C to 19 °C	1 h	12 h
20 °C to 24 °C	30 min	7 h
25 °C to 29 °C	20 min	6 h
30 °C to 34 °C	15 min	5 h
35 °C to 39 °C	12 min	4,5 h
40 °C	10 min	4 h

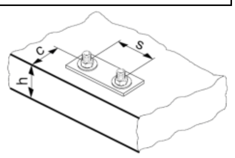
1) The curing time data are valid for dry base material only. In wet base material, the curing times must be doubled.
2) The minimum temperature of the foil pack is +5° C.

Setting details for HAS-U

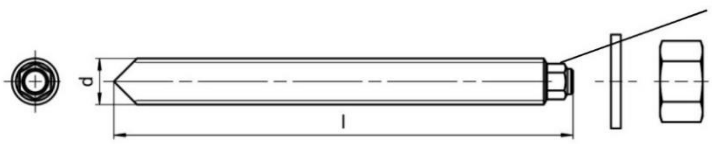
Anchor size			ETA-20/0541, issue 2020-11-21								Hilti tech. data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	22	28	30	35	37	40	42
Effective anchorage and drill hole depth range [a)]	$h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120	132	144	156
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600	660	720	780
Minimum base material thickness	h_{min}	[mm]	h_{ef} +30 mm ≥ 100 mm		$h_{ef} + 2\ d_0$								
Max. installation torque	max. T_{inst}	[Nm]	10	20	40	80	150	200	270	300	330	360	390
Min. spacing	s_{min}	[mm]	40	50	60	75	90	115	120	140	165	180	195
Min. edge distance	c_{min}	[mm]	40	45	45	50	55	60	75	80	165	180	195
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$										
Critical edge distance for splitting failure [b)]	$c_{cr,sp}$	[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) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef}: embedment depth)
b) h: base material thickness ($h \geq h_{min}$)

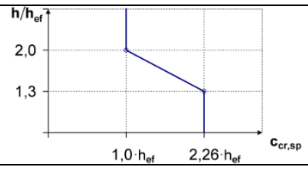


HAS-U-...



Marking:
Steel grade number and length identification letter: e.g. 8 L

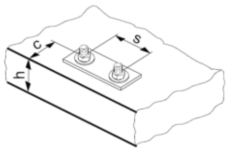
Setting details for HIS-N

Anchor size			ETA-20/0541, issue 2020-11-21				
			M8	M10	M12	M16	M20
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Diameter of element	d	[mm]	12,5	16,5	20,5	25,4	27,6
Effective anchorage and drill hole depth	h_{ef}	[mm]	90	110	125	170	205
Min. material thickness	h_{min}	[mm]	120	150	170	230	270
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22
Thread engagement length; min - max	h_s	[mm]	8-20	10-25	12-30	16-40	20-50
Min. spacing	s_{min}	[mm]	60	70	90	115	130
Min. edge distance	c_{min}	[mm]	40	45	55	65	90
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$				
Critical edge distance for splitting failure b)	$c_{cr,sp}$	[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}				
Max. installation torque	max. T_{inst}	[Nm]	10	20	40	80	150

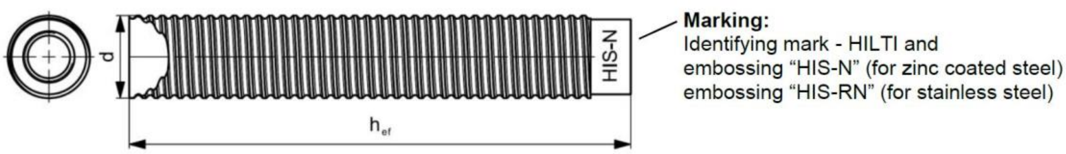
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef}: embedment depth)

b) h: base material thickness ($h \geq h_{min}$)



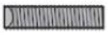
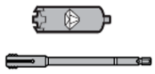
Internally threaded sleeve HIS-(R)N…



Installation equipment

Anchor size		M8	M10	M12	M16	M20	M24	M27	M30	M36	M39
Rotary hammer	HAS-U	TE 2 – TE 16				TE 40 – TE 80					
	HIS-N	TE 2 – TE 16		TE 40 – TE 80			-				
Other tools		compressed air gun, set of cleaning brushes, dispenser									
		roughening tools TE-YRT								-	
Additional Hilti recommended tools		DD EC-1, DD 100 … DD 160								-	

Parameters of cleaning and setting tools

HAS-U	HIS-N	Drill bit diameters d_0 [mm]				Installation	
		Hammer drill (HD)	Hollow Drill Bit (HDB)[a]	Diamond coring		Brush HIT-RB	Piston plug HIT-SZ
				Diamond coring (DD)	with roughening tool (RT)		
							
M8	**-**	10	-	10	-	10	-
M10	**-**	12	-	12	-	12	12
M12	**M8**	14	14	14	-	14	14
M16	**M10**	18	18	18	18	18	18
M20	**M12**	22	22	22	22	22	22
M24	**M16**	28	28	28	28	28	28
M27	**-**	30	-	30	30	30	30
-	**M20**	32	32	32	32	32	32
M30	**-**	35	35	35	35	35	35
M33	**-**	37[b]	-	-	-	37[b]	37[b]
M36	**-**	40[b]	-	-	-	40[b]	40[b]
M39	**-**	42[b]	-	-	-	42[b]	42[b]

a) No cleaning required.
b) Additional Hilti technical data

Associated components for the use of Hilti Roughening tool TE-YRT

Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
			
d_0 [mm]		d_0 [mm]	size
nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

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

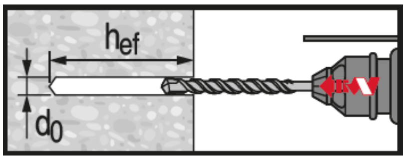
h_{ef} [mm]	$t_{roughen}$ [sec]
0 to 100	10
101 to 200	20
201 to 300	30
301 to 400	40
401 to 500	50
501 to 600	60

Setting instructions

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

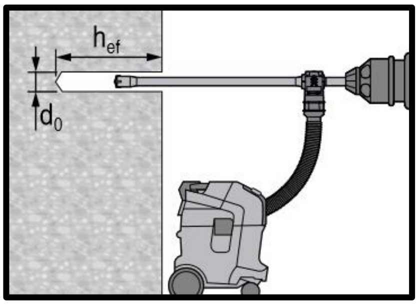
Safety regulations
Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V4.

Drilling



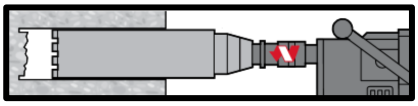
Hammer drilled hole

For dry and wet concrete and installation in flooded holes (no sea water).

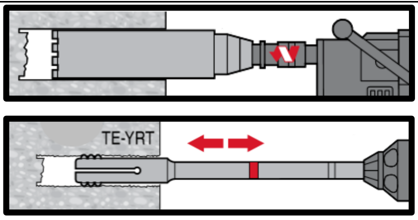


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required.
For dry and wet concrete, only.

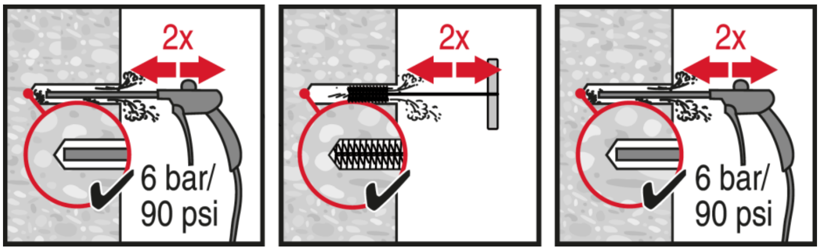


Diamond Coring
For dry and wet concrete, only.



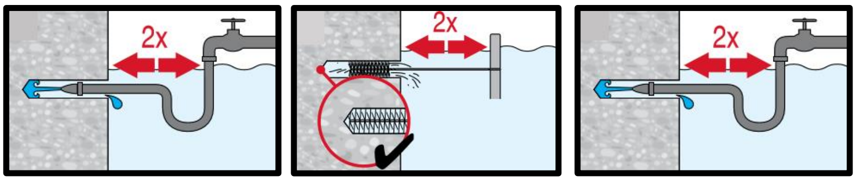
Diamond Coring + Roughening Tool
For dry and wet concrete only.
Before roughening, the borehole needs to be dry.

Cleaning (Inadequate hole cleaning=poor load values.)



Hammer Drilling:

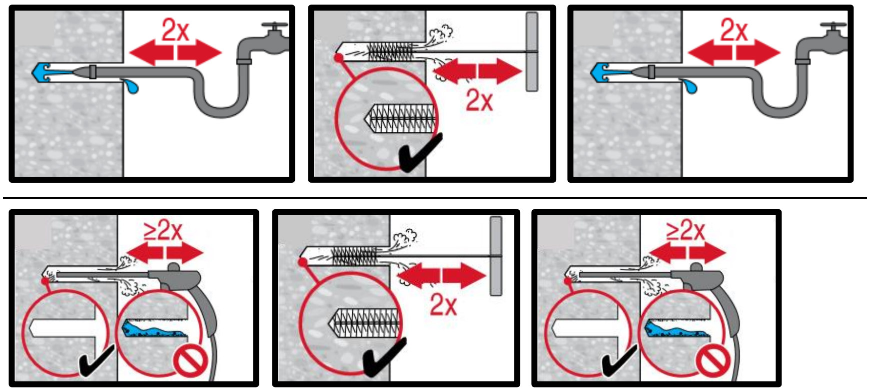
Compressed air cleaning (CAC)
For all drill hole diameters d_0 and all drill hole depths h_0.



Hammer drilling:

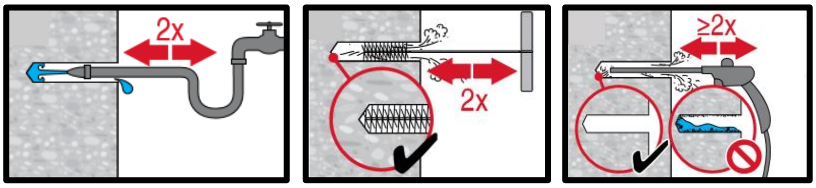
Cleaning for under water:

For all bore hole diameters d_0 and all bore hole depth h_0.



Hammer drilled flooded holes and diamond cored holes:

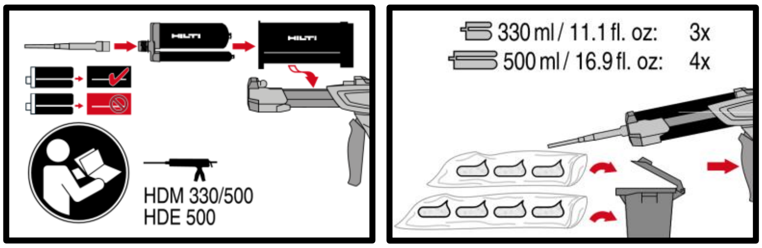
For all drill hole diameters d_0 and drill hole depths h_0.



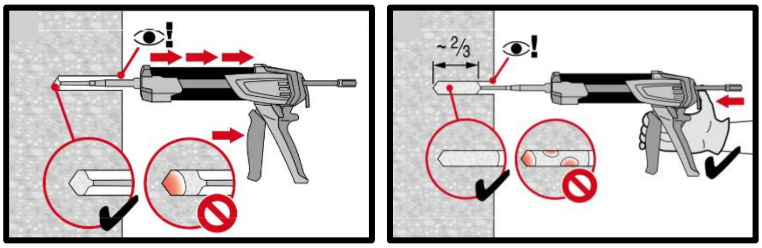
Diamond cored holes with Hilti roughening tool:

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

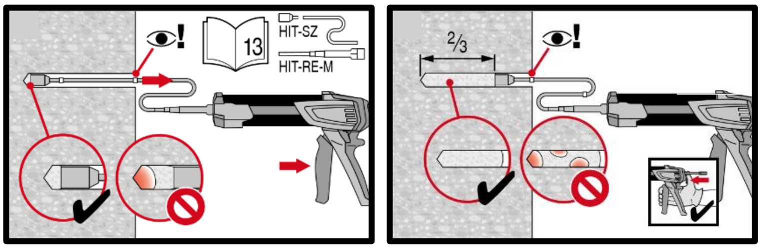
Injection preparation



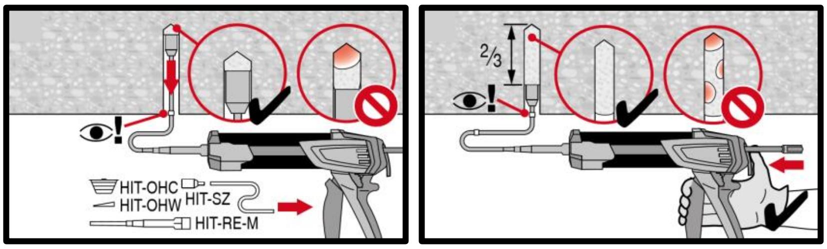
Injection system preparation.



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

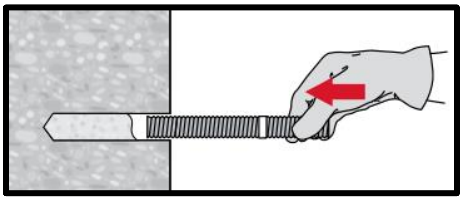


Injection method for drill hole depth $h_{ef} > 250$mm.

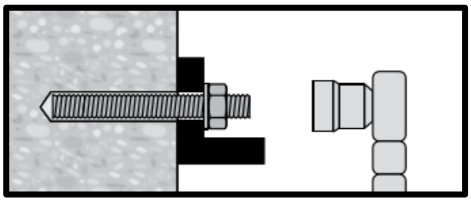


Injection method for overhead application.

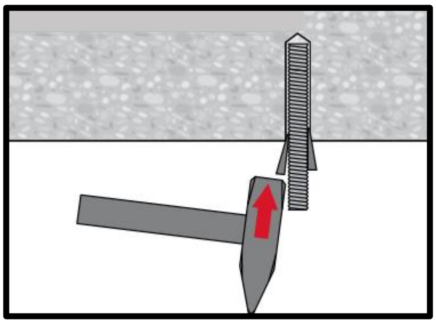
Setting the element



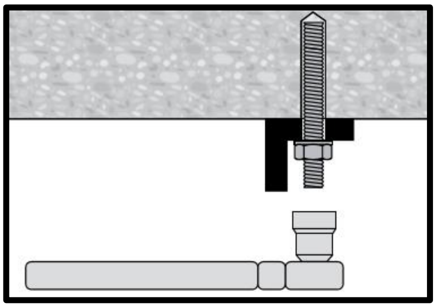
Setting element, observe working time “t_{work}”.



Loading the anchor after required curing time t_{cure} the anchor can be loaded. The applied installation torque shall not exceed max. $T_{inst.}$



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



Loading the anchor after required curing time t_{cure} the anchor can be loaded. The applied installation torque shall not exceed max. $T_{inst.}$

HIT-RE 500 V4 injection mortar

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

Injection mortar system

Foil pack: HIT-RE 500 V4

(available in 330, 500 and 1400 ml cartridges)

Rebar B500

(ϕ8 - ϕ40)

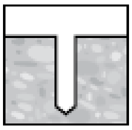
Benefits

- **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 non-cracked and cracked concrete C 20/25 to C 50/60
- ETA approval for seismic performance category C1
- Hilti Technical Data for service life of 100 years
- High loading capacity
- Suitable for dry and water saturated concrete
- Hilti Technical Data for under water application
- Long working time to allow installation of big diameters and/or deep embedment depths even at higher temperature
- Cures down to -5 °C

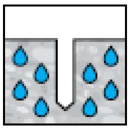
Base material

Concrete (non-cracked)

Concrete (cracked)

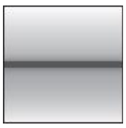


Dry concrete



Wet concrete

Load conditions

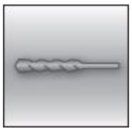


Static/ quasi-static

Seismic, ETA-C1

Service life 100y, Hilti Tech Data

Installation conditions

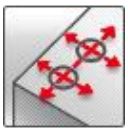


Hammer drilling

Diamond coring

SAFESET

Hilti **SafeSet** technology



Small edge distance and spacing

Other informations

European Technical Assessment

CE

CE conformity

PROFIS design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical Assessment[a]	CSTB, Marne la Vallée	ETA-20/0541 / 2020-11-21

[a] All data given in this section according to ETA-20/0541 issue 2020-11-21 (if not stated otherwise).

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
- Rebar B500
- Base material thickness and one typical embedment depth, as specified in the table
- Concrete C 20/25
- Service life: 50 years
- Temperature range I: -40 °C to +40 °C
  (min. base material temperature -40°C, max. long/short term base material temperature: +24°C/40°C)
- Short term loading. For long term loading apply ψ_{sus} acc. to EN 1992-4
  Hammer drilled holes, hammer drilled holes with hollow drill bit and diamond cored holes with Hilti roughening tool: $\psi^0_{sus} = 0{,}88$; diamond cored holes: $\psi^0_{sus} = 0{,}89$

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

Rebar size		ETA-20/0541, issued 2020-11-21										Hilti tech. data	
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typ. embed. depth	[mm]	80	90	110	125	125	170	210	270	270	300	330	360
Base m. thickness	[mm]	110	120	142	161	165	220	274	340	344	380	420	470

For hammer drilled holes, hammer drilled holes with hollow drill bit[1)] and diamond cored with Hilti roughening tool TE-YRT [2)]:

Characteristic resistance

Rebar size		ETA-20/0541, issued 2020-11-21										Hilti tech. data	
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete													
Tension N_{Rk}	[kN]	20,1	42,4	62,0	76,9	76,9	122	167	244	244	286	330	376
Shear V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	135	169	194	221	280	346
Cracked concrete													
Tension N_{Rk}	[kN]	11,1	28,3	44,4	53,8	53,8	85,3	117	171	171	200	-	-
Shear V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	135	169	194	221	-	-

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

Design resistance

Rebar size		ETA-20/0541, issued 2020-11-21										Hilti tech. data	
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete													
Tension N_{Rd}	[kN]	13,4	28,0	37,8	45,8	45,8	72,7	99,8	146	146	170	164	187
Shear V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	113	129	147	187	231
Cracked concrete													
Tension N_{Rd}	[kN]	7,4	18,8	26,5	32,1	32,1	50,9	69,9	102	102	119	-	-
Shear V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	90,0	113	129	147	-	-

Recommended loads[a)]

Rebar size		ETA-20/0541, issued 2020-11-21										Hilti tech. data	
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete													
Tension N_{rec}	[kN]	9,6	20,0	27,0	32,7	32,7	51,9	71,3	104	104	122	117	133
Shear V_{rec}	[kN]	6,7	10,5	14,8	20,0	26,2	41	64,3	80,5	92,4	105	133	165
Cracked concrete													
Tension N_{rec}	[kN]	5,3	13,5	18,9	22,9	22,9	36,3	49,9	72,7	72,7	85,2	-	-
Shear V_{rec}	[kN]	6,7	10,5	14,8	20,0	26,2	41	64,3	80,5	92,4	105	-	-

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond cored holes:

Characteristic resistance

Rebar size		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Non-cracked concrete											
Tension N_{Rk}	[kN]	19,1	26,9	39,4	52,2	59,7	102	157	238	244	286
Shear V_{Rk}	[kN]	*14,0*	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*169*	*194*	*221*

Design resistance

Rebar size		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Non-cracked concrete											
Tension N_{Rd}	[kN]	10,6	14,9	21,9	29,0	28,4	48,3	71,3	104	104	128
Shear V_{Rd}	[kN]	*9,3*	*14,7*	*20,7*	*28,0*	*36,7*	*57,3*	*90,0*	*113*	*129*	*147*

Recommended loads[a)]

Rebar size		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Non-cracked concrete											
Tension N_{krec}	[kN]	7,6	10,7	15,6	20,7	20,3	34,5	50,9	74,2	74,2	86,9
Shear $_{krec}$	[kN]	*6,7*	*10,5*	*14,8*	*20,0*	*26,2*	*41*	*64,3*	*80,5*	*92,4*	*105*

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

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

All data in this section applies to

- Correct setting (see setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Rebar B500
- Base material thickness and one typical embedment depth, as specified in the table
- Concrete C 20/25
- Service life: 100 years
- Temperature range I: -40 °C to +40 °C
  (min. base material temperature -40 °C, max. long/short term base material temperature: +24 °C/40 °C)
- Short term loading. For long term loading apply ψ_{sus} acc. to EN 1992-4.

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

Rebar size		Hilti technical data									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Typ. embed. depth	[mm]	80	90	110	125	125	170	210	270	270	300
Base m. thickness	[mm]	110	120	142	161	165	220	274	340	344	380

For hammer drilled holes, hammer drilled holes with hollow drill bit[1)] and diamond cored with Hilti roughening tool TE-YRT[2)]:

Characteristic resistance

Rebar size		Hilti technical data									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Non-cracked concrete											
Tension N_{Rk}	[kN]	20,1	42,4	*62,0*	76,9	76,9	122	167	244	244	286
Shear V_{Rk}	[kN]	*14,0*	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*169*	*194*	*221*
Cracked concrete											
Tension N_{Rk}	[kN]	5,0	21,1	33,2	44,0	50,3	80,1	117	171	171	200
Shear V_{Rk}	[kN]	10,1	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*169*	*194*	*221*

1) Hilti hollow drill bit available for element size ϕ10-ϕ28.

2) Hilti Roughening tools are available for element size ϕ14-ϕ28.

Design resistance

Rebar size		Hilti technical data									
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete											
Tension N_{Rd}	[kN]	13,4	28,0	37,8	45,8	45,8	72,7	99,8	146	146	170
Shear V_{Rd}	[kN]	*9,3*	*14,7*	*20,7*	*28,0*	*36,7*	*57,3*	*90,0*	*113*	*129*	*147*
Cracked concrete											
Tension N_{Rd}	[kN]	3,4	14,1	22,1	29,3	32,1	50,9	69,9	102	102	119
Shear V_{Rd}	[kN]	6,7	*14,7*	*20,7*	*28,0*	*36,7*	*57,3*	*90,0*	*113*	*129*	*147*

Recommended load[a)]

Rebar size		Hilti technical data									
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete											
Tension N_{rec}	[kN]	9,6	20,0	27,0	32,7	32,7	51,9	71,3	104	104	122
Shear V_{rec}	[kN]	*6,7*	*10,5*	*14,8*	*20,0*	*26,2*	*41*	*64,3*	*80,5*	*92,4*	*105*
Cracked concrete											
Tension N_{rec}	[kN]	2,4	10,1	15,8	20,9	22,9	36,3	49,9	72,7	72,7	85,2
Shear V_{rec}	[kN]	4,8	*10,5*	*14,8*	*20,0*	*26,2*	*41*	*64,3*	*80,5*	*92,4*	*105*

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

For diamond cored holes:

Characteristic resistance

Rebar size		Hilti technical data									
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete											
Tension N_{Rk}	[kN]	18,1	25,4	37,3	49,5	56,5	96,1	148	226	242	286
Shear V_{Rk}	[kN]	*14,0*	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135*	*169*	*194*	*221*

Design resistance

Rebar size		Hilti technical data									
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete											
Tension N_{Rd}	[kN]	10,1	14,1	20,7	27,5	26,9	45,8	70,7	104	104	122
Shear V_{Rd}	[kN]	*9,3*	*14,7*	*20,7*	*28,0*	*36,7*	*57,3*	*90,0*	*113*	*129*	*147*

Recommended load[a)]

Rebar size		Hilti technical data									
		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete											
Tension N_{rec}	[kN]	7,2	10,1	14,8	19,6	19,2	32,7	50,5	74,2	74,2	86,9
Shear V_{rec}	[kN]	*6,7*	*10,5*	*14,8*	*20,0*	*26,2*	*41*	*64,3*	*80,5*	*92,4*	*105*

a) With overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

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
- Rebar B500
- Base material thickness and one typical embedment depth, as specified in the table
- 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

		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Typical embedment depth	[mm]	-	90	110	125	125	170	210	270	270	300
Base material thickness	[mm]	-	120	142	161	165	220	274	340	344	380

For hammer drilled holes, hammer drilled holes with hollow drill bit[1)] and diamond cored with Hilti roughening tool TE-YRT[2)]:

Characteristic resistance in case of seismic performance category C1

		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Tension $N_{Rk,seis}$	[kN]	-	25,7	37,8	45,7	45,7	72,5	99,6	145	145	170
Shear $V_{Rk,seis}$	[kN]	-	*15,0*	*22,0*	*29,0*	*39,0*	*60,0*	*95,0*	*118*	*136*	*155*

1) Hilti hollow drill bit available for element size ϕ10-ϕ28.

2) Roughening tools are available for element size ϕ14-ϕ28.

Design resistance in case of seismic performance category C1

		ETA-20/0541, issued 2020-11-21									
Rebar size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Tension $N_{Rd,seis}$	[kN]	-	17,2	25,2	30,5	30,5	48,4	66,4	96,8	96,8	113
Shear $V_{Rd,seis}$	[kN]	-	*10,0*	*14,7*	*19,3*	*26,0*	*40,0*	*63,3*	*78,7*	*90,7*	*103*

Materials

Mechanical properties

Rebar size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Nominal tensile strength f_{uk}	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	[mm²]	50,3	78,5	113	154	201	314	491	616	707	804	1018	1257
Moment of resistance W	[mm³]	50,3	98,2	170	269	402	785	1534	2155	2650	3217	4580	6283

Material quality

Part	Material
Rebar EN 1992-1-1:2004 and AC:2010	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1/ NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

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.

Temperature range	Base material temperature	Max. long term base material temperature	Max. short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +55 °C	+43 °C	+55 °C
Temperature range III	-40 °C to +75 °C	+55 °C	+75 °C

Max. short term base material temperature
Short term elevated base material temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

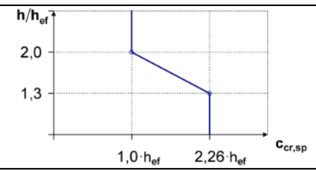
Max. long term base material temperature
Long term elevated base material temperatures are roughly constant over significant periods of time.

Working time and curing time

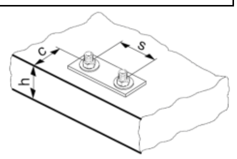
Temperature of the base material T[2)]	Max. working time in which rebar can be inserted and adjusted t_{gel}	Min. curing time before rebar can be fully loaded t_{cure}[1)]
-5 °C ≤ T_{BM} < -1 °C	2 h	168 h
0 °C ≤ T_{BM} < 4 °C	2 h	48 h
5 °C ≤ T_{BM} < 9 °C	2 h	24 h
10 °C ≤ T_{BM} < 14 °C	1,5 h	16 h
15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

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

Setting details

			ETA-20/0541, issued 2020-11-21											Hilti tech. data	
Rebar size			**ϕ8**	**ϕ10**	**ϕ12**		**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Nominal diameter of drill bit	d_0	[mm]	10 12 [a]	12 14[a]	14[a]	16[a]	18	20	25	30 32[a]	35	37	40	45	55
Effective anchorage and drill hole depth range [b]	$h_{ef,min}$	[mm]	60	60	70	70	75	80	90	100	112	120	128	144	160
	$h_{ef,max}$	[mm]	160	200	240	240	280	320	400	500	560	600	640	720	800
Min. base material thickness	h_{min}	[mm]	hef +30mm ≥ 100 mm		h_{ef} + 2 d_0										
Min. spacing	s_{min}	[mm]	40	50	60	60	70	80	100	125	140	150	160	180	200
Min. edge distance	c_{min}	[mm]	40	45	45	45	50	50	65	70	75	80	80	180	200
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 h_{ef}			for h / h_{ef} ≥ 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} ≤ 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

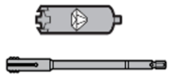
[b] $h_{ef,min} \leq h_{ef} \leq h_{ef,max}$ (h_{ef}: embedment depth)

[c] h: base material thickness (h ≥ h_{min})

Installation equipment

Rebar size	**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Rotary hammer	TE 2 (-A) – TE 40(-A)						TE40 – TE80					
Diamond coring tools	DD EC-1, DD 100 … DD 160										-	
Other tools	Compressed air gun, brush, hollow drill bit, roughening tool, dispenser, piston plug											

Drilling and cleaning diameters

Rebar size	Hammer drill (HD)	Hollow Drill Bit (HDB)[c]	Diamond coring		Brush HIT-RB	Piston plug HIT-SZ
			Diamond coring (DD)	with roughening tool (RT)		
	d_0 [mm]				size [mm]	
						
ϕ8	12 (10 [a])	-	12 (10 [a])	-	12 (10 [a])	12
ϕ10	14 (12 [a])	14	14 (12 [a])	-	14 (12 [a])	14 (12 [a])
ϕ12	16 (14 [a])	16 (14 [a])	16 (14 [a])	-	16 (14 [a])	16 (14 [a])
ϕ14	18	18	18	18	18	18
ϕ16	20	20	20	20	20	20
ϕ20	25	25	25	25	25	25
ϕ25	32	32	32	32	32	32
ϕ28	35	35	35	35	35	35
ϕ30	37	-	37	-	37	37
ϕ32	40	-	-	-	40	40
	-	-	42	-	42	42
ϕ36	45[b]	-	-	-	45[b]	45[b]
ϕ40	55[b]	-	-	-	55[b]	55[b]

[a] Each of two given values can be used
[b] Additional Hilti technical data.
[c] 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

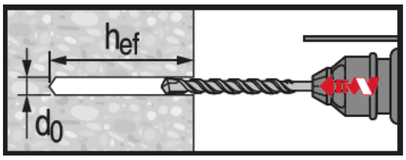
Setting instructions

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

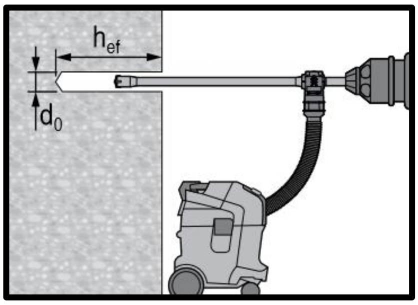
Safety regulations.

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 V4.

Drilling

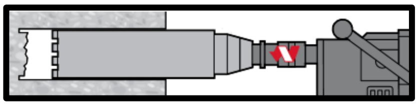


Hammer drilled hole

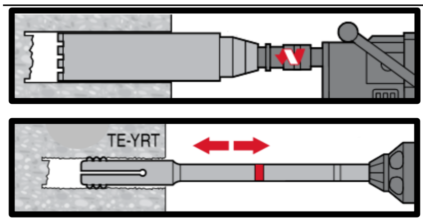


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required

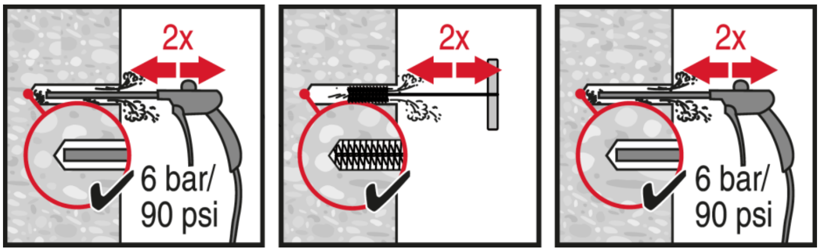


Diamond Coring



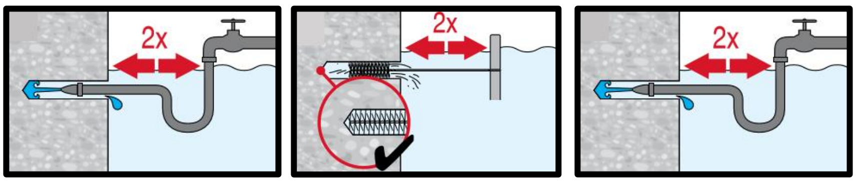
Diamond Coring + Roughening Tool
For dry and wet concrete only.
Before roughening, the borehole needs to be dry.

Cleaning (Inadequate hole cleaning=poor load values.)



Hammer Drilling:

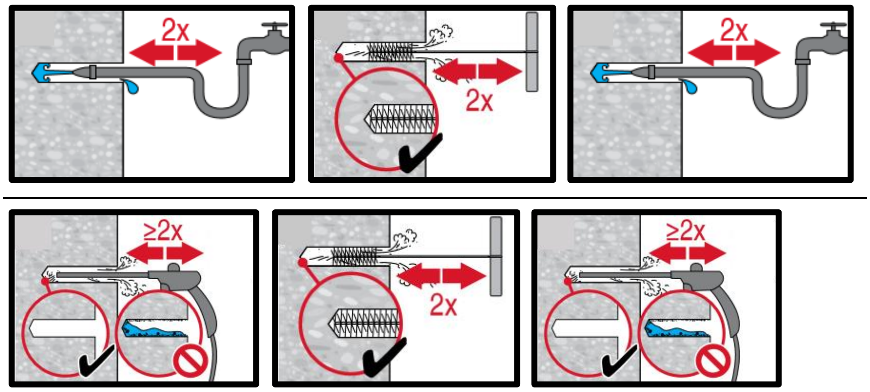
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths $h_0 \le 20 \cdot d$.



Hammer drilling:

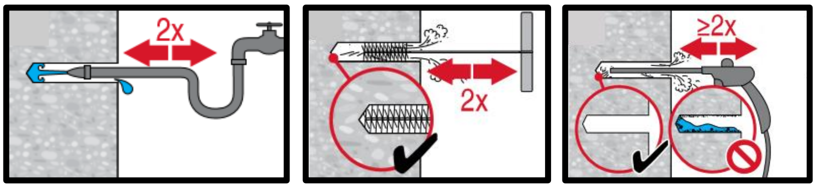
Cleaning for under water:

For all bore hole diameters d_0 and all bore hole depth h_0.



Hammer drilled flooded holes and diamond cored holes:

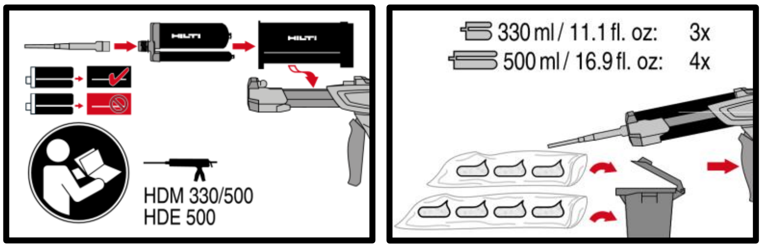
For all drill hole diameters d_0 and drill hole depths h_0.



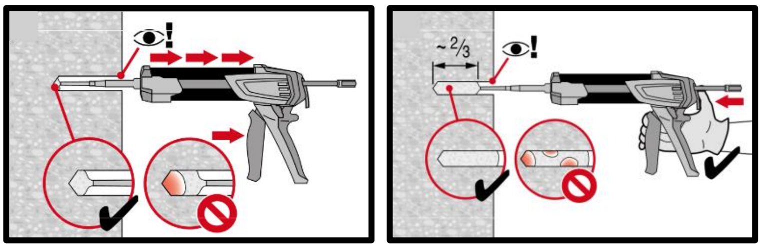
Diamond cored holes with Hilti roughening tool:

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

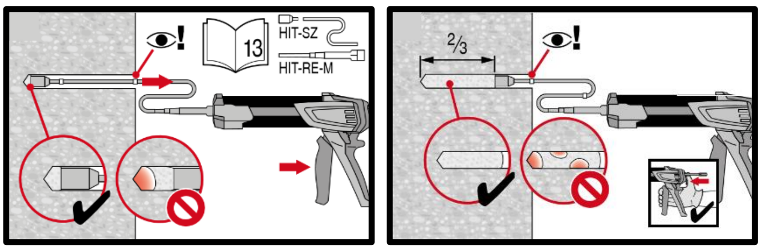
Injection preparation



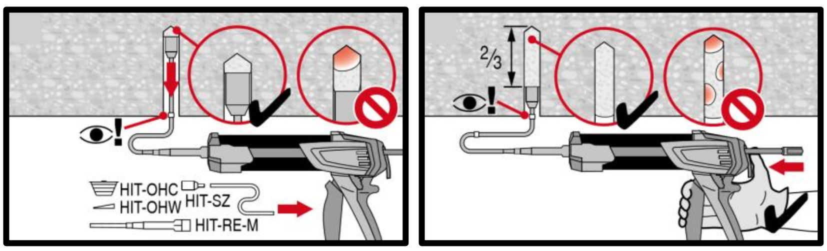
Injection system preparation.



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

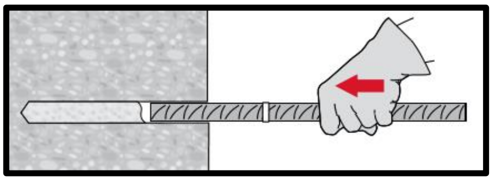
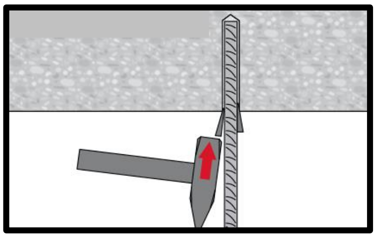


Injection method for drill hole depth h_{ef} > 250mm.



Injection method for overhead application.

Setting the element

	**Setting element**, observe working time "t_{work}".
	**Setting element** for overhead applications, observe working time "t_{work}". **Loading the anchor**: After required curing time t_{cure} the anchor can be loaded.

HIT-RE 500 V4 injection mortar

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

Injection mortar system

Foil pack: HIT-RE 500 V4

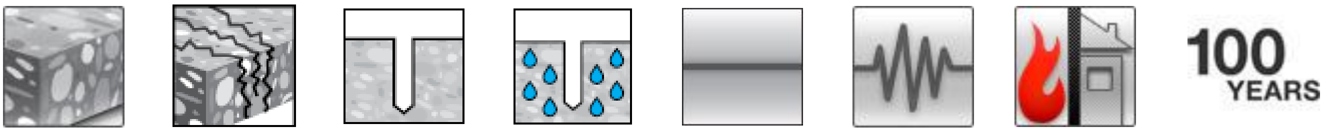
(available in 330, 500 and 1400 ml cartridges)

Rebar
(ϕ8 - ϕ40)

Benefits

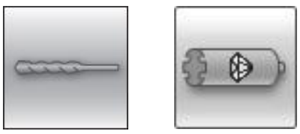
- SafeSet technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Allows the design of post-installed, moment-resisting reinforced concrete connections under static loading conditions without using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

Base material / Load conditions



Concrete (non-cracked)	Concrete (cracked)	Dry concrete	Wet concrete	Static/ quasi-static	Seismic*	Fire resistance	Service life 100y, ETA

Installation conditions / Other informations



SAFESET

Hammer drilling	Diamond coring	Hilti **SafeSet** technology	European Technical Assessment	CE conformity	PROFIS Rebar design Software

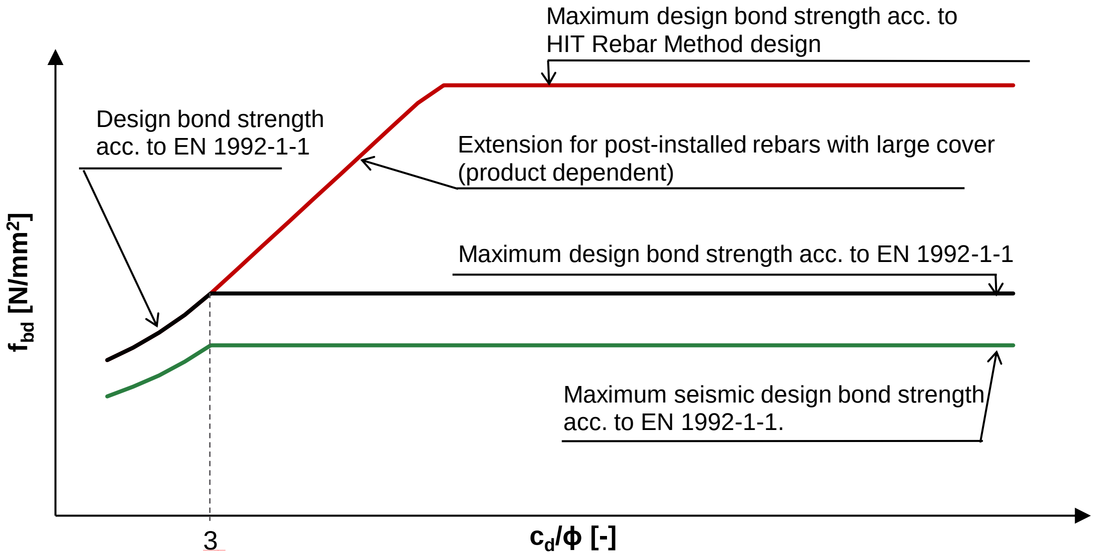
*only for EN 1992-1-1 design

Approvals / certificates

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

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

Static and quasi-static loading



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

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

Design bond strength in N/mm² for good bond conditions for service life of 50 and 100 years[1)]

For hammer drilled holes, hammer drilled holes with hollow drill bit[2)] and diamond cored with Hilti roughening tool TE-YRT[3)]:

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

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

For diamond cored holes (wet):

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

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

Increasing factors in concrete

Drilling method	Concrete class	ETA 20/0540, issued 2021-07-09											
		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	C30/37	1,04											
	C40/50	1,07											
	C50/60	1,09											
Diamond cored holes with roughening tool	C30/37 - 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:

Hammer drilled holes, hammer drilled holes with hollow drill bit[1)] and diamond cored with Hilti roughening tool TE-YRT[2)]

Rebar size	ETA 20/0540, issued 2021-07-09								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ40	1,0								

1) Hilti hollow drill bit available for element size ϕ10-ϕ28.

2) Roughening tools are available for element size ϕ14-ϕ28.

Diamond cored holes (wet)

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

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

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

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

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

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

For diamond cored holes:

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

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

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

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

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

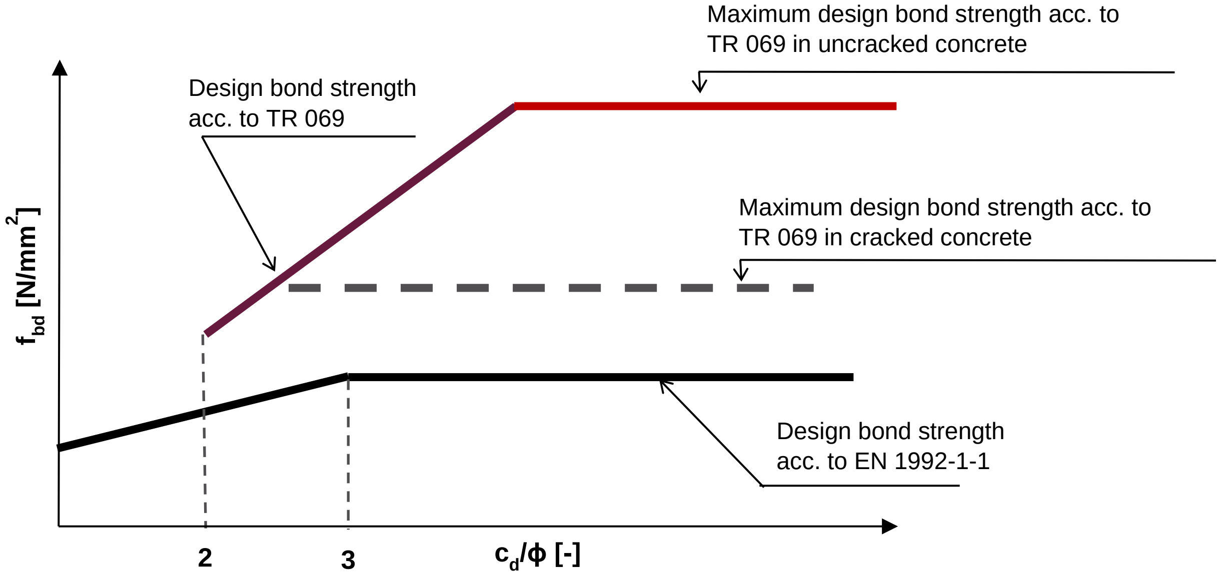
1) For poor bond conditions multiply the values by 0,7.
2) Temperate range I: (min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C).
3) Hilti hollow drill bit available for element size ϕ10-ϕ28.
4) Roughening tools are available for element size ϕ14-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

For diamond cored holes:

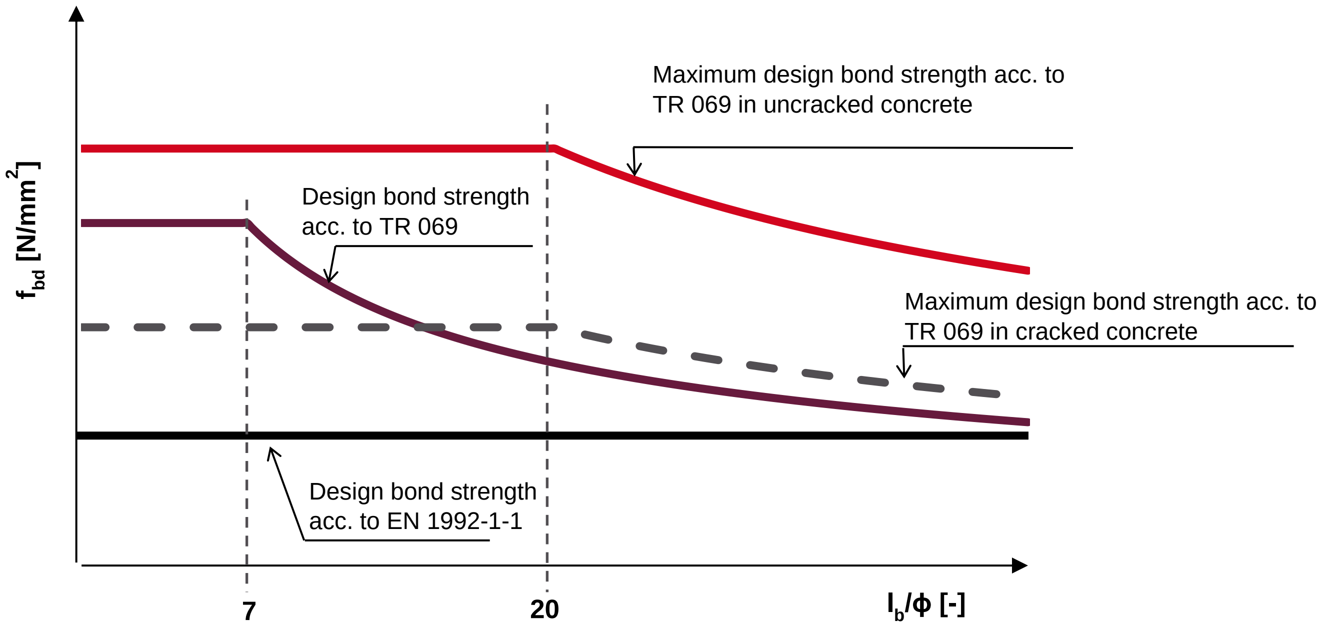
Rebar size	ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32
Non-cracked concrete C20/25	5,0	5,0	5,0	5,0	4,3	4,3	4,3	4,5	4,5	4,5
Cracked concrete C20/25	-	-	-	-	-	-	-	-	-	-

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

Static design acc. to EOTA TR 069



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



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

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

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

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

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

Design parameter for working life of 50 and 100 years[1)]

For hammer drilled holes, hammer drilled holes with hollow drill bit[2)] and diamond cored with Hilti roughening tool TE-YRT [3)]:															
Rebar size		**ETA 20/0539, issued 2021-07-09**													
		ϕ8	**ϕ10**	**ϕ12**	**ϕ13**	**ϕ14**	**ϕ16**	**ϕ18**	**ϕ20**	**ϕ22**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**
Combined pullout and concrete cone failure in non-cracked concrete C20/25															
Characteristic resistance $\tau_{Rk,ucr}$	[N/mm²]	10	15	15	15	15	15	14	14	14	14	14	14	13	13
Characteristic resistance $\tau_{Rk,100,ucr}$	[N/mm²]	10	15	15	15	15	15	14	14	14	14	14	14	13	13
Bond-splitting failure															
Product basic factor A_k	[-]	4,2													
Exponent for influence of concrete compressive strength sp1	[-]	0,35													
Exponent for influence of rebar diameter ϕ sp2	[-]	0,19													
Exponent for influence of concrete cover sp3	[-]	0,67													
Exponent for influence of side concrete cover sp4	[-]	0,33													
Exponent for influence of anchorage length lb1	[-]	0,60													
Influence of cracked concrete on combined pullout and concrete cone failure															
Factor for influence of cracked concrete Ω_{cr}	[-]	1,00	0,94	0,90	0,89	0,87	0,85	0,82	0,80	0,79	0,77	0,76	0,74	0,73	0,72

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

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

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

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

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

Seismic loading

Design bond strength according to in N/mm² for good bond conditions for working life of 50 and 100 years[1)]

For hammer drilled holes, hammer drilled holes with hollow drill bit[2)] and diamond cored with Hilti roughening tool TE-YRT [3)]:

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

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

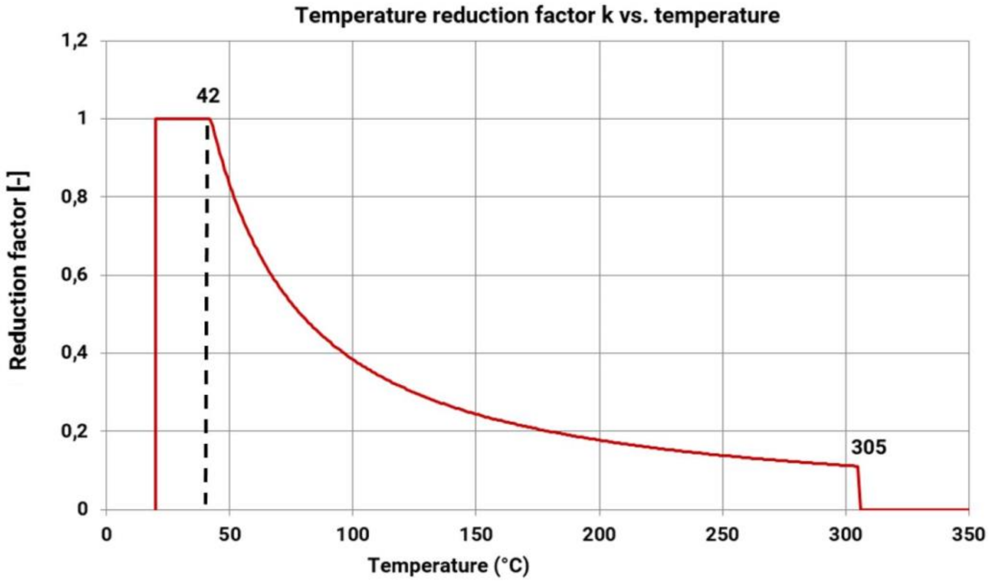
For diamond cored holes:

Rebar size	ETA-20/0540, issued 2021-07-09							
	Concrete class							
	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ12	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
ϕ13 - ϕ32	2,0	2,3	2,7	3,0	3,3	3,4	3,4	3,4
ϕ34	1,9	2,3	2,3	2,3	2,3	2,3	2,3	2,3
ϕ36	1,9	2,2	2,2	2,2	2,2	2,2	2,2	2,2
ϕ40	1,8	2,1	2,1	2,1	2,1	2,1	2,1	2,1

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

Fire resistance

Temperature reduction factor $k_{fi}(\theta)$ for concrete class C20/25 for good bond conditions according to ETA-20/0540 for working life of 50 and 100 years[1)]



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

$$f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd,PIR} \cdot \frac{\gamma_c}{\gamma_{M,fi}}$$ for a working life of 50 years

$$f_{bd,fi,100y} = k_{b,fi,100y}(\theta) \cdot f_{bd,PIR,100y} \cdot \frac{\gamma_c}{\gamma_{M,fi}}$$ for a working life of 100 years

with $\theta \leq 305°C$:

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

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

$\theta > 305°C$:

$$k_{b,fi}(\theta) = k_{b,fi,100y}(\theta) = 0{,}0$$

$f_{bd,fi,50y}$ = Design value of the bond resistance in case of fire in N/mm² (service life 50 years).

$f_{bd,fi,100y}$ = Design value of the bond resistance in case of fire in N/mm² (service life 100 years).

(θ) = Temperature in °C in the mortar layer.

$k_{b,fi}(\theta)$ = Reduction factor under fire exposure.

$k_{b,fi,100y}(\theta)$ = Reduction factor under fire exposure for a working life of 100 years.

$f_{bd,PIR}$ = Design value of the bond resistance in N/mm² in cold condition according to Table C3 or C6 of ETA 20/0540 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1.

$f_{bd,PIR,100y}$ = Design value of the bond strength in N/mm² in cold condition according to Table C3 or Table C6 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1 for a working life of 100 years.

γ_c = Partial safety factor according to EN 1992-1-1

$\gamma_{M,fi}$ = Partial safety factor according to EN 1992-1-2

For evidence under fire exposure the anchorage length shall be calculated according to EN 1992-1- 1:2004+AC:2010 Equation 8.3 using the temperature-dependent bond resistance $f_{bd,fi}$.

Materials

Mechanical properties

Rebar size		ϕ8	ϕ10	ϕ12	ϕ13	ϕ14	ϕ16	ϕ18	ϕ20	ϕ24	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Nominal tensile strength f_{uk}	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	[mm²]	50,3	78,5	113	133	154	201	254	314	452	491	616	707	804	1018	1257
Moment of resistance W	[mm³]	50,3	98,2	170	216	269	402	573	785	1357	1534	2155	2650	3217	4580	6283

Material quality

Part	Material
Rebar EN 1992-1-1:2004 and AC:2010	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1/ NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Fitness for use

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

Resistance to chemical substances

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

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

\+ **Resistant**
\- **Not resistant**
o **Partially Resistant**

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

Service temperature range

Hilti HIT-RE 500 V4 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

ETA-20/0540

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

ETA-20/0539

Temperature range	Base material temperature	Max. long term base material temperature	Max. short term base material temperature
Temperature range I	-40 °C to +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +55 °C	+43 °C	+55 °C
Temperature range III	-40 °C to +75 °C	+55 °C	+75 °C

Max. short term base material temperature
Short-term elevated base material temperatures are those that occur over brief intervals, e.g. as result of diurnal cycling.

Max. long term base material temperature
Long-term elevated base material temperatures are roughly constant over significant periods of time.

Working time and curing time[1)]

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

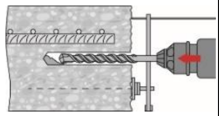
1) The curing time data are valid for dry base material only. In wet base material, the curing times must be doubled.
2) The minimum temperature of the foil pack is +5° C.

Setting information

Installation equipment															
Rebar size	**ϕ8**	**ϕ10**	**ϕ12**	**ϕ13**	**ϕ14**	**ϕ16**	**ϕ18**	**ϕ20**	**ϕ24**	**ϕ25**	**ϕ28**	**ϕ32**	**ϕ34**	**ϕ36**	**ϕ40**
Rotary hammer	TE 2 (-A)– TE 40(-A)						TE40 – TE80								
Other tools	Blow out pump ($h_{ef} \leq 10 \cdot d$)						-								
	Compressed air gun[a)] Set of cleaning brushes[b)], dispenser, piston plug Roughening tools														

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

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

Drilling method	Rebar size	Minimum concrete cover c_{min} [mm]		
		Without drilling aid	With drilling aid	
Hammer drilling **(HD)** and **(HDB)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
Compressed air drilling **(CA)**	**ϕ < 25**	$50 + 0{,}08 \cdot l_v$	$50 + 0{,}02 \cdot l_v$	
	ϕ ≥ 25	$60 + 0{,}08 \cdot l_v \geq 2 \cdot \phi$	$60 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
Diamond coring in wet **(PCC)** dry **(DD)**	**ϕ < 25**	Drill stand works like a drilling aid	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
	ϕ ≥ 25		$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
Diamond coring with Roughening tool TE-YRT **(RT)**	**ϕ < 25**	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	
	ϕ ≥ 25	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$	

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

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

Drilling diameters

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

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

Associated components for the use of Hilti Roughening tool TE-YRT

Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
d_0 [mm]		d_0 [mm]	size
nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

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

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

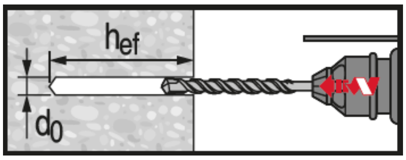
Setting instructions

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

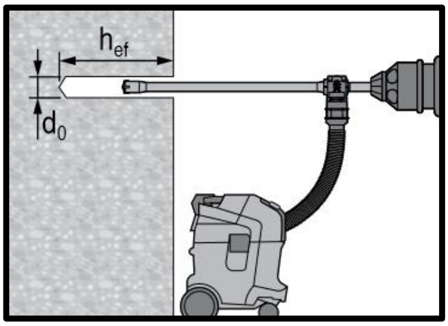
Safety regulations.

Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V4.

Drilling

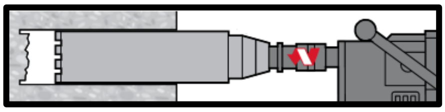


Hammer drilled hole (HD)

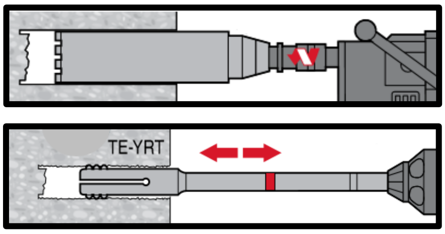


Hammer drilled hole with Hollow Drilled Bit (HDB)

No cleaning required.

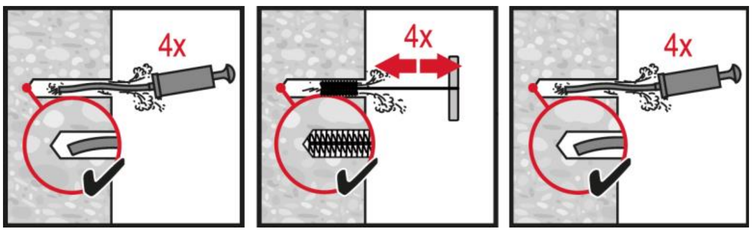


Diamond Drilling (DD)



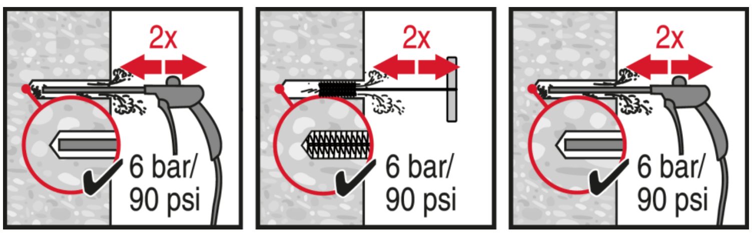
Diamond Drilling + Roughening Tool (DD+RT)

Cleaning (Inadequate hole cleaning=poor load values.)



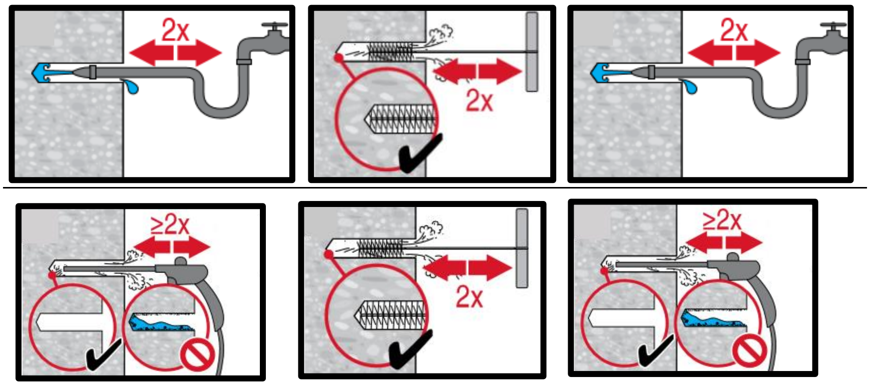
Hammer Drilling:

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



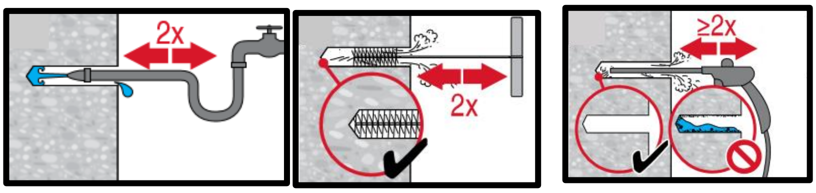
Hammer Drilling:

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



Diamond cored holes:

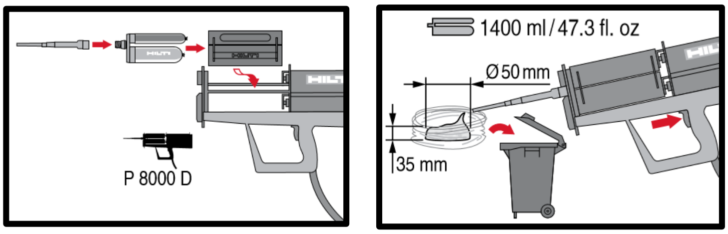
For all drill hole diameters d_0 and drill hole depths h_0.



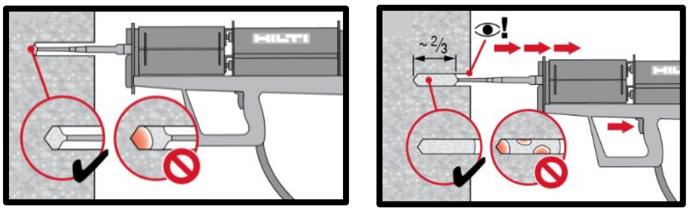
Diamond cored holes with Hilti roughening tool:

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

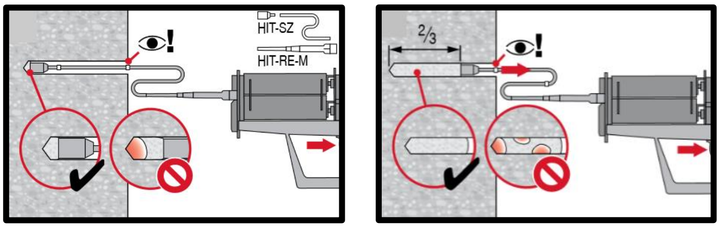
Injection preparation



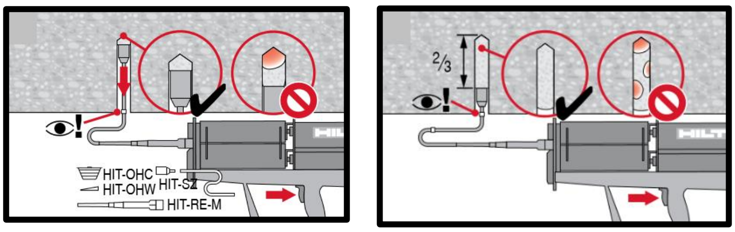
Injection system preparation.



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

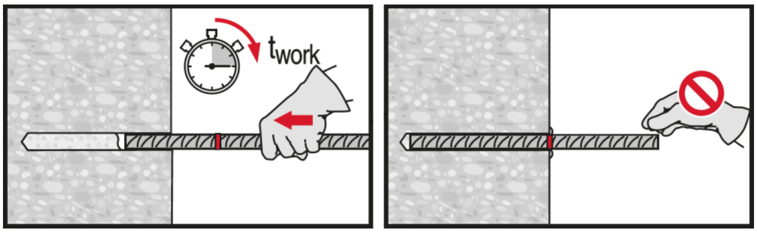


Injection method for drill hole depth $h_{ef} > 250$mm.

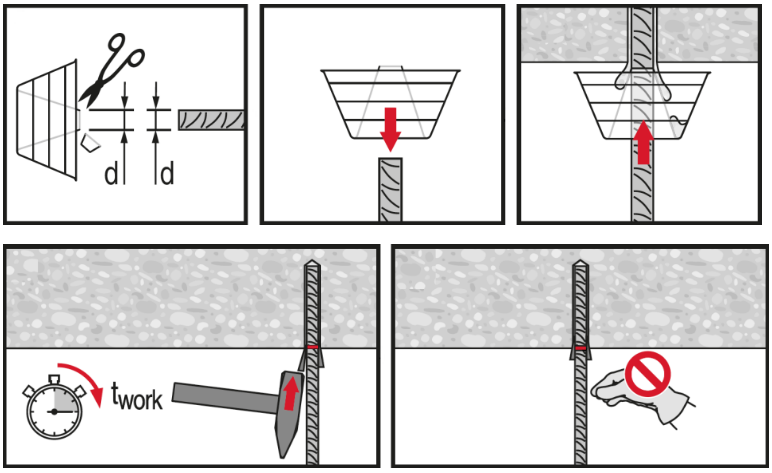


Injection method for overhead application.

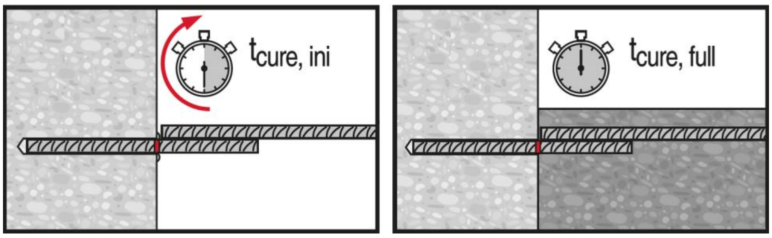
Setting the element



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



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



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