HIT-RE 500 V3
INJECTION MORTAR

Technical Datasheet

Update: Dec-17



HIT-RE 500 V3 injection mortar

Anchor design (ETAG 001) / Rods&Sleeves / Concrete

Injection mortar system



Foil pack: HIT-RE 500 V3

(available in 330, 500 and 1400 ml cartridges)



Anchor rod:
HIT-V
HIT-V-F
HIT-V-R
HIT-V-HCR
AM 8.8 (HDG)
(M8-M39)
Internally threaded sleeve:
HIS-N,
HIS-RN
(M8-M20)



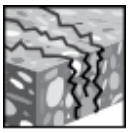
Benefits

- **Safe**Set technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Suitable for cracked/non-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
- 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



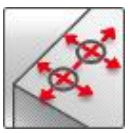
Hammer drilled holes



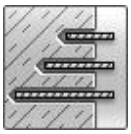
Diamond drilled holes



Hilti **Safe**Set technology



Small edge distance and spacing



Variable embedment depth

Load conditions



Static/ quasi-static



Seismic, ETA-C1, C2



Fire resistance

Other information



European Technical Assessment



CE conformity



PROFIS Anchor design Software



Corrosion resistance



High corrosion resistance [a)]

a) Applications only with HIT-V anchor rods

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment [a)]	CSTB	ETA-16/0143 / 2017-07-12
Fire test report [b)]	MFPA Leipzig	GS 3.2/15-361-4 / 2016-08-04

a) All data given in this section according to ETA-16/0143, issue 2017-07-12.
b) Fire test report only available for HIT-V rods.

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
- HIT-V 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, as specified in the table
- One typical embedment depth as specified in the table
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Temperature range I
  (min. base material temperature -40°C, max. long/short term base material temperature: +24°C/40°C)

Embedment depth[a)] and base material thickness

Anchor size		ETA-16/0143, issue 2017-07-12								Additional Hilti technical data		
		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
HIT-V												
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, hollow drill bit[1)] and diamond cored with roughening tool[2)]:

Mean ultimate resistance

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti technical data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Non-cracked concrete													
Tension $N_{Ru,m}$	HIT-V 5.8	[kN]	*18,9*	*30,5*	*44,1*	*83,0*	*129,2*	*185,9*	*241,5*	*295,1*	348,4	401,9	457,9
	HIS-N 8.8		*26,3*	*48,3*	*70,4*	*131,3*	*121,8*	-	-	-	-	-	-
Shear $V_{Ru,m}$	HIT-V 5.8	[kN]	*9,5*	*15,8*	*22,1*	*41,0*	*64,1*	*92,4*	*120,8*	*147,0*	*182,7*	*214,2*	*256,2*
	HIS-N 8.8		*13,7*	*24,2*	*35,7*	*66,2*	*60,9*	-	-	-	-	-	-
Cracked concrete													
Tension $N_{Ru,m}$	HIT-V 5.8	[kN]	17,4	28,2	44,0	66,7	105,9	145,4	177,7	212,0	-	-	-
	HIS-N 8.8		*26,3*	*48,3*	66,8	105,9	*121,8*	-	-	-	-	-	-
Shear $V_{Ru,m}$	HIT-V 5.8	[kN]	*9,5*	*15,8*	*22,1*	*41,0*	*64,1*	*92,4*	*120,8*	*147,0*	-	-	-
	HIS-N 8.8		*13,7*	*24,2*	*35,7*	*66,2*	*60,9*	-	-	-	-	-	-

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

Characteristic resistance

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti technical data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Non-cracked concrete													
Tension N_{Rk}	HIT-V 5.8	[kN]	*18,0*	*29,0*	*42,0*	70,6	111,9	153,7	187,8	224,0	262,4	302,7	344,9
	HIT-V 8.8, AM 8.8		*29,0*	43,1	58,3	70,6	111,9	153,7	187,8	224,0	262,4	302,7	344,9
	HIS-N 8.8		*25,0*	*46,0*	*67,0*	111,9	*116,0*	-	-	-	-	-	-
Shear V_{Rk}	HIT-V 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115,0*	*140,0*	*174,0*	*204,0*	*244,0*
	HIT-V 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141,0*	*184,0*	*224,0*	*278,0*	*327,0*	*390,0*
	HIS-N 8.8		*13,0*	*23,0*	*34,0*	*63,0*	*58,0*	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rk}	HIT-V 5.8	[kN]	13,1	21,2	33,2	50,3	79,8	109,6	133,9	159,7	-	-	-
	HIT-V 8.8, AM 8.8		13,1	21,2	33,2	50,3	79,8	109,6	133,9	159,7	-	-	-
	HIS-N 8.8		*25,0*	41,5	50,3	79,8	105,7	-	-	-	-	-	-
Shear V_{Rk}	HIT-V 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115,0*	*140,0*	-	-	-
	HIT-V 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141,0*	*184,0*	*224,0*	-	-	-
	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) Roughening tools are available for element size M16-M30.

Design resistance

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti technical data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Non-cracked concrete													
Tension N_{Rd}	HIT-V 5.8	[kN]	12,0	19,3	28,0	47,1	74,6	102,5	125,2	149,4	145,8	168,2	191,6
	HIT-V 8.8, AM 8.8		19,3	28,7	38,8	47,1	74,6	102,5	125,2	149,4	145,8	168,2	191,6
	HIS-N 8.8		16,7	30,7	44,7	74,6	77,3	-	-	-	-	-	-
Shear V_{Rd}	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0	139,2	163,2	195,2
	HIT-V 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2	222,4	261,6	312,0
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rd}	HIT-V 5.8	[kN]	8,7	14,1	22,1	33,5	53,2	73,0	89,2	106,5	-	-	-
	HIT-V 8.8, AM 8.8		8,7	14,1	22,1	33,5	53,2	73,0	89,2	106,5	-	-	-
	HIS-N 8.8		16,7	27,7	33,5	53,2	70,4	-	-	-	-	-	-
Shear V_{Rd}	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0	-	-	-
	HIT-V 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2	-	-	-
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-

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

Recommended loads [a)]

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti technical data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Non-cracked concrete													
Tension N_{Rec}	HIT-V 5.8	[kN]	8,6	13,8	20,0	33,6	53,3	73,2	89,4	106,7	104,1	120,1	136,
	HIS-N 8.8		16,7	30,7	44,7	74,6	77,3	-	-	-	-	-	-
Shear V_{Rec}	HIT-V 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0	99,4	116,6	139,
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-
Cracked concrete													
Tension N_{Rec}	HIT-V 5.8	[kN]	6,2	10,1	15,8	23,9	38,0	52,2	63,7	76,1	-	-	-
	HIS-N		16,7	27,7	33,5	53,2	70,4	-	-	-	-	-	-
Shear V_{Rec}	HIT-V 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0	-	-	-
	HIS-N 8.8		10,4	18,4	27,2	50,4	46,4	-	-	-	-	-	-

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 [a)]**:**

Mean ultimate resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension $N_{Ru,m}$	HIT-V 5.8	[kN]	*18,9*	*30,5*	*44,1*	*83,0*	*129,2*	*185,9*	*241,5*	*295,1*
Shear $V_{Ru,m}$	HIT-V 5.8		*9,5*	*15,8*	*22,1*	*41,0*	*64,1*	*92,4*	*120,8*	*147,0*

a) No data for HIS-N when diamond coring without roughening tools.

Characteristic resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rk}	HIT-V 5.8	[kN]	*18,0*	*29,0*	*42,0*	70,6	111,9	153,7	187,8	224,0
	HIT-V 8.8, AM 8.8		24,1	33,9	49,8	70,6	111,9	153,7	187,8	224,0
Shear V_{Rk}	HIT-V 5.8	[kN]	*9,0*	*15,0*	*21,0*	*39,0*	*61,0*	*88,0*	*115,0*	*140,0*
	HIT-V 8.8, AM 8.8		*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141,0*	*184,0*	*224,0*

a) No data for HIS-N when diamond coring without roughening tools.

Design resistance

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tension N_{Rd}	HIT-V 5.8	[kN]	12,0	18,8	27,6	33,6	53,3	73,2	89,4	106,7
	HIT-V 8.8, AM 8.8		13,4	18,8	27,6	33,6	53,3	73,2	89,4	106,7
Shear V_{Rd}	HIT-V 5.8	[kN]	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0
	HIT-V 8.8, AM 8.8		12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2

a) No data for HIS-N when diamond coring without roughening tools.

Recommended loads [b)]

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete										
Tensile N_{Rec}	HIT-V 5.8	[kN]	8,6	13,5	19,7	24,0	38,1	52,3	63,9	76,2
Shear V_{Rec}	HIT-V 5.8	[kN]	5,1	8,6	12,0	22,3	34,9	50,3	65,7	80,0

a) No data for HIS-N when diamond coring without roughening tools.
b) 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 resistance

All data in this section applies to:

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Anchor HIT-V strength class 8.8, anchor AM 8.8
- Base material thickness, as specified in the table
- One typical embedment depth as specified in the table
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- 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		M8	M10	M12	M16	M20	M24	M27	M30
HIT-V									
Eff. Anchorage depth	[mm]	80	90	110	125	170	210	240	270
Base material thickness	[mm]	110	120	140	165	220	270	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 HIT-V rods.

For hammer drilled holes, hollow drill bit and diamond cored with roughening tool:

Characteristic resistance in case of seismic performance category C2 using Hilti seismic filling set

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tensile N_{Rk}	HIT-V 8.8, AM 8.8	[kN]	-	-	-	34,6	57,7	80,8	-	-
Shear V_{Rk}	HIT-V 8.8, AM 8.8	[kN]	-	-	-	*46,0*	*77,0*	*103,0*	-	-
	HIT-V-F 8.8 AM-HDG 8.8		-	-	-	30,0	46,0	66,0	-	-

Design resistance in case of seismic performance category C2 using Hilti seismic filling set

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tensile N_{Rd}	HIT-V 8.8, AM 8.8	[kN]	-	-	-	23,0	38,5	53,8	-	-
Shear V_{Rd}	HIT-V 8.8, AM 8.8	[kN]	-	-	-	36,8	61,6	82,4	-	-
	HIT-V-F 8.8 AM-HDG 8.8		-	-	-	24,0	36,8	52,8	-	-

For hammer drilled holes and hammer drilled holes with Hilti hollow drill bit:

Characteristic resistance in case of seismic performance category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tensile N_{Rk}	HIT-V 8.8, AM 8.8	[kN]	12,1	19,8	32,8	42,8	67,8	93,1	113,8	135,8
	HIS-N 8.8		*25,0*	35,3	42,8	67,8	89,8	-	-	-
Shear V_{Rk}	HIT-V 8.8, AM 8.8	[kN]	*15,0*	*23,0*	*34,0*	*63,0*	*98,0*	*141,0*	*184,0*	*224,0*
	HIS-N 8.8		*9,0*	*16,0*	*24,0*	*44,0*	*41,0*	-	-	-

Design resistance in case of seismic performance category C1

Anchor size			M8	M10	M12	M16	M20	M24	M27	M30
Tensile N_{Rd}	HIT-V 8.8, AM 8.8	[kN]	8,0	13,2	21,8	28,5	45,2	62,1	75,9	90,5
	HIS-N 8.8		16,7	23,5	28,5	45,2	59,9	-	-	-
Shear V_{Rd}	HIT-V 8.8, AM 8.8	[kN]	12,0	18,4	27,2	50,4	78,4	112,8	147,2	179,2
	HIS-N 8.8		7,2	12,8	19,2	35,2	32,8	-	-	-

Materials

Mechanical properties for HIT-V

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti Technical data		
			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Nominal tensile strength f_{uk}	HIT-V 5.8(F)	[N/mm²]	500	500	500	500	500	500	500	500	500	500	500
	HIT-V 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
	HIT-V-R		700	700	700	700	700	700	500	500	500	500	500
	HIT-V-HCR		800	800	800	800	800	700	700	700	500	500	500
Yield strength f_{yk}	HIT-V 5.8(F)	[N/mm²]	400	400	400	400	400	400	400	400	400	400	400
	HIT-V 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
	HIT-V-R		450	450	450	450	450	450	210	210	210	210	210
	HIT-V-HCR		640	640	640	640	640	400	400	400	250	250	250
Stressed cross-section A_s	HIT-V AM 8.8	[mm²]	36,6	58,0	84,3	157	245	353	459	561	694	817	976
Moment of resistance W	HIT-V 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-16/0143, issue 2017-07-12				
			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	108,0	169,1	256,1	237,6
	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 HIT-V

Part	Material
Zinc coated steel	
Threaded rod, HIT-V 5.8 (F)	Strength class 5.8; Elongation at fracture A5 > 8% ductile Electroplated zinc coated ≥ 5μm; (F) hot dip galvanized ≥ 45 μm
Threaded rod, HIT-V 8.8 (F)	Strength class 8.8; Elongation at fracture A5 > 12% ductile Electroplated zinc coated ≥ 5μm; (F) hot dip galvanized ≥ 45 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 ≥ 45 μm
Washer	Electroplated zinc coated ≥ 5 μm, hot dip galvanized ≥ 45 μm
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated ≥ 5μm, hot dip galvanized ≥ 45 μm
Stainless Steel	
Threaded rod, HIT-V-R	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, HIT-V-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 V3 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	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 +70 °C	+43 °C	+70 °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.

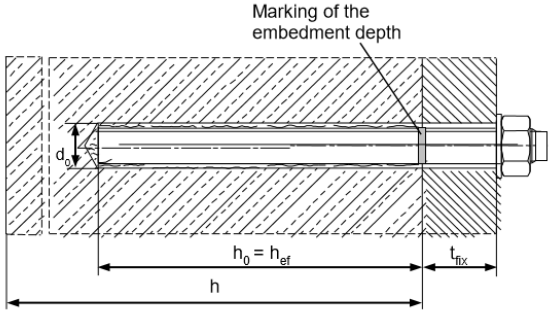
Working time and curing time

Temperature of the base material T	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	16 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.

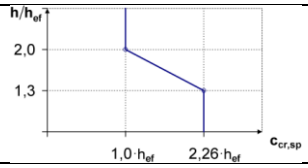
Setting details for HIT-V

Anchor size			ETA-16/0143, issue 2017-07-12								Additional Hilti Technical 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. torque moment	T_{max}	[mm]	10	20	40	80	150	200	270	300	330	360	390
Minimum 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 · 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)]	$c_{cr,N}$	[mm]	1,5 h_{ef}										



Setting details for HIS-N

Anchor size			M8	M10	M12	M16	M20
Nominal diameter of drill	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
Minimum base 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
Minimum spacing	s_{min}	[mm]	60	70	90	115	130
Minimum 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]	$c_{cr,N}$	[mm]	$1{,}5\ h_{ef}$				
Max. torque moment [a]	T_{max}	[Nm]	10	20	40	80	150

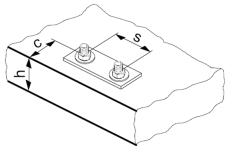


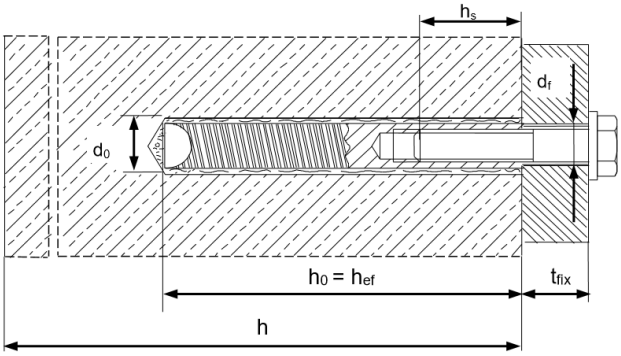
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

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

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

c) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side.





Installation equipment

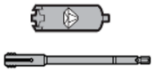
Anchor size		M8	M10	M12	M16	M20	M24	M27	M30	M36	M39
Rotary hammer	HIT-V	TE 2 – TE 16				TE 40 – TE 80				Not available from Hilti	
	HIS-N	TE 2 – TE 16		TE 40 – TE 80			-				
Other tools		compressed air gun, set of cleaning brushes, dispenser									
		roughening tools TE-YRT								-	
Additional Hilti recommended tools		DD EC-1, DD 100 … DD 160 [a]								-	

a) For anchors in diamond drilled holes load values for combined pull-out and concrete cone resistance have to be reduced

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

Parameters of cleaning and setting tools

HIT-V	HIS-N	Drill bit diameters d_0 [mm]				Installation	
		Hammer drill (HD)	Hollow Drill Bit (HDB)	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	-	-	-	37	37
M36	**-**	40	-	-	-	40	40
M39	**-**	42	-	-	-	42	42

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

Setting instructions

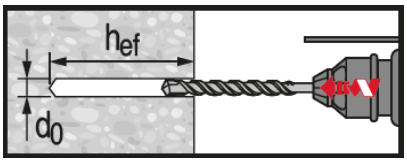
***For detailed information on installation see instruction for use given with the package of the product.**



Safety regulations.

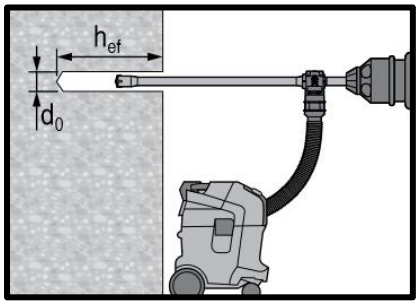
Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V3.

Drilling



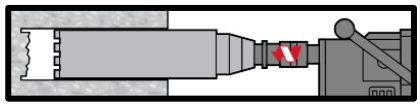
Hammer drilled hole

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

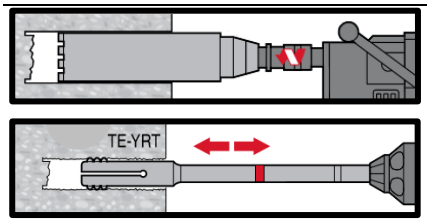


Hammer drilled hole with Hollow Drilled Bit (HDB)

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

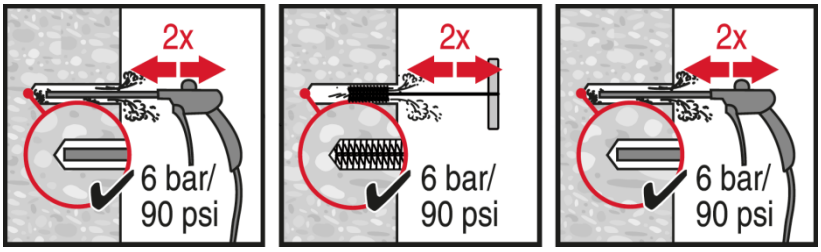


Diamond Coring
For dry and wet concrete, only.



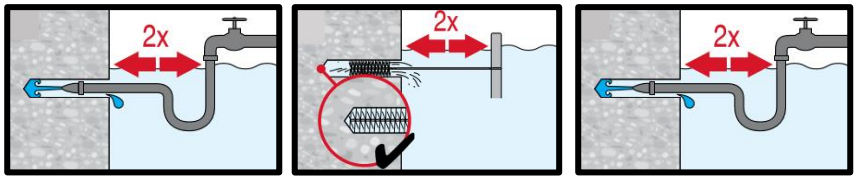
Diamond Coring + Roughening Tool
For dry and wet concrete only.
Before roughening, the borehole needs to be dry.

Cleaning (Inadequate hole cleaning=poor load values.)



Hammer Drilling:

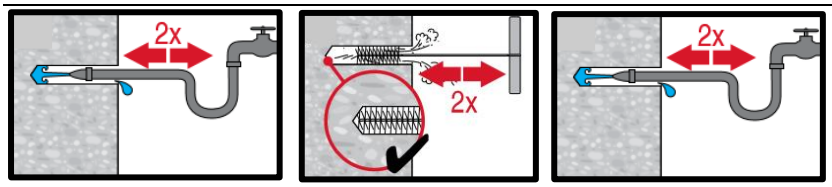
Compressed air cleaning (CAC)
For all drill hole diameters d_0 and all drill hole depths h_0.



Hammer drilling:

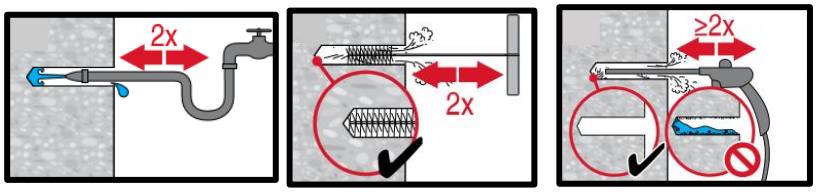
Cleaning for under water:

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



Hammer drilled flooded holes and diamond cored holes:

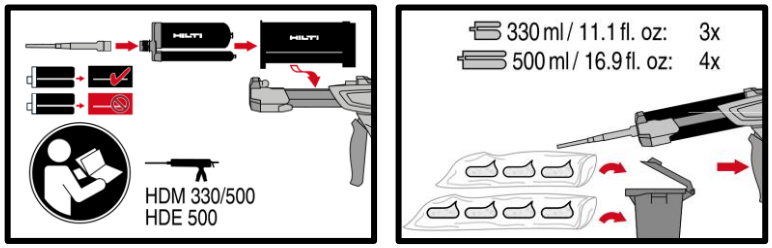
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0.



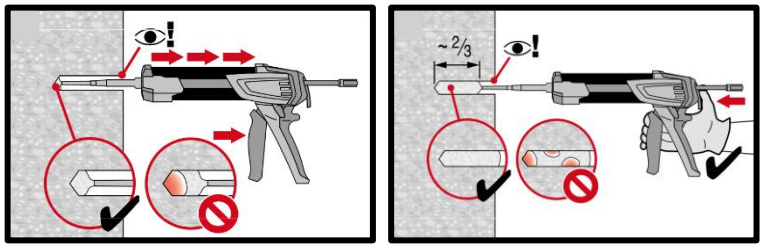
Diamond cored holes with Hilti roughening tool:

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

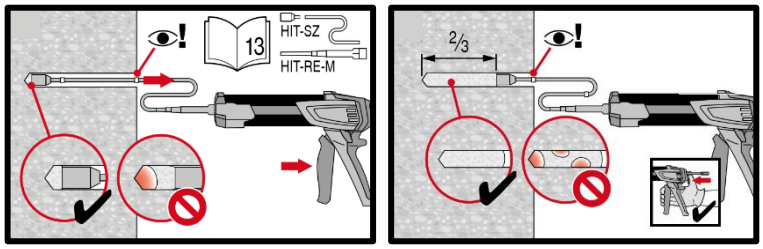
Injection preparation



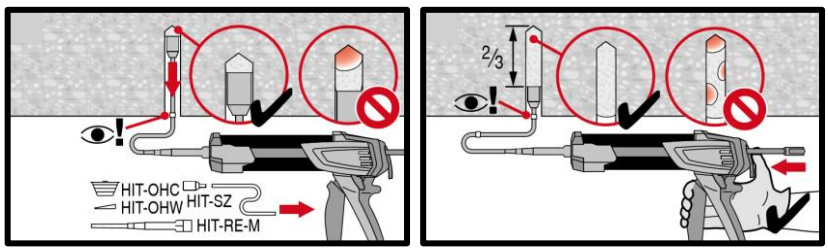
Injection system preparation.



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

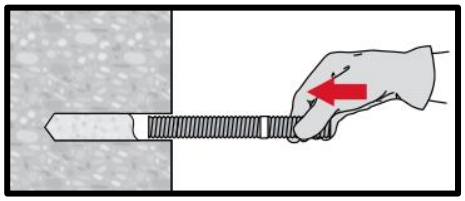


Injection method for drill hole depth $h_{ef} > 250$mm.

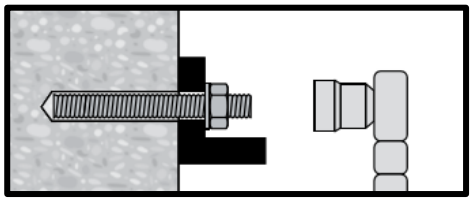


Injection method for overhead application.

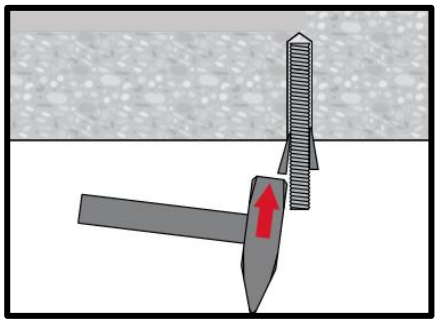
Setting the element



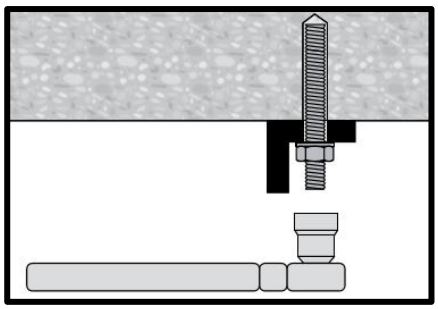
Setting element, observe working time "t_{work}",



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



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 $T_{max.}$

HIT-RE 500 V3 injection mortar

Anchor design (ETAG 001) / Rebar elements / Concrete

Injection mortar system



Hilti
HIT-RE 500 V3
500 ml foil pack

(also available as 330 ml and 1400 ml foil pack)



Rebar B500 B

(ϕ8 - ϕ40)

Benefits

- **SafeSet** technology: Simplified method of borehole preparation using either Hilti hollow drill bit for hammer drilling or Roughening tool for diamond cored applications
- Suitable for non-cracked and cracked concrete C 20/25 to C 50/60
- ETA approval for seismic performance category C1
- Hilti Technical Data for seismic performance category C2
- High loading capacity
- Suitable for dry and water saturated concrete
- Hilti Technical Data for under water application
- Fastest curing epoxy mortar to speed up construction process
- 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

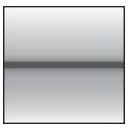

Concrete (non-cracked)


Concrete (cracked)


Dry concrete


Wet concrete

Load conditions


Static/ quasi-static


Seismic, ETA-C1
Hilti Technical Data-C2

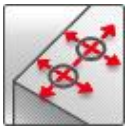
Installation conditions


Hammer drilling


Diamond coring



Hilti **SafeSet** technology


Small edge distance and spacing

Other informations


European Technical Assessment


CE conformity


PROFIS Rebar design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment a)	CSTB, Marne la Vallée	ETA-16/0143 / 2017-07-12

a) All data given in this section according to ETA-16/0143 issue 2016-11-30.

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

All data in this section applies to
-Design according to TR029
-Correct setting (See setting instruction)
-No edge distance and spacing influence
-*Steel* failure
-Base material thickness, as specified in the table
-One typical embedment depth, as specified in the table
-Rebar B500B
-Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
-Temperate range I (min. base material temp. -40°C, max. long term/short term base material temp.: +24°C/40°C)

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

		ETA-16/0143, issue 2017-07-12										Additional Hilti technical data	
Anchor- size		**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Typ. embedment depth	[mm]	80	90	110	125	125	170	210	270	285	300	330	360
Base material thickness	[mm]	110	120	140	161	165	220	274	340	359	380	420	470

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

Mean ultimate resistance

			ETA-16/0143, issue 2017-07-12									Additional Hilti technical data	
Anchor- size			**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Non-cracked concrete														
Tensile $N_{Ru,m}$	B500B	[kN]	-	*45,2*	*65,1*	*89,3*	93,7	148,6	204,0	297,4	331,1	348,4	401,9	457,9
Shear $V_{Ru,m}$	B500B	[kN]	-	*23,1*	*32,6*	*44,1*	*57,8*	*90,3*	*141,8*	*177,5*	*203,7*	*232,1*	*293,9*	*363,0*
Cracked concrete														
Tensile $N_{Ru,m}$	B500B	[kN]	-	31,9	52,3	66,8	66,8	105,9	145,4	212,0	229,9	248,3	-	-
Shear $V_{Ru,m}$	B500B	[kN]	-	*23,1*	*32,6*	*44,1*	*57,8*	*90,3*	*141,8*	*177,5*	*203,7*	*232,1*	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Characteristic resistance

			ETA-16/0143, issue 2017-07-12									Additional Hilti technical data	
Anchor- size			**ϕ8**	**ϕ10**	**ϕ12**	**ϕ14**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ28**	**ϕ30**	**ϕ32**	**ϕ36**	**ϕ40**
Non-cracked concrete														
Tensile N_{Rk}	B500B	[kN]	-	39,6	58,1	70,6	70,6	111,9	153,7	224,0	249,4	262,4	302,7	344,9
Shear V_{Rk}	B500B	[kN]	-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	*280,0*	*346,0*
Cracked concrete														
Tensile N_{Rk}	B500B	[kN]	-	24,0	39,4	50,3	50,3	79,8	109,6	159,7	177,8	187,1	-	-
Shear V_{Rk}	B500B	[kN]	-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Design resistance

Anchor- size			ETA-16/0143, issue 2017-07-12										Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete														
Tensile N_{Rd}	B500B	[kN]	-	26,4	38,7	47,1	47,1	74,6	102,5	149,4	166,3	174,9	168,2	191,6
Shear V_{Rd}	B500B	[kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	186,7	230,7
Cracked concrete														
Tensile N_{Rd}	B500B	[kN]	-	16,0	26,3	33,5	33,5	53,2	73,0	106,5	118,5	124,7	-	-
Shear V_{Rd}	B500B	[kN]	-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Recommended loads[3)]

Anchor- size			ETA-16/0143, issue 2017-07-12										Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Non-cracked concrete														
Tensile N_{Rec}	B500B	[kN]	-	18,8	27,6	33,6	33,6	53,3	73,2	106,7	115,7	125,0	120,1	136,9
Shear V_{Rec}	B500B	[kN]	-	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	133,3	164,6
Cracked concrete														
Tensile N_{Rec}	B500B	[kN]	-	11,4	18,8	24,0	24,0	38,0	52,2	76,1	84,7	89,1	-	-
Shear V_{Rec}	B500B	[kN]	-	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.
3) 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:

Mean ultimate resistance

Anchor- size			ETA-16/0143, issue 2017-07-12										Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile N_{Rk}	B500B	[kN]	-	33,8	49,6	65,7	75,1	127,6	197,1	297,4	331,1	348,4	-	-
Shear V_{Rk}	B500B	[kN]	-	*23,1*	*32,6*	*44,1*	*57,8*	*90,3*	*141,8*	*177,5*	*203,7*	*232,1*	-	-

Characteristic resistance

Anchor- size			ETA-16/0143, issue 2017-07-12										Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile N_{Rk}	B500B	[kN]	-	25,4	37,3	49,5	56,5	96,1	148,4	224,0	249,4	262,4	-	-
Shear V_{Rk}	B500B	[kN]	-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	-	-

Design resistance

Anchor- size			ETA-16/0143, issue 2017-07-12									Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile N_{Rd}	B500B	[kN]	-	14,1	20,7	27,5	26,9	45,8	70,7	106,7	115,7	125,0	-	-
Shear V_{Rd}	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

Recommended loads[a)]

Anchor- size			ETA-16/0143, issue 2017-07-12									Additional Hilti technical data	
			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile N_{Rec}	B500B	[kN]	-	10,1	14,8	19,6	19,2	32,7	50,5	76,2	82,6	89,3	-	-
Shear V_{Rec}	B500B		-	10,5	14,8	20,0	26,2	41,0	64,3	80,5	92,4	105,2	-	-

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:
- Design according to TR 045
- Correct setting (See setting)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Rebar B450C

-Temperate range I
(min. base material temperature -40°C, max. long term/short term base material temperature: +24°C/40°C)
- Installation temperature range -5°C to +40°C
- α_{gap} = 1,0

For hammer drilled holes:

Embedment depth and base material thickness in case of seismic performance category C2

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typical embedment depth	[mm]	-	-	-	-	125	170	210	-	-	-	-	-
Base material thickness	[mm]	-	-	-	-	165	220	274	-	-	-	-	-

Characteristic resistance in case of seismic performance category C2[1)]

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rk,\,seis}$	B450C	[kN]	-	-	-	-	24,5	45,9	57,7	-	-	-	-	-
Shear $V_{Rk,\,seis}$	B450C	[kN]	-	-	-	-	16,7	29,7	40,7	-	-	-	-	-

1) Hilti technical data.

Design resistance in case of seismic performance category C2[1)]

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rd,\,seis}$	B450C	[kN]	-	-	-	-	16,3	30,6	38,5	-	-	-	-	-
Shear $V_{Rd,\,seis}$	B450C	[kN]	-	-	-	-	13,3	23,7	32,5	-	-	-	-	-

1) Hilti technical data.

For hammer drilled holes, hollow drill bit[2] and diamond cored with roughening tool[3]:

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

Anchor- size		ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Typical embedment depth	[mm]	-	90	110	125	125	170	210	270	285	300	-	-
Base material thickness	[mm]	-	120	140	161	165	220	274	340	359	380	-	-

Characteristic resistance in case of seismic performance category C1

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rk, seis}$	B500B	[kN]	-	22,6	35,3	42,8	42,8	67,8	93,1	135,8	151,1	159,0	-	-
Shear $V_{Rk, seis}$	B500B		-	*22,0*	*31,0*	*42,0*	*55,0*	*86,0*	*135,0*	*169,0*	*194,0*	*221,0*	-	-

1) Hilti hollow drill bit available for element size ϕ12-ϕ28.
2) Roughening tools are available for element size ϕ14-ϕ28.

Design resistance in case of seismic performance category C1

Anchor- size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Tensile $N_{Rd, seis}$	B500B	[kN]	-	15,1	23,5	28,5	28,5	45,2	62,1	90,5	100,7	106,0	-	-
Shear $V_{Rd, seis}$	B500B		-	14,7	20,7	28,0	36,7	57,3	90,0	112,7	129,3	147,3	-	-

2) Hilti hollow drill bit available for element size ϕ12-ϕ28.
3) Roughening tools are available for element size ϕ14-ϕ28.

Materials

Mechanical properties

Anchor size			ϕ8	ϕ10	ϕ12	ϕ14	ϕ16	ϕ20	ϕ25	ϕ28	ϕ30	ϕ32	ϕ36	ϕ40
Nominal tensile strength f_{uk}	B500B	[N/mm²]	550	550	550	550	550	550	550	550	550	550	550	550
	B450C		-	-	-	-	518	518	518	-	-	-	-	-
Yield strength f_{yk}	B500B	[N/mm²]	500	500	500	500	500	500	500	500	500	500	50	500
	B450C		-	-	-	-	450	450	450	-	-	-	-	-
Stressed cross-section A_s	B500B	[mm²]	50,3	78,5	113,1	153,9	201,1	314,2	490,9	615,8	706,9	804,2	1018	1257
	B450C		-	-	-	-	201,1	314,2	490,9	-	-	-	-	-
Moment of resistance W	B500B	[mm³]	50,3	98,2	169,6	269,4	402,1	785,4	1534	2155	2650	3217	4580	6283
	B450C		-	-	-	-	402,1	785,4	1534	-	-	-	-	-

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 V3 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

Temperature range	Base material temperature	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 + 70 °C	+ 43 °C	+ 70 °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	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.

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 [a)]										-	
Other tools	Compressed air gun,brush, hollow drill bit, roughening tool, dispenser, piston plug											

a) For anchors in diamond drilled holes, load values for combined pull-out and concrete cone resistance have to be reduced (see section "Setting instruction")

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

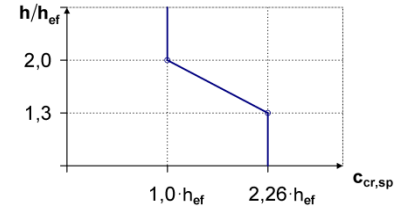
Diamond coring		Roughening tool TE-YRT	Wear gauge RTG…
			
d_0 [mm]		d_0 [mm]	size
Nominal	measured		
18	17,9 to 18,2	18	18
20	19,9 to 20,2	20	20
22	21,9 to 22,2	22	22
25	24,9 to 25,2	25	25
28	27,9 to 28,2	28	28
30	29,9 to 30,2	30	30
32	31,9 to 32,2	32	32
35	34,9 to 35,2	35	35

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

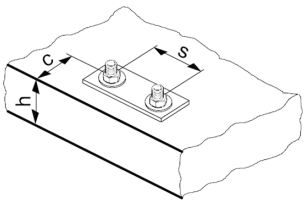
Setting details

Anchor size			Ø8	Ø10	Ø12		Ø14	Ø16	Ø20	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Nominal diameter of drill bit	d_0	[mm]	10 12 a)	12 14a)	14a)	16a)	18	20	25	30 32a)	35	37	40	451)	551)
Effective anchorage and drill hole depth	$h_{ef,min}$	[mm]	60	60	70	70	75	80	90	100	112	120	128	1441)	1601)
	$h_{ef,max}$	[mm]	160	200	240	240	280	320	400	500	560	600	640	7201)	8001)
Minimum base material thickness	h_{min}	[mm]	hef +30mm ≥ 100 mm			h_{ef} + 2 d_0									
Minimum spacing	s_{min}	[mm]	40	50	60	60	70	80	100	125	140	150	160	1801)	2001)
Minimum edge	c_{min}	[mm]	40	45	45	45	50	50	65	70	75	80	80	1801)	2001)
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 d)	$c_{cr,N}$	[mm]	1,5 h_{ef}												

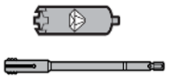


1) Additional Hilti Technical data
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) both given values for drill bit diameter can be used
b) $h_{ef,min} \le h_{ef} \le h_{ef,max}$ (h_{ef}: embedment depth)
c) h: base material thickness ($h \ge h_{min}$)
d) The critical edge distance for concrete cone failure depends on the embedment depth h_{ef} and the design bond resistance. The simplified formula given in this table is on the save side



Drilling and cleaning diameters

Rebar - size	Hammer drill (HD)	Hollow Drill Bit (HDB)	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

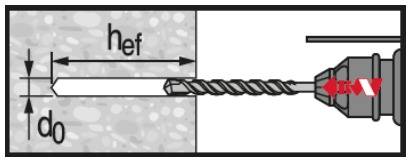
Setting instructions

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

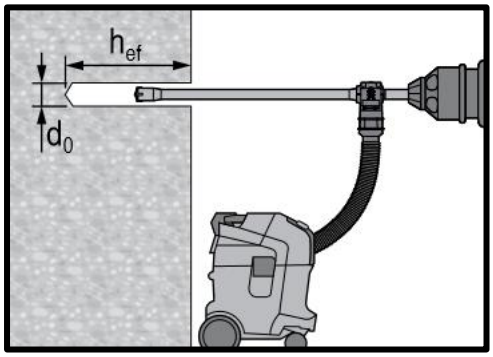


Safety regulations.

Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V3.

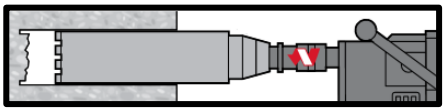


Hammer drilled hole

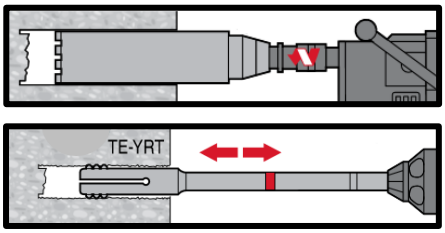


Hammer drilled hole with Hollow Drilled Bit (HDB)

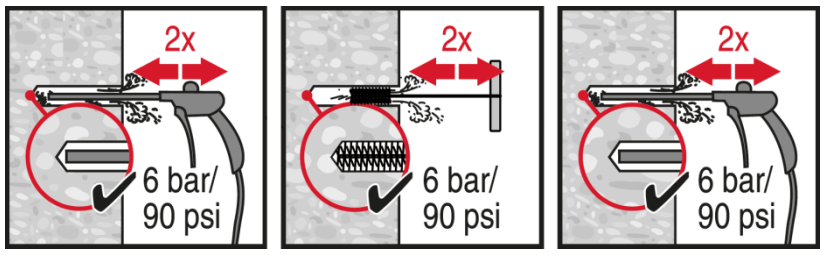
No cleaning required



Diamond Coring

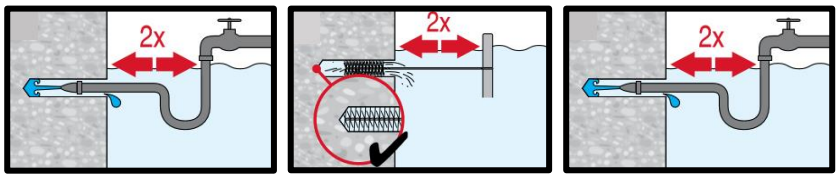


Diamond Coring + Roughening Tool



Hammer Drilling:

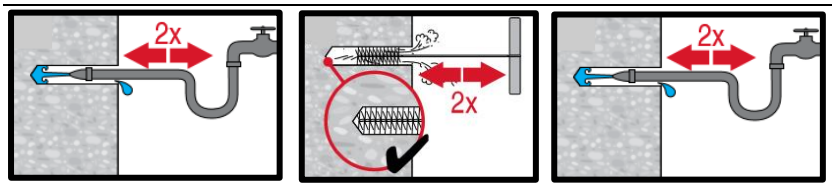
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths $h_0 \leq 20 \cdot d$.



Hammer drilling:

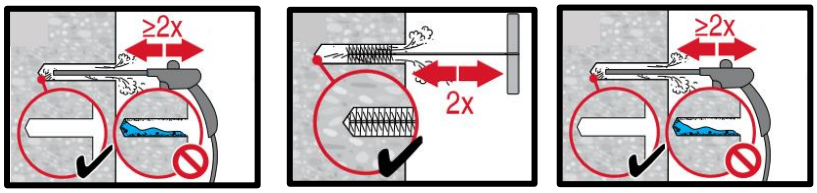
Cleaning for under water:

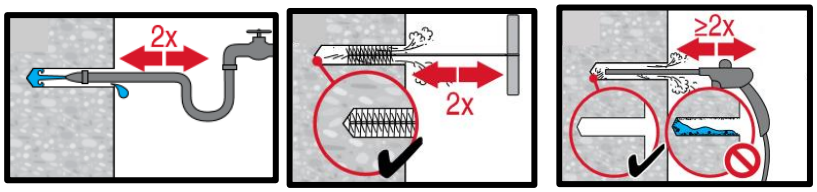
For all bore hole diameters d_0 and all bore hole depth h_0.



Hammer drilled flooded holes and diamond cored holes:

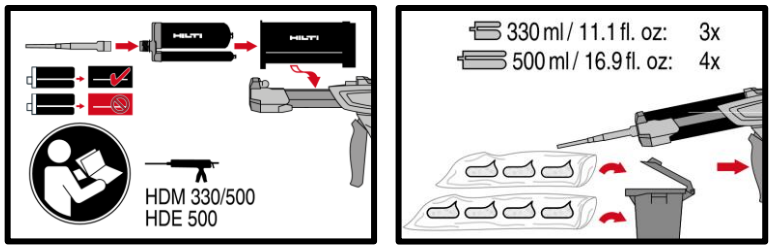
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .



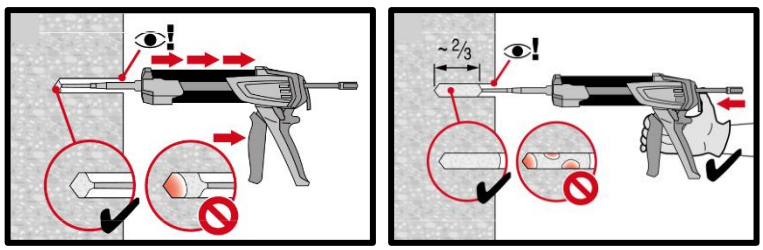


Diamond cored holes with Hilti roughening tool:

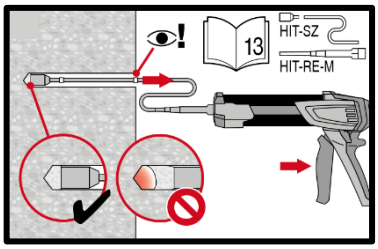
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .

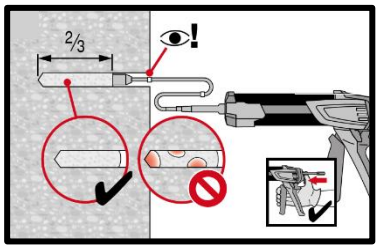


Injection system preparation.

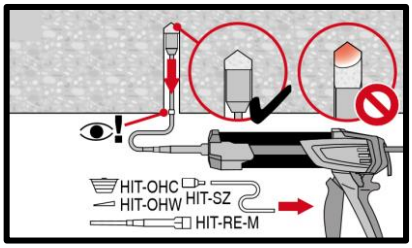


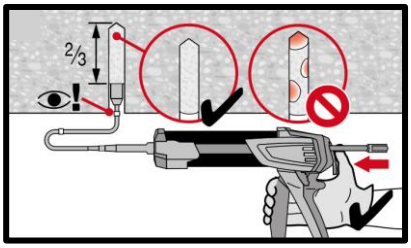
Injection method for drill hole depth $h_{ef} \leq 250$ mm.



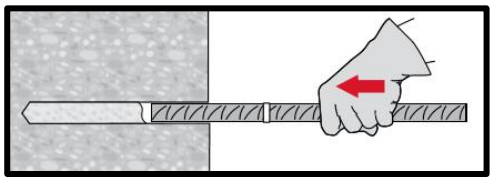


Injection method for drill hole depth h_{ef} > 250mm.

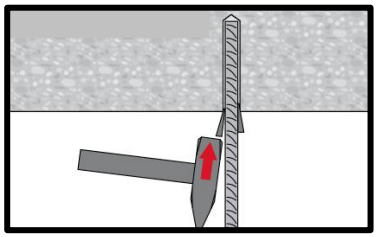




Injection method for overhead application.



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 V3 injection mortar

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

Injection mortar system



Foil pack: HIT-RE 500 V3

(available in 330, 500 and 1400 ml cartridges)



Rebar B500 B
(ϕ8 - ϕ40)

Benefits

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

Base material



Concrete (non-cracked)



Concrete (cracked)



Dry concrete



Wet concrete

Load conditions



Static/ quasi-static



Seismic, ETA-C1



Fire resistance

Installation conditions



Hammer drilling



Diamond coring



Hilti **SafeSet** technology

Other informations



European Technical Assessment



CE conformity



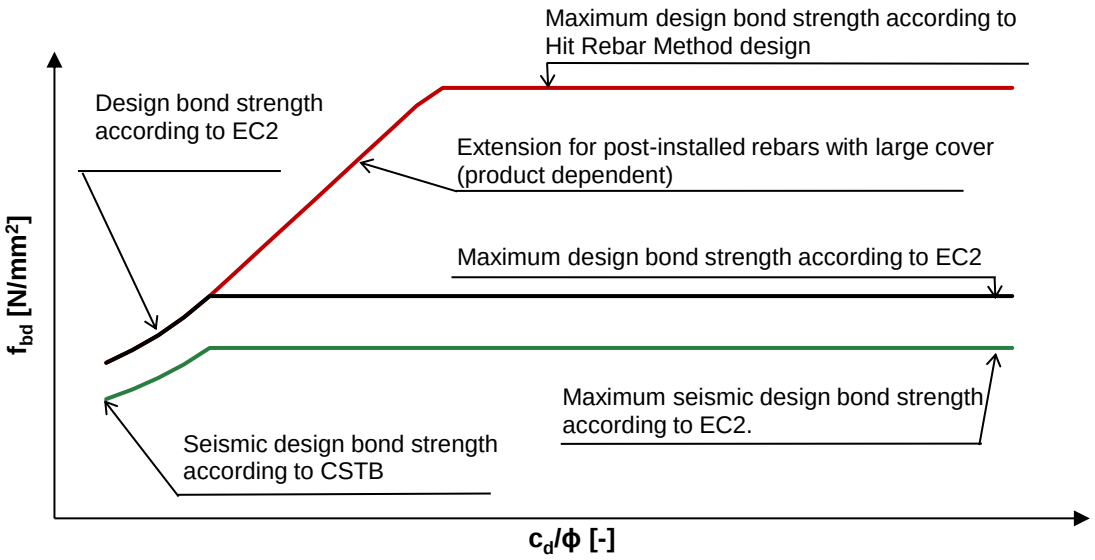
PROFIS Rebar design Software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [a)]	CSTB, Marne la Vallée	ETA-16/0142 / 2016-07-11
Fire evaluation	CSTB, Marne la Vallée	MRF 1526054277/B

b) All data given in this section according to ETA-16/0142 issue 2016-07-11.

Static and quasi-static loading



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

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

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

All allowed hammer drilling methods									
Rebar - size	**Concrete class**								
	C12/15	**C16/20**	**C20/25**	**C25/30**	**C30/37**	**C35/45**	**C40/50**	**C45/55**	**C50/60**
ϕ8 - ϕ40	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
Diamond coring wet									
ϕ8 - ϕ12	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,0
ϕ14 -ϕ 16	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7
ϕ20 - ϕ36	1,6	2,0	2,3	2,7	3,0	3,4	3,4	3,4	3,4
ϕ40	1,6	2,0	2,3	2,7	3,0	3,0	3,0	3,0	3,0

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

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

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

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

For poor bond conditions multiply values by 0,7.

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

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

Minimum anchorage length and minimum lap length

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

Amplification factor α_{lb} for the min. anchorage length and min. lap length

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

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

Hammer drilling									
Rebar-size	**Concrete class**	**f_{bd} [N/mm²]**	**$f_{bd,p}$ [N/mm²]**	**$l_{0,min}$ [1)] [mm]**	**$l_{b,min}$ [2)] [mm]**	**$l_{bd,y,\alpha2=1}$ [3)] [mm]**	**$l_{bd,y,\alpha2=0.7}$ [4)] [mm]**	**$l_{bd,y,HRM,\alpha2<0.7}$ [5)] [mm]**	**l_{max} [6)] [mm]**
ϕ8	C20/25	2,3	6,3	200	113	378	265	138	1000
	C50/60	4,3	6,9	200	100	202	142	126	1000
ϕ10	C20/25	2,3	9,3	213	142	473	331	142	1000
	C50/60	4,3	10,2	200	100	253	177	107	1000
ϕ12	C20/25	2,3	9,3	255	170	567	397	170	1200
	C50/60	4,3	10,2	200	120	303	212	128	1200
ϕ14	C20/25	2,3	9,3	298	198	662	463	198	1400
	C50/60	4,3	10,2	210	140	354	248	149	1400
ϕ16	C20/25	2,3	9,3	340	227	756	529	234	1600
	C50/60	4,3	10,2	240	160	404	283	171	1600
ϕ20	C20/25	2,3	9,3	435	284	945	662	356	2000
	C50/60	4,3	10,2	300	200	506	354	213	2000
ϕ25	C20/25	2,3	8,7	532	354	1181	827	539	2500
	C50/60	4,3	9,4	375	250	632	442	289	2500
ϕ28	C20/25	2,3	8,7	595	397	1323	926	663	2800
	C50/60	4,3	9,4	420	280	708	495	354	2800
ϕ30	C20/25	2,3	8,7	638	425	1418	992	751	3000
	C50/60	4,3	9,4	450	300	758	531	402	3000
ϕ32	C20/25	2,3	8,7	681	454	1512	1059	844	3200
	C50/60	4,3	9,4	480	320	809	566	451	3200
ϕ36	C20/25	2,3	5,5	766	510	1701	1191	1042	3200
	C50/60	4,3	6	540	360	910	637	652	3200
ϕ40	C20/25	2,3	5,5	851	567	1890	1323	1256	3200
	C50/60	4,3	5,8	600	400	1011	708	750	3200

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

Seismic loading

Seismic DTA 3/16-874 design

Design bond strength in N/mm² for good bond conditions

All allowed hammer drilling methods							
Rebar - size	Concrete class						
	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ10 - ϕ34	2,3	2,7	3,0	3,4	3,7	4,0	4,0
ϕ36	2,3	2,6	2,9	3,3	3,6	3,9	4,0
ϕ40	2,2	2,6	2,9	3,3	3,6	3,8	4,0

For poor bond conditions multiply the values 0,7.

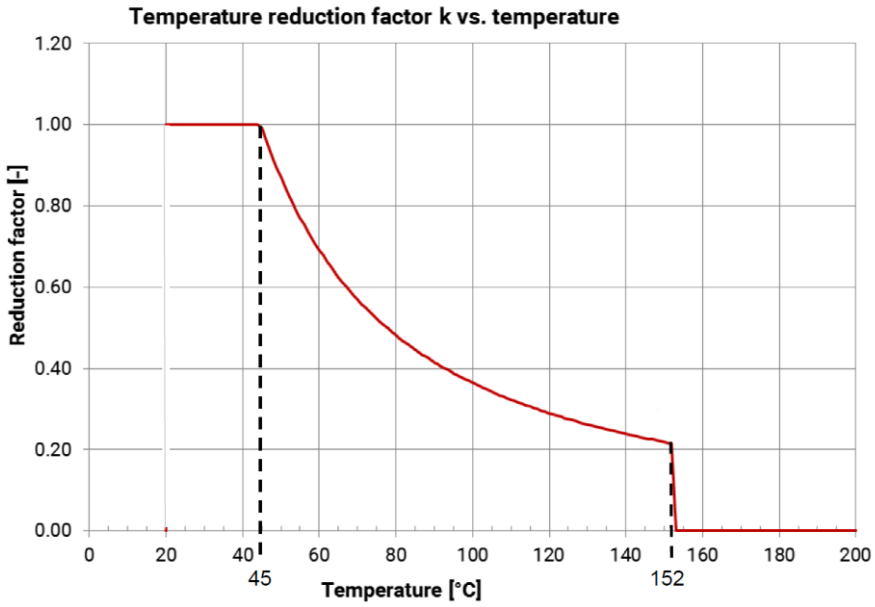
Anchorage length for characteristic steel strength f_{yk}=500 N/mm² for good conditions

Hammer drilling						
Rebar-size	Concrete class	f_{bd} [N/mm²]	$l_{0,min}$ [1)] [mm]	$l_{b,min}$ [2)] [mm]	$l_{bd,y,\alpha2=1}$ [3)] [mm]	$l_{bd,y,\alpha2=0.7}$ [4)] [mm]
ϕ10	C20/25	2,3	213	142	331	1000
	C50/60	4	200	100	190	1000
ϕ12	C20/25	2,3	255	170	397	1200
	C50/60	4	200	120	228	1200
ϕ14	C20/25	2,3	298	198	463	1400
	C50/60	4	210	140	266	1400
ϕ16	C20/25	2,3	340	227	529	1600
	C50/60	4	240	160	304	1600
ϕ20	C20/25	2,3	425	284	662	2000
	C50/60	4	300	200	380	2000
ϕ25	C20/25	2,3	532	354	827	2500
	C50/60	4	375	250	476	2500
ϕ28	C20/25	2,3	595	397	926	2800
	C50/60	4	420	280	533	2800
ϕ30	C20/25	2,3	638	425	992	3000
	C50/60	4	450	300	571	3000
ϕ32	C20/25	2,3	681	454	1059	3200
	C50/60	4	480	320	609	3200
ϕ36	C20/25	2,3	766	510	1191	3200
	C50/60	4	540	360	685	3200
ϕ40	C20/25	2,2	889	593	1383	3200
	C50/60	4	600	400	761	3200

1) Minimum anchorage length for overlap joint
2) Minimum anchorage length for simply supported connections
3) Anchorage length for simply supported connections in case of: α_1= α_2= α_3= α_4= α_5= 1. – (design for yielding)
4) Anchorage length for simply supported connections in case of: α_1= α_3= α_4= α_5= 1; α_2= 0.7 – (design for yielding)

Fire resistance

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



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

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

If θ < 45ºC $k_{fi}(\theta) = 1{,}0$

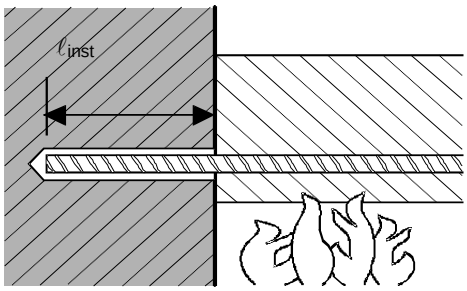
If θ > 152ºC $k_{fi}(\theta) = 0{,}0$

With:

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

According to MRF 1526054277 / B

a) Anchoring application



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

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

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

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

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

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

Rebar-size	Max. $F_{s,T}$ [kN]	l_{inst} [mm]	Fire resistance of bar in [kN]					
			R30	R60	R90	R120	R180	R240
ϕ8	16,8	100	4,9	1,8	0,8	0,4	0,0	0,0
		140	8,4	5,0	2,9	1,9	0,7	0,2
		180	11,9	8,5	6,2	4,5	2,3	1,3
		220	15,4	11,9	9,7	8,0	4,9	3,1
		240	*16,8*	13,7	11,4	9,7	6,6	4,3
		280		*16,8*	14,9	13,2	10,1	7,6
		310			*16,8*	15,8	12,7	10,2
		330				*16,8*	14,4	11,9
		360					*16,8*	14,5
		390						*16,8*
ϕ10	26,2	110	7,3	3,1	1,5	0,9	0,0	0,0
		150	11,6	7,3	4,5	3,0	1,3	0,6
		190	15,9	11,7	8,9	6,7	3,5	2,1
		230	20,3	16,0	13,2	11,0	7,2	4,6
		290	*26,2*	22,5	19,7	17,5	13,7	10,5
		330		*26,2*	24,0	21,9	18,0	14,9
		350			*26,2*	24,0	20,2	17,0
		370				*26,2*	22,3	19,2
		410					*26,2*	23,6
		440						*26,2*
ϕ12	37,7	140	12,6	7,5	4,3	2,8	1,1	0,3
		200	20,4	15,3	11,9	9,3	5,2	3,2
		260	28,2	23,1	19,7	17,1	12,5	8,8
		320	36,0	30,9	27,6	25,0	20,3	16,6
		340	*37,7*	33,5	30,2	27,6	22,9	19,2
		380		*37,7*	35,4	32,8	28,1	24,4
		400			*37,7*	35,4	30,7	27,0
		420				*37,7*	33,3	29,6
		460					*37,7*	34,8
		490						*37,7*
ϕ14	51,3	160	17,8	11,8	7,9	5,2	2,5	1,2
		220	26,9	20,9	17,0	13,9	8,5	5,5
		280	36,0	30,0	26,1	23,0	17,6	13,2
		340	45,1	39,1	35,2	32,1	26,7	22,4
		390	*51,3*	46,7	42,8	39,7	34,3	29,9
		430		*51,3*	48,8	45,8	40,4	36,0
		450			*51,3*	48,8	43,4	39,0
		470				*51,3*	46,4	42,1
		510					*51,3*	48,1
		540						*51,3*
ϕ16	67	180	23,8	16,9	12,5	9,0	4,6	2,7
		240	34,2	27,3	22,9	19,4	13,2	8,7
		300	44,6	37,7	33,3	29,8	23,6	18,6
		360	55,0	48,2	43,7	40,2	34,0	29,0
		430	*67,0*	60,3	55,8	52,3	46,1	41,2
		470		*67,0*	62,7	59,3	53,1	48,1
		500			*67,0*	64,5	58,3	53,3
		520				*67,0*	61,7	56,8
		560					*67,0*	63,7
		580						*67,0*
ϕ20	104,7	220	38,4	29,8	24,2	19,9	12,2	7,8
		300	55,7	47,2	41,6	37,3	29,5	23,3
		380	73,1	64,5	58,9	54,6	46,8	40,6
		460	90,4	81,9	76,3	71,9	64,2	57,9
		530	*104,7*	97,0	91,4	87,1	79,3	73,1
		570		*104,7*	100,1	95,8	88,0	81,8
		600			*104,7*	102,3	94,5	88,3
		620				*104,7*	98,9	92,6

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

b) Overlap joint application

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

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

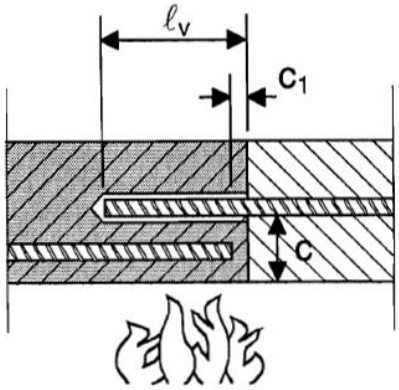
$F_{s,T} \leq (\ell_{inst} - c_f) \cdot \phi \cdot \pi \cdot f_{bd,FIRE}$ where: $(\ell_{inst} - c_f) \geq \ell_s$;

ℓ_s = lap length

ϕ = nominal diameter of bar

$\ell_{inst} - c_f$ = selected overlap joint length; this must be at least ℓ_s, but may not be assumed to be more than 80 ϕ

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



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

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

Materials

Properties of reinforcement

Designation	Material
Reinforcing bars (rebars)	
Rebar EN 1992-1-1	Bars and de-coiled rods class B or C with f_{yk} and k according to NDP or NCL of EN 1992-1-1 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Fitness for use

Some creep tests have been conducted in accordance with ETAG guideline 001 part 5 and TR 023 in the following conditions: **in dry environment at 50 °C during 90 days**.
These tests show an excellent behaviour of the post-installed connection made with HIT-RE 500 V3: low displacements with long term stability, failure load after exposure above reference load.

Resistance to chemical substances

Chemicals tested	Content (%)	Resistance	Chemical tested	Content (%)	Resistance
Toluene	47,5	+	Sodium hydroxide 20%	100	-
Iso-octane	30,4	+	Triethanolamine	50	-
Heptane	17,1	+	Butylamine	50	-
Methanol	3	+	Benzyl alcohol	100	-
Butanol	2	+	Ethanol	100	-
Toluene	60	+	Ethyl acetate	100	-
Xylene	30	+	Methyl ethyl ketone (MEK)	100	-
Methylnaphthalene	10	+	Trichlorethylene	100	-
Diesel	100	+	Lutensit TC KLC 50	3	+
Petrol	100	+	Marlophen NP 9,5	2	+
Methanol	100	-	Water	95	+
Dichloromethane	100	-	Tetrahydrofurane	100	-
Mono-chlorobenzene	100	o	Demineralized water	100	+
Ethylacetat	50	-	Salt water	saturated	+
Methylisobutylketone	50	-	Salt spray testing	-	+
Salicylic acid-	50	+	SO_2	-	+
Acetophenon	50	+	Enviroment/wheather	-	+
Acetic acid	50	-	Oil for formwork (forming oil)	100	+
Propionic acid	50	-	Concentrate plasticizer	-	+
Sulfuric acid	100	-	Concrete potash solution	-	+
Nitric acid	100	-	Concrete potash solution	-	+
Hydrochloric acid	36	-	Saturated suspension of borehole cuttings	-	+
Potassium hydroxide	100	-			

+ Resistant
- Not resistant
o Partially Resistant

Electrical Conductivity

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

Installation temperature range

-5°C to +40°C

Service temperature range
Hilti HIT-RE 500 V3 injection mortar may be applied in the temperature ranges given below. An elevated base material temperature may lead to a reduction of the design bond resistance.

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

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

Working time and curing time [1)]

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

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

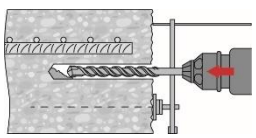
Setting information

Installation equipment

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

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

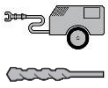
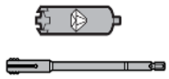
Minimum concrete cover c_{min} of the post-installed rebar

Drilling method	Bar diameter [mm]	Minimum concrete cover c_{min} [mm]		
		Without drilling aid	With drilling aid	
Hammer drilling **(HD)** and **(HDB)**	**ϕ < 25**	30 + 0,06 · 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	
Diamond coring in wet **(PCC)** dry **(DD)**	**ϕ < 25**	Drill stand works like a drilling aid	30 + 0,02 · l_v ≥ 2 · ϕ	
	ϕ ≥ 25		40 + 0,02 · l_v ≥ 2 · ϕ	
Diamond coring with Roughening too	**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	

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

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

Drilling diameters

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

c) Each of two given values can be used.
d) No cleaning required

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

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

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

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

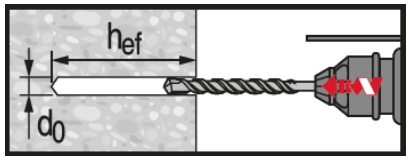
Setting instructions

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

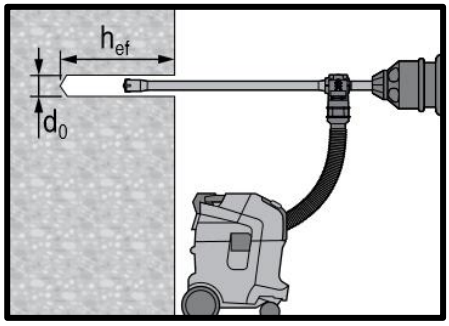


Safety regulations.

Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V3.

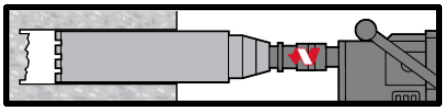


Hammer drilled hole (HD)

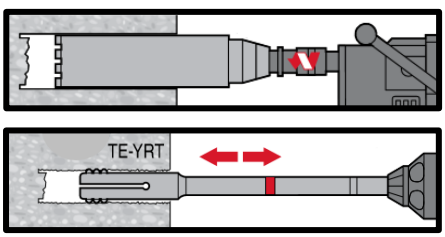


Hammer drilled hole with Hollow Drilled Bit (HDB)

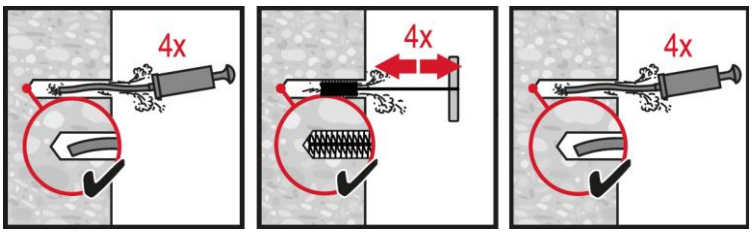
No cleaning required



Diamond Drilling (DD)

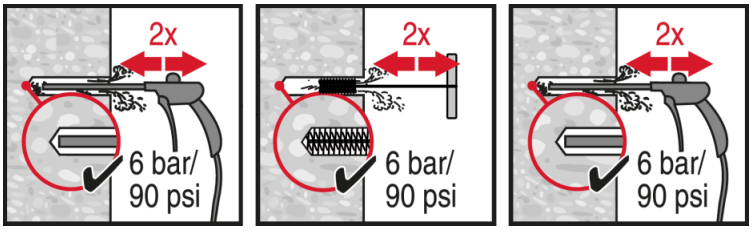


Diamond Drilling + Roughening Tool (DD+RT)



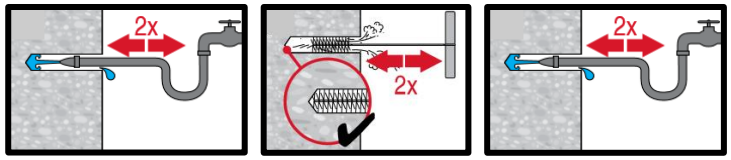
Hammer Drilling:

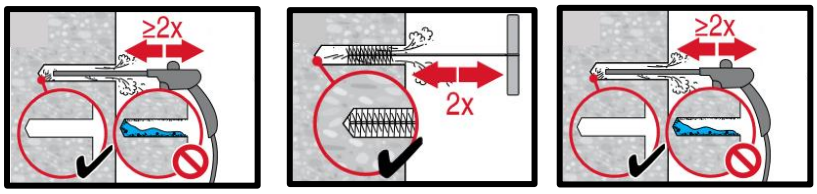
Manual cleaning (MC)
for drill diameters $d_0 \leq 20$ mm and drill hole depth $h_0 \leq 10 \cdot d$.



Hammer Drilling:

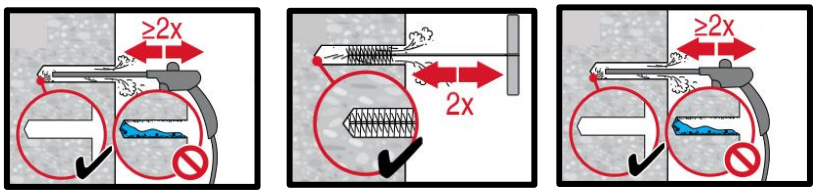
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths $h_0 \leq 20 \cdot d$.





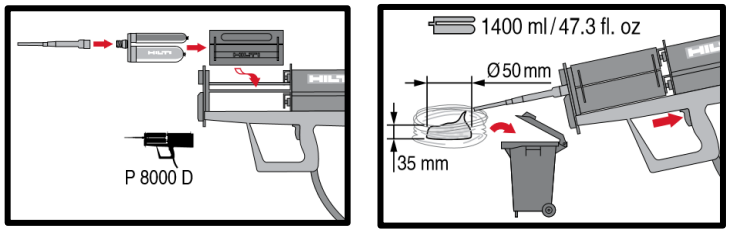
Diamond cored holes:

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

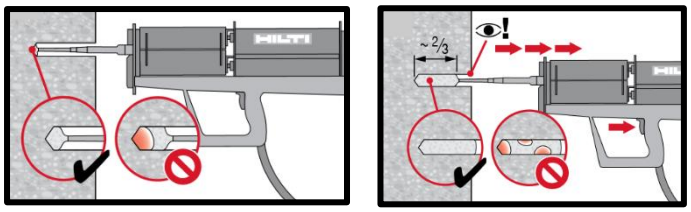


Diamond cored holes with Hilti roughening tool:

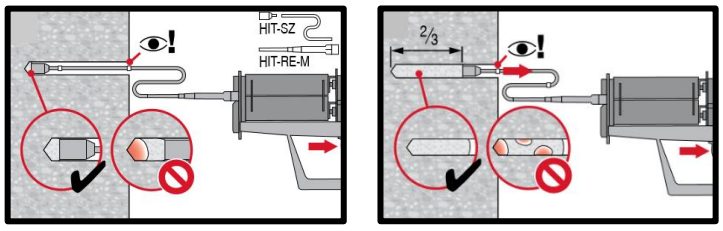
Compressed air cleaning (CAC)
for all drill hole diameters d_0 and drill hole depths h_0 .



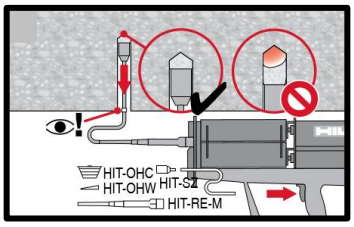
Injection system preparation.

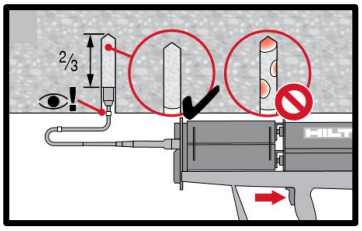


Injection method for drill hole depth $h_{ef} \leq 250$ mm.

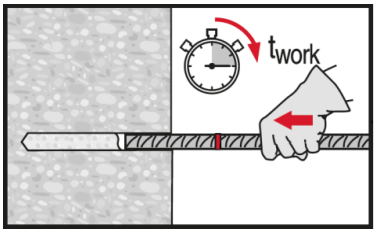


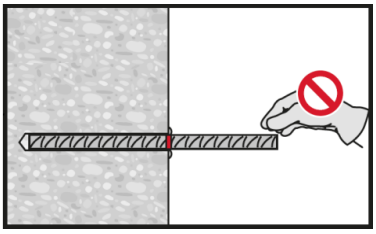
Injection method for drill hole depth $h_{ef} > 250$mm.



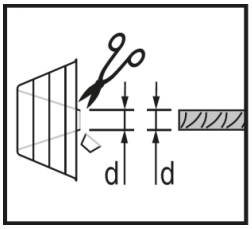


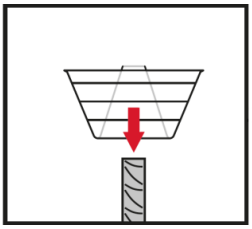
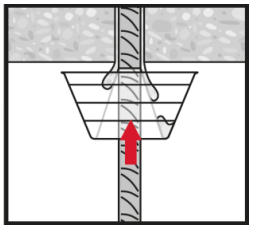
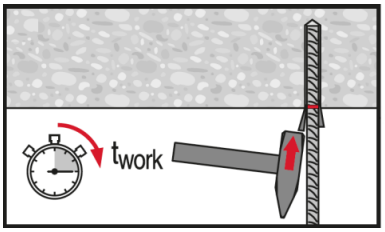
Injection method for overhead application.

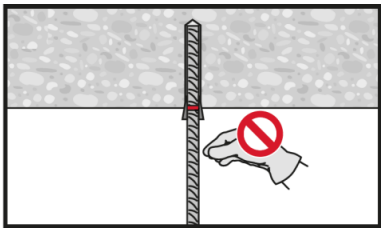




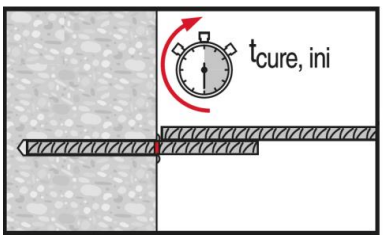
Setting element, observe working time "t_{work}".

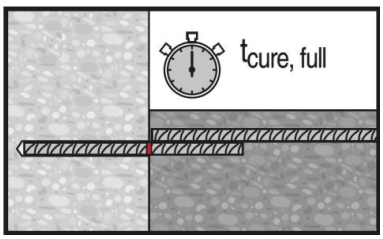




Setting element for overhead applications, observe working time "t_{work}".





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