



HIT-RE 500 V3 INJECTION MORTAR

Technical Datasheet

Update: Mar-18





HIT-RE 500 V3 injection mortar

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

Injection mortar system

Benefits



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)



- **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 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

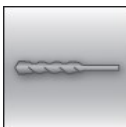
Installation conditions



Concrete
(non-cracked)



Concrete
(cracked)



Hammer
drilled holes



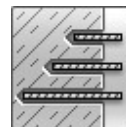
Diamond
drilled
holes

SAFE-ET

Hilti **SafeSet**
technology



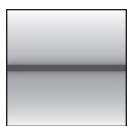
Small edge
distance and
spacing



Variable
embedment
depth

Load conditions

Other information



Static/
quasi-static



Seismic,
ETA-C1, C2



Fire
resistance



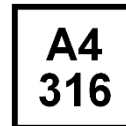
European
Technical
Assessment



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
Shockproof fastenings in civil defence installations	Federal Office for Civil Protection, Bern	BZS D 16-601/ 2016-08-31
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, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Temperature range I
(min. base material temperature -40°C , max. long/short term base material temperature: $+24^\circ\text{C}/40^\circ\text{C}$)

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 bit¹⁾ and diamond cored with roughening tool²⁾:

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	18,9	30,5	44,1	83,0	129,2	185,9	241,5	295,1	348,4	401,9
	HIS-N 8.8	26,3	48,3	70,4	131,3	121,8	-	-	-	-	-
Shear $V_{Ru,m}$	HIT-V 5.8	9,5	15,8	22,1	41,0	64,1	92,4	120,8	147,0	182,7	214,2
	HIS-N 8.8	13,7	24,2	35,7	66,2	60,9	-	-	-	-	-
Cracked concrete											
Tension $N_{Ru,m}$	HIT-V 5.8	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	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	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 [kN]	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	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 [kN]	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	13,1	21,2	33,2	50,3	79,8	109,6	133,9	159,7	-	-	-
	HIT-V 8.8, AM 8.8 [kN]	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	9,0	15,0	21,0	39,0	61,0	88,0	115,0	140,0	-	-	-
	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	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	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 [kN]	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	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 [kN]	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	8,7	14,1	22,1	33,5	53,2	73,0	89,2	106,5	-	-	-
	HIT-V 8.8, AM 8.8 [kN]	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	7,2	12,0	16,8	31,2	48,8	70,4	92,0	112,0	-	-	-
	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	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 $\gamma=1,4$. 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	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	8,6	13,5	19,7	24,0	38,1	52,3	63,9	76,2
Shear V_{Rec} HIT-V 5.8	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 $\gamma=1,4$. 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, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Temperature range I
(min. base material temperature -40°C , max. long/short term base material temperature: $+24^\circ\text{C}/40^\circ\text{C}$)
- $\alpha_{gap}=1,0$ (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	-	-
	HIT-V 8.8, AM 8.8	-	-	-	46,0	77,0	103,0	-	-
Shear V_{Rk}	HIT-V-F 8.8 AM-HDG 8.8 [kN]	-	-	-	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	-	-
	HIT-V 8.8, AM 8.8	-	-	-	36,8	61,6	82,4	-	-
Shear V_{Rd}	HIT-V-F 8.8 AM-HDG 8.8 [kN]	-	-	-	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)	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) [N/mm ²]	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)	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) [N/mm ²]	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 [mm ²]	36,6	58,0	84,3	157	245	353	459	561	694	817	976
Moment of resistance W	HIT-V AM 8.8 [mm ³]	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	490	490	460	460	460
	Screw 8.8 [N/mm ²]	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	410	410	375	375	375
	Screw 8.8 [N/mm ²]	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 [mm ²]	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 [mm ³]	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 $\geq 5\mu\text{m}$; (F) hot dip galvanized $\geq 45\mu\text{m}$
Threaded rod, HIT-V 8.8 (F)	Strength class 8.8; Elongation at fracture A5 > 12% ductile Electroplated zinc coated $\geq 5\mu\text{m}$; (F) hot dip galvanized $\geq 45\mu\text{m}$
Hilti Meter rod, AM 8.8 (HDG)	Strength class 8.8; Elongation at fracture A5 > 12% ductile Electroplated zinc coated $\geq 5\mu\text{m}$ (HDG) hot dip galvanized $\geq 45\mu\text{m}$
Washer	Electroplated zinc coated $\geq 5\mu\text{m}$, hot dip galvanized $\geq 45\mu\text{m}$
Nut	Strength class of nut adapted to strength class of threaded rod. Electroplated zinc coated $\geq 5\mu\text{m}$, hot dip galvanized $\geq 45\mu\text{m}$
Stainless Steel	
Threaded rod, HIT-V-R	Strength class 70 for $\leq \text{M}24$ and strength class 50 for $> \text{M}24$; 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 $\leq \text{M}20$ and class 70 for $> \text{M}20$, 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.

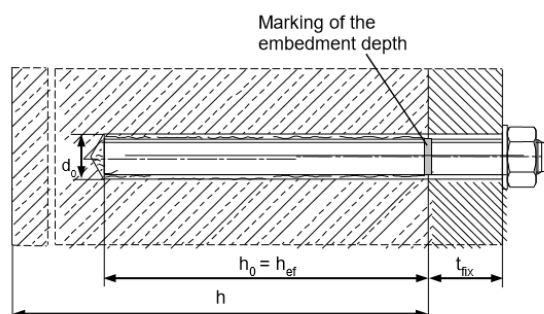
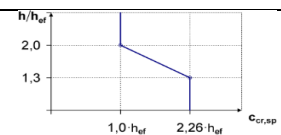
Working time and curing time

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	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.

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

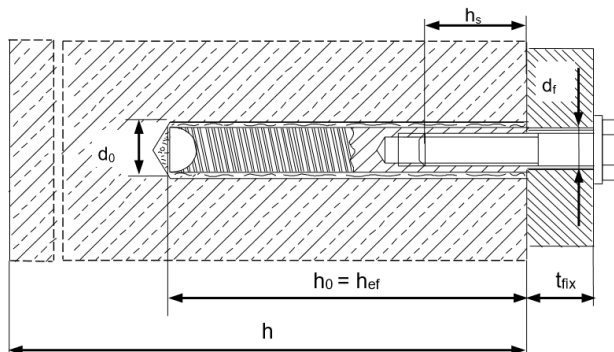
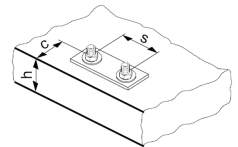
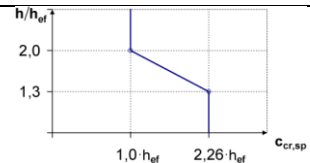
Anchor size			M8	M10	M12	M16	M20
Nominal diameter of drill	d_0	[mm]	14	18	22	28	32
Diameter of element	d	[mm]	12,5	16,5	20,5	25,4	27,6
Effective anchorage and drill hole depth	h_{ef}	[mm]	90	110	125	170	205
Minimum base material thickness	h_{min}	[mm]	120	150	170	230	270
Diameter of clearance hole in 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} ($t_{\text{roughen}} [\text{sec}] = h_{\text{ef}} [\text{mm}] / 10$)

$h_{\text{ef}} [\text{mm}]$	$t_{\text{roughen}} [\text{sec}]$
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

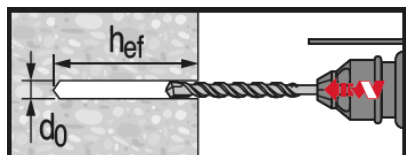
*For detailed information on installation see instruction for use given with the package of the product.



Safety regulations.

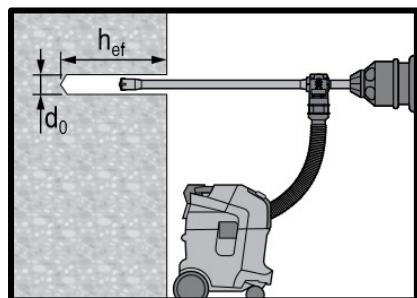
Review the Material Safety Data Sheet (MSDS) before use for proper and safe handling! Wear well-fitting protective goggles and protective gloves when working with Hilti HIT-RE 500 V3.

Drilling



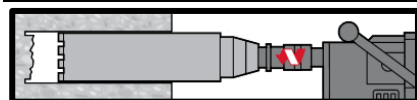
Hammer drilled hole

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



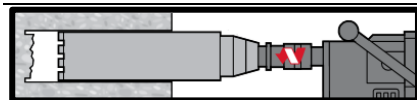
Hammer drilled hole with Hollow Drilled Bit (HDB)

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



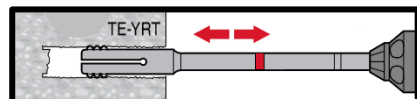
Diamond Coring

For dry and wet concrete, only.

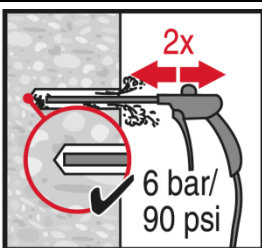
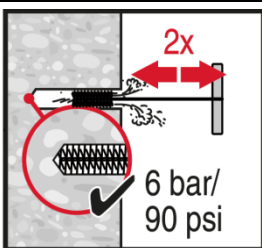
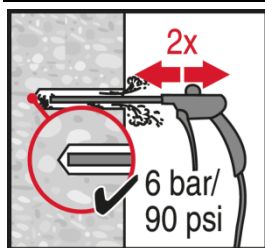


Diamond Coring + Roughening Tool

For dry and wet concrete only.
Before roughening, the borehole needs to be dry.



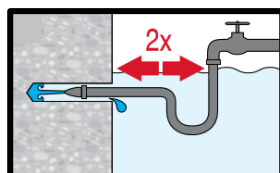
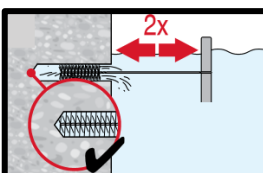
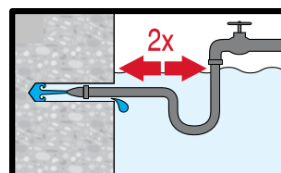
Cleaning (Inadequate hole cleaning=poor load values.)



Hammer Drilling:

Compressed air cleaning (CAC)

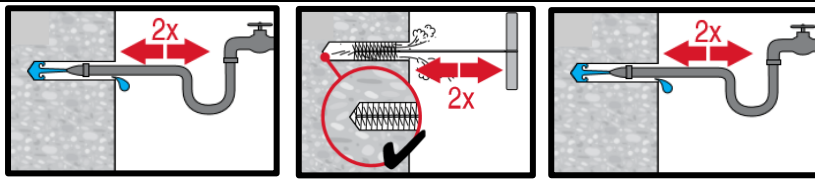
For all drill hole diameters d_0 and all drill hole depths h_0 .



Hammer drilling:

Cleaning for under water:

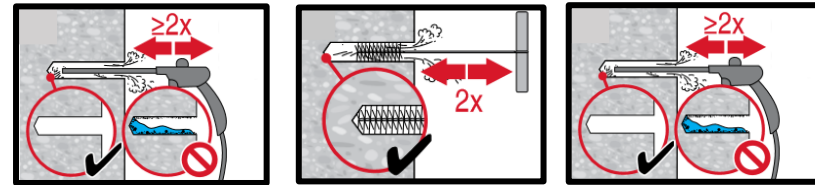
For all bore hole diameters d_0 and all bore hole depth h_0 .



Hammer drilled flooded holes and diamond cored holes:

Compressed air cleaning (CAC)

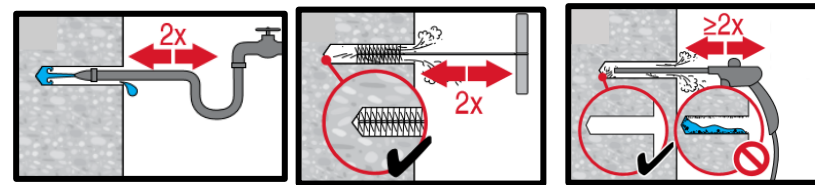
for all drill hole diameters d_0 and drill hole depths h_0 .



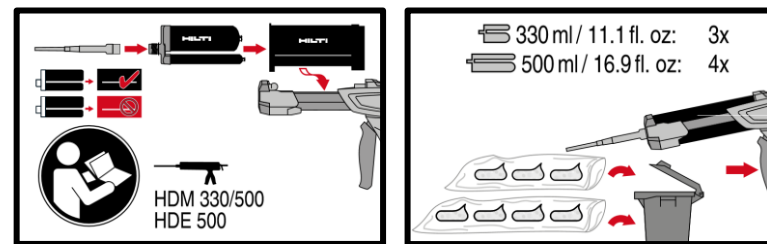
Diamond cored holes with Hilti roughening tool:

Compressed air cleaning (CAC)

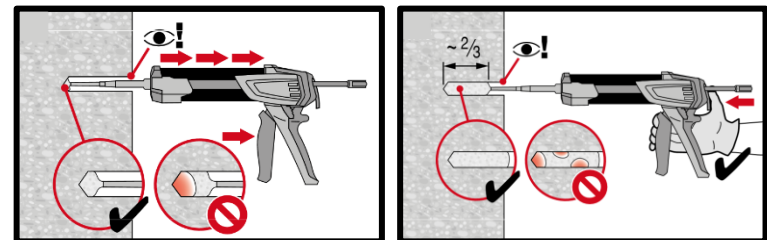
for all drill hole diameters d_0 and drill hole depths h_0 .



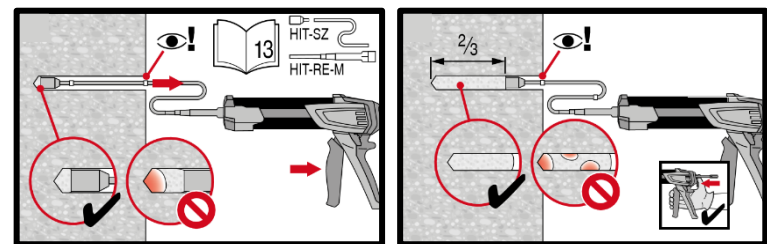
Injection preparation



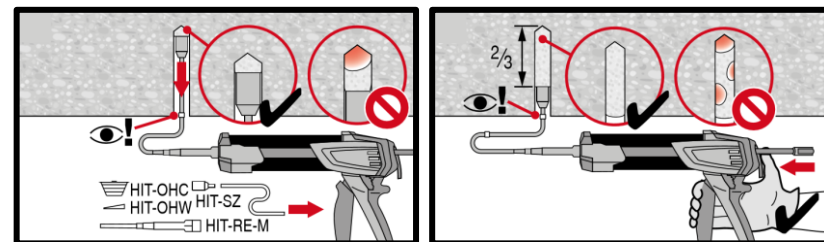
Injection system preparation.



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

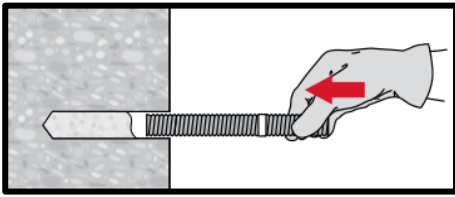


Injection method for drill hole depth
 $h_{ef} > 250 \text{ mm}$.

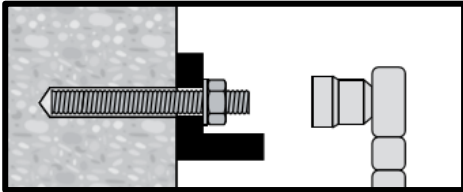


Injection method for overhead
application.

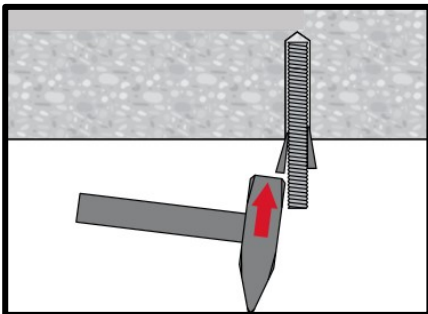
Setting the element



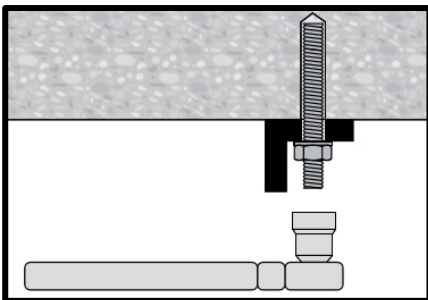
Setting element, observe working time " t_{work} ",



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
($\phi 8$ - $\phi 40$)

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

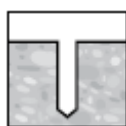
Base material



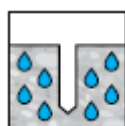
Concrete
(non-
cracked)



Concrete
(cracked)



Dry concrete



Wet
concrete



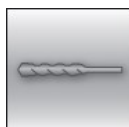
Static/
quasi-static



Seismic,
ETA-C1

Hilti Technical Data-C2

Installation conditions



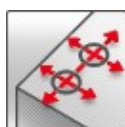
Hammer
drilling



Diamond
coring

SAFE-ET

Hilti **SafeSet**
technology



Small edge
distance and
spacing



European
Technical
Assessment



CE
conformity



PROFIS
Rebar design
Software

Other informations

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, $f_{ck, cube} = 25 \text{ N/mm}^2$
- Temperature range I (min. base material temp. -40°C , max. long term/short term base material temp.: $+24^\circ\text{C}/40^\circ\text{C}$)

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

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
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 bit¹⁾ and diamond cored with roughening tool²⁾:

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
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

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_{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		-	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		-	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 loads³⁾

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		-	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		-	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		-	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		-	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 $\gamma=1,4$. 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, $f_{ck,cube} = 25 \text{ N/mm}^2$
- Rebar B450C
- Temperature range I
(min. base material temperature -40°C , max. long term/short term base material temperature: $+24^\circ\text{C}/40^\circ\text{C}$)
- Installation temperature range -5°C to $+40^\circ\text{C}$
- $\alpha_{gap} = 1,0$

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 C2¹⁾

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

1) Hilti technical data.

Design resistance in case of seismic performance category C2¹⁾

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

1) Hilti technical data.



For hammer drilled holes, hollow drill bit²⁾ and diamond cored with roughening tool³⁾:

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 $N_{Rk, se}$ B500B [kN]	-	22,6	35,3	42,8	42,8	67,8	93,1	135,8	151,1	159,0	-	-
Shear $V_{Rk, se}$ 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 in case of seismic performance category C1

Anchor- size	φ8	φ10	φ12	φ14	φ16	φ20	φ25	φ28	φ30	φ32	φ36	φ40
Tensile $N_{Rd, se}$ B500B [kN]	-	15,1	23,5	28,5	28,5	45,2	62,1	90,5	100,7	106,0	-	-
Shear $V_{Rd, se}$ B500B [kN]	-	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}	550	550	550	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	500	500	500	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	50,3	78,5	113,1	153,9	201,1	314,2	490,9	615,8	706,9	804,2	1018	1257
Moment of resistance W	50,3	98,2	169,6	269,4	402,1	785,4	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 $f_{tk} = f_{tk} = k \cdot f_{yk}$

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 $t_{cure}^{1)}$
$-5\text{ °C} \leq T_{BM} < -1\text{ °C}$	2 h	168 h
$0\text{ °C} \leq T_{BM} < 4\text{ °C}$	2 h	48 h
$5\text{ °C} \leq T_{BM} < 9\text{ °C}$	2 h	24 h
$10\text{ °C} \leq T_{BM} < 14\text{ °C}$	1,5 h	16 h
$15\text{ °C} \leq T_{BM} < 19\text{ °C}$	1 h	12 h
$20\text{ °C} \leq T_{BM} < 24\text{ °C}$	30 min	7 h
$25\text{ °C} \leq T_{BM} < 29\text{ °C}$	20 min	6 h
$30\text{ °C} \leq T_{BM} < 34\text{ °C}$	15 min	5 h
$35\text{ °C} \leq T_{BM} < 39\text{ °C}$	12 min	4,5 h
$T_{BM} = 40\text{ °C}$	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

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} ($t_{\text{roughen}} [\text{sec}] = h_{\text{ef}} [\text{mm}] / 10$)

$h_{\text{ef}} [\text{mm}]$	$t_{\text{roughen}} [\text{sec}]$
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 14 ^{a)}	14 ^{a)}	16 ^{a)}	18	20	25	30 32 ^{a)}	35	37	40	45 ¹⁾	55 ¹⁾	
Effective anchorage and drill hole depth	h _{ef,min}	[mm]	60	60	70	70	75	80	90	100	112	120	128	144 ¹⁾	160 ¹⁾	
	h _{ef,max}	[mm]	160	200	240	240	280	320	400	500	560	600	640	720 ¹⁾	800 ¹⁾	
Minimum base material thickness	h _{min}	[mm]	h _{ef} +30mm ≥ 100 mm				h _{ef} + 2 d ₀									
Minimum spacing	s _{min}	[mm]	40	50	60	60	70	80	100	125	140	150	160	180 ¹⁾	200 ¹⁾	
Minimum edge	c _{min}	[mm]	40	45	45	45	50	50	65	70	75	80	80	180 ¹⁾	200 ¹⁾	
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													h/h_{ef} 2,0 1,3 1,0 · h_{ef}2,26 · h_{ef} c_{cr,sp}
			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

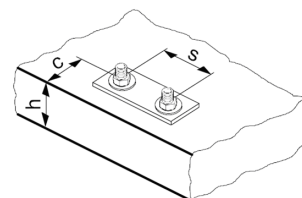
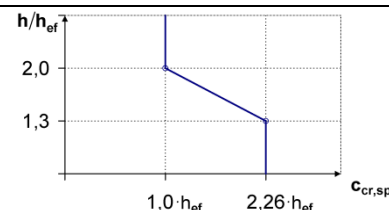
For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.

a) both given values for drill bit diameter can be used

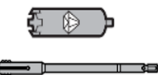
b) $h_{\text{ef,min}} \leq h_{\text{ef}} \leq h_{\text{ef,max}}$ (h_{ef} : embedment depth)

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

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 same 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

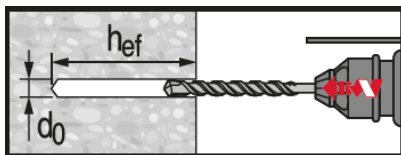
Setting instructions

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

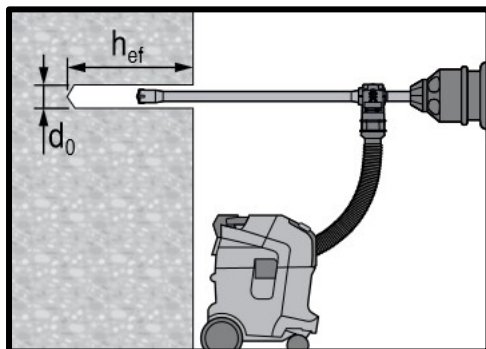


Safety regulations.

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.

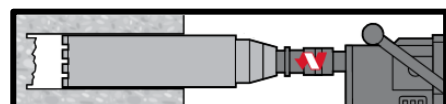


Hammer drilled hole

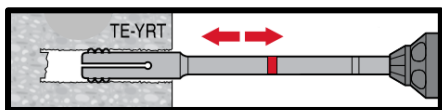
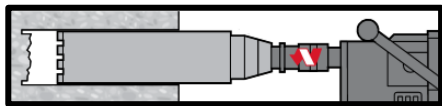


Hammer drilled hole with Hollow Drilled Bit (HDB)

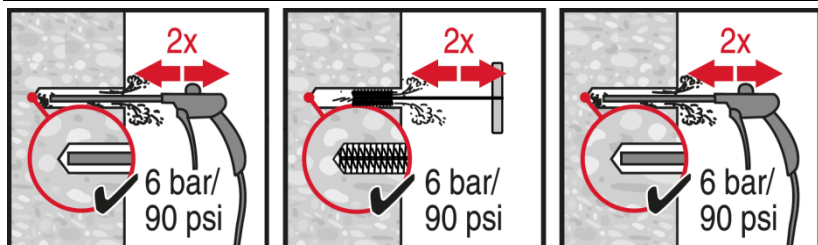
No cleaning required



Diamond Coring



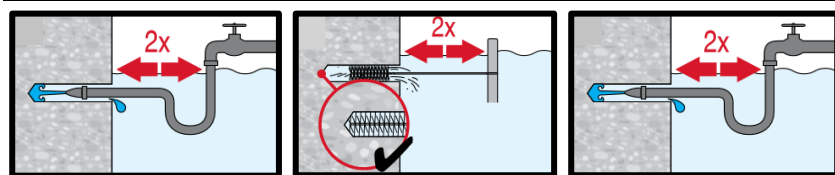
Diamond Coring + Roughening Tool



Hammer Drilling:

Compressed air cleaning (CAC)

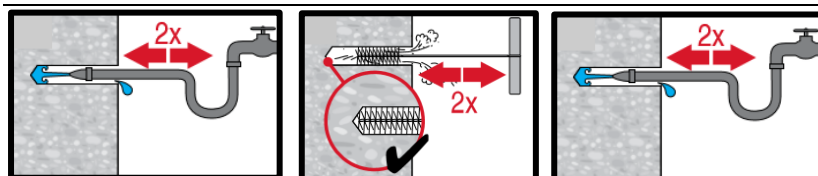
for all drill hole diameters d_0 and drill hole depths $h_0 \leq 20 \cdot d$.



Hammer drilling:

Cleaning for under water:

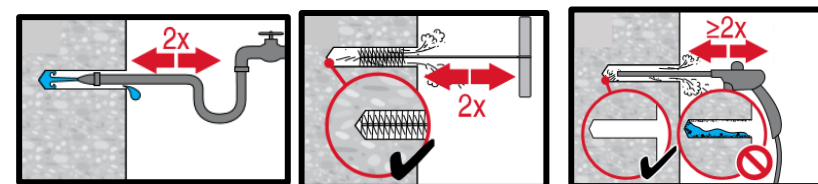
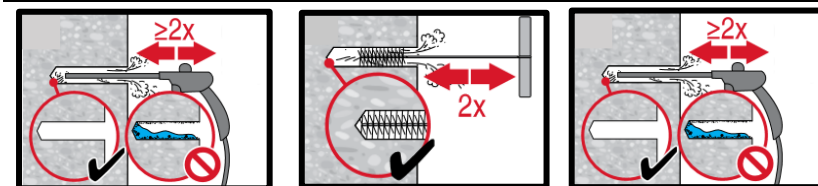
For all bore hole diameters d_0 and all bore hole depth h_0 .



Hammer drilled flooded holes and diamond cored holes:

Compressed air cleaning (CAC)

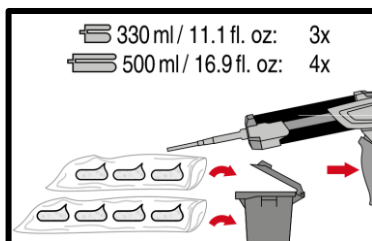
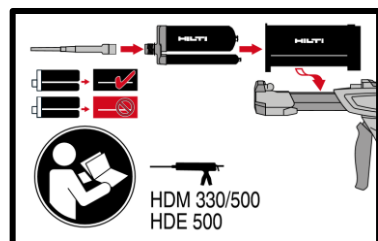
for all drill hole diameters d_0 and drill hole depths h_0 .



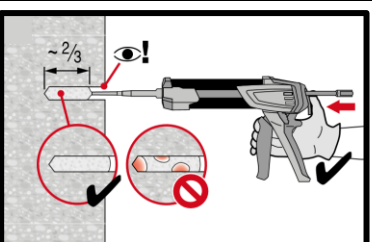
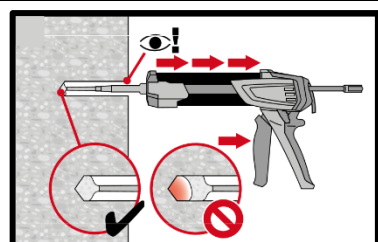
Diamond cored holes with Hilti roughening tool:

Compressed air cleaning (CAC)

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

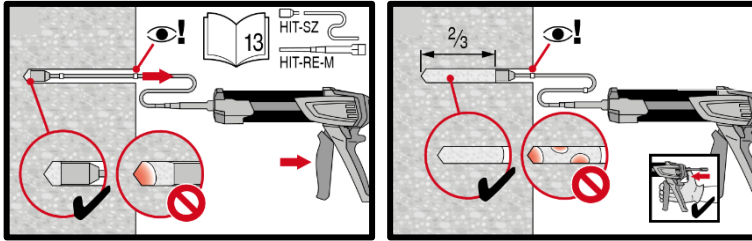


Injection system preparation.

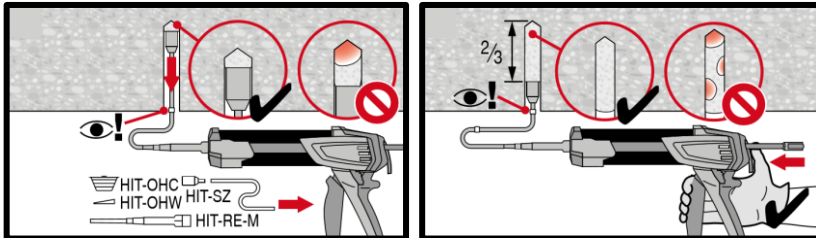


Injection method for drill hole depth

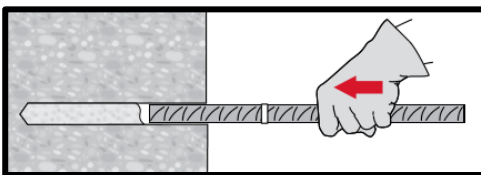
$h_{ef} \leq 250 \text{ mm}$.



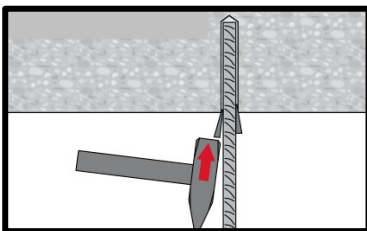
Injection method for drill hole depth $h_{ef} > 250\text{mm}$.



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
($\phi 8$ - $\phi 40$)

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

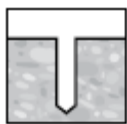
Base material



Concrete
(non-
cracked)



Concrete
(cracked)



Dry concrete



Wet concrete

Load conditions



Static/
quasi-static

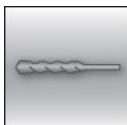


Seismic,
ETA-C1



Fire
resistance

Installation conditions



Hammer
drilling



Diamond
coring

SAFE-SET

Hilti **SafeSet**
technology

Other informations



European
Technical
Assessment



CE
conformity



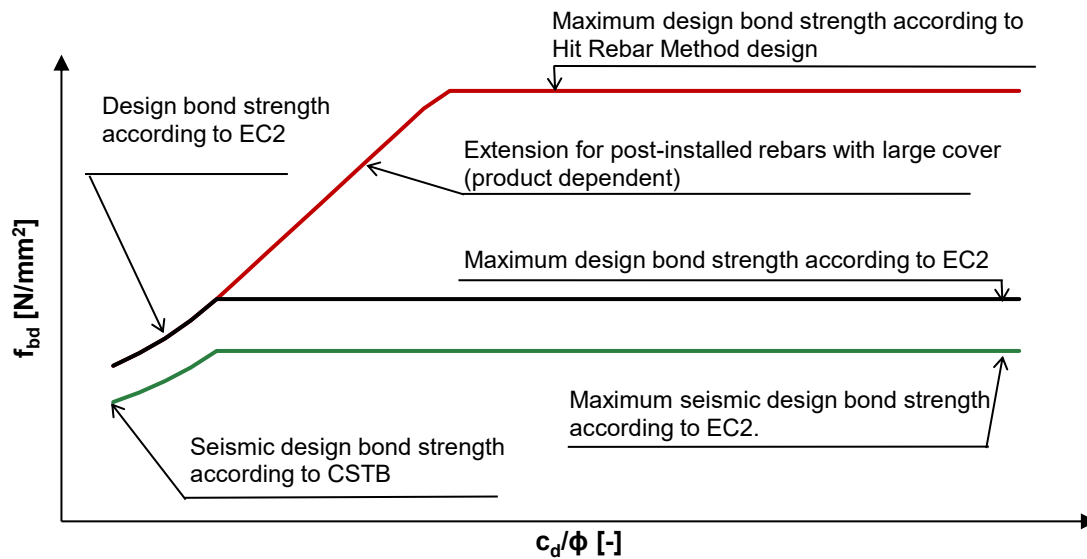
PROFIS
Rebar
design
Software

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

Non-cracked concrete C20/25, all allowed drilling methods													
Temperature range	Drilling method	Rebar - size											
		φ8	φ10	φ12	φ14	φ16	φ20	φ25	φ28	φ30	φ32	φ36	φ40
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	C 30/37	1,04											
Hammer drilled holes with hollow drill bit	C40/50	1,07											
Diamond cored holes	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 $f_{yk}=500 \text{ N/mm}^2$ for good conditions

Hammer drilling									
Rebar-size	Concrete class	f_{bd}	$f_{bd,p}$	$\ell_{0,min}^{1)}$	$\ell_{b,min}^{2)}$	$\ell_{bd,y,\alpha_2=1}^{3)}$	$\ell_{bd,y,\alpha_2=0.7}^{4)}$	$\ell_{bd,y,HRM,\alpha_2<0.7}^{5)}$	$\ell_{max}^{6)}$
		[N/mm ²]	[N/mm ²]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
$\phi 8$	C20/25	2,3	6,3	200	113	378	265	138	1000
	C50/60	4,3	6,9	200	100	202	142	126	1000
$\phi 10$	C20/25	2,3	9,3	213	142	473	331	142	1000
	C50/60	4,3	10,2	200	100	253	177	107	1000
$\phi 12$	C20/25	2,3	9,3	255	170	567	397	170	1200
	C50/60	4,3	10,2	200	120	303	212	128	1200
$\phi 14$	C20/25	2,3	9,3	298	198	662	463	198	1400
	C50/60	4,3	10,2	210	140	354	248	149	1400
$\phi 16$	C20/25	2,3	9,3	340	227	756	529	234	1600
	C50/60	4,3	10,2	240	160	404	283	171	1600
$\phi 20$	C20/25	2,3	9,3	435	284	945	662	356	2000
	C50/60	4,3	10,2	300	200	506	354	213	2000
$\phi 25$	C20/25	2,3	8,7	532	354	1181	827	539	2500
	C50/60	4,3	9,4	375	250	632	442	289	2500
$\phi 28$	C20/25	2,3	8,7	595	397	1323	926	663	2800
	C50/60	4,3	9,4	420	280	708	495	354	2800
$\phi 30$	C20/25	2,3	8,7	638	425	1418	992	751	3000
	C50/60	4,3	9,4	450	300	758	531	402	3000
$\phi 32$	C20/25	2,3	8,7	681	454	1512	1059	844	3200
	C50/60	4,3	9,4	480	320	809	566	451	3200
$\phi 36$	C20/25	2,3	5,5	766	510	1701	1191	1042	3200
	C50/60	4,3	6	540	360	910	637	652	3200
$\phi 40$	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: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 1$ - (design for yielding)

4) 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)

5) 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.

6) Maximum feasible embedment depth due to mortar installation limitations.

Seismic loading

Seismic DTA 3/16-874 design

Design bond strength in N/mm^2 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
$\phi 10 - \phi 34$	2,3	2,7	3,0	3,4	3,7	4,0	4,0
$\phi 36$	2,3	2,6	2,9	3,3	3,6	3,9	4,0
$\phi 40$	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 $f_{yk}=500 \text{ N/mm}^2$ for good conditions

Hammer drilling

Rebar-size	Concrete class	f_{bd} [N/mm^2]	$l_{0,min}^{1)}$ [mm]	$l_{b,min}^{2)}$ [mm]	$l_{bd,y,\alpha_2=1}^{3)}$ [mm]	$l_{bd,y,\alpha_2=0.7}^{4)}$ [mm]
$\phi 10$	C20/25	2,3	213	142	331	1000
	C50/60	4	200	100	190	1000
$\phi 12$	C20/25	2,3	255	170	397	1200
	C50/60	4	200	120	228	1200
$\phi 14$	C20/25	2,3	298	198	463	1400
	C50/60	4	210	140	266	1400
$\phi 16$	C20/25	2,3	340	227	529	1600
	C50/60	4	240	160	304	1600
$\phi 20$	C20/25	2,3	425	284	662	2000
	C50/60	4	300	200	380	2000
$\phi 25$	C20/25	2,3	532	354	827	2500
	C50/60	4	375	250	476	2500
$\phi 28$	C20/25	2,3	595	397	926	2800
	C50/60	4	420	280	533	2800
$\phi 30$	C20/25	2,3	638	425	992	3000
	C50/60	4	450	300	571	3000
$\phi 32$	C20/25	2,3	681	454	1059	3200
	C50/60	4	480	320	609	3200
$\phi 36$	C20/25	2,3	766	510	1191	3200
	C50/60	4	540	360	685	3200
$\phi 40$	C20/25	2,2	889	593	1383	3200
	C50/60	4	600	400	761	3200

1) Minimum anchorage length for overlap joint

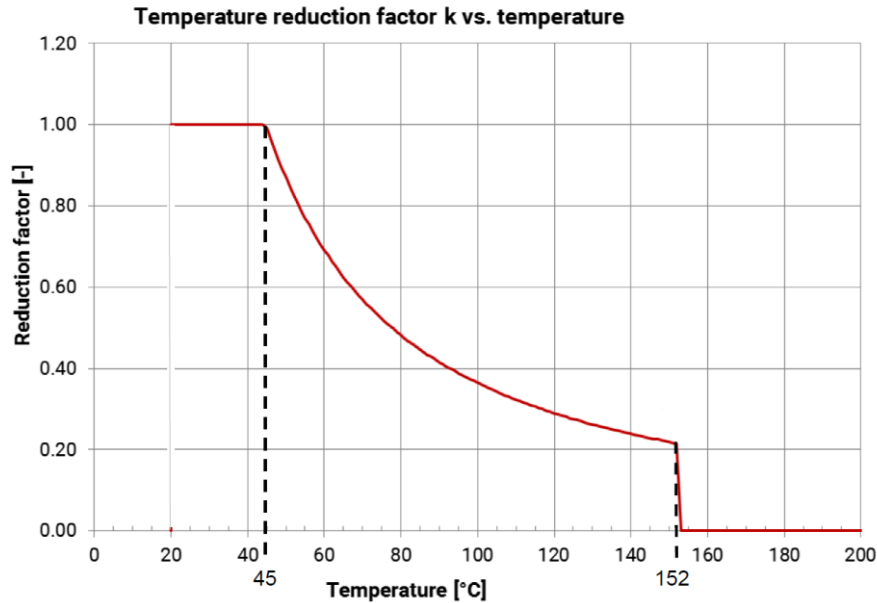
2) Minimum anchorage length for simply supported connections

3) Anchorage length for simply supported connections in case of: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 1$. – (design for yielding)

4) 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)

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 $45^{\circ}\text{C} \leq \theta \leq 152^{\circ}\text{C}$: $k_{fi}(\theta) = \frac{f_{bm}(\theta)}{f_{bm,rqd,d}} \leq 1,0$ in $^{\circ}\text{C}$

If $\theta < 45^{\circ}\text{C}$: $k_{fi}(\theta) = 1,0$

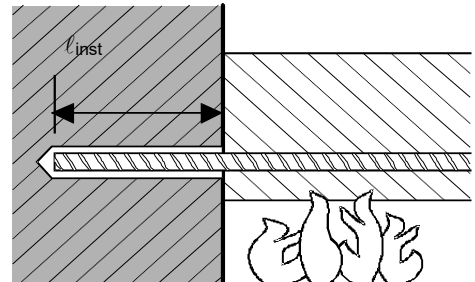
If $\theta > 152^{\circ}\text{C}$: $k_{fi}(\theta) = 0,0$

With:

$f_{bm}(\theta) = 1178,2 \cdot \theta^{-1,255}$ in $^{\circ}\text{C}$

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 $f_{yk} = 500 \text{ N/mm}^2$ 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
$\phi 8$	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 $f_{yk} = 500 \text{ N/mm}^2$ 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
$\phi 10$	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
$\phi 12$	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
$\phi 14$	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	51,3	47,6
		540						51,3
$\phi 16$	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	67,0	63,0
		590						67,0
$\phi 20$	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	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		157,7	152,2	142,5	134,7	
		720			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		197,8	191,8	180,9	172,2	
		790			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		260,8	253,8	241,4	231,4	
		890			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.

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

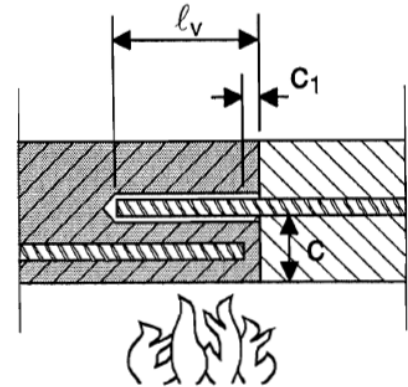
ℓ_s = lap length

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 80ϕ

$f_{bd,FIRE}$ = 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/mm ²]					
	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 $66 \cdot 10^{12} \Omega \cdot m$ (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}
$5\text{ °C} \leq T_{BM} < -1\text{ °C}$	2 h	48 h	168 h
$0\text{ °C} \leq T_{BM} < 4\text{ °C}$	2 h	24 h	48 h
$5\text{ °C} \leq T_{BM} < 9\text{ °C}$	2 h	16 h	24 h
$10\text{ °C} \leq T_{BM} < 14\text{ °C}$	1,5 h	12 h	16 h
$15\text{ °C} \leq T_{BM} < 19\text{ °C}$	1 h	8 h	16 h
$20\text{ °C} \leq T_{BM} < 24\text{ °C}$	30 min	4 h	7 h
$25\text{ °C} \leq T_{BM} < 29\text{ °C}$	20 min	3,5 h	6 h
$30\text{ °C} \leq T_{BM} < 34\text{ °C}$	15 min	3 h	5 h
$35\text{ °C} \leq T_{BM} < 39\text{ °C}$	12 min	2 h	4,5 h
$T_{BM} = 40\text{ °C}$	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

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 ($h_{ef} \leq 10 \cdot d$)					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 $20 \cdot \phi$ (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 $20 \cdot \phi$ (for φ > 12 mm).

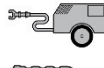
Minimum concrete cover c_{min} of the post-installed rebar

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

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

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

Drilling diameters

Rebar - size	Hammer drill (HD)	Hollow Drill Bit (HDB) ^{b)}	Compressed air drill (CA)	Diamond coring		
				Dry (PCC) ^{b)}	Wet (DD)	With roughening tool (RT) ^{b)}
	d ₀ [mm]					
						
φ8	12 (10 ^{a)})	-	-	-	12 (10 ^{a)})	-
φ10	14 (12 ^{a)})	14 (12 ^{a)})	-	-	14 (12 ^{a)})	-
φ12	16 (14 ^{a)})	16 (14 ^{a)})	17	-	16 (14 ^{a)})	-
φ14	18	18	17	-	18	18
φ16	20	20	20	-	20	20
φ18	22	22	22	-	22	22
φ20	25	25	26	-	25	25
φ22	28	28	28	-	28	28
φ24	32 (30 ^{a)})	32 (30 ^{a)})	32	-	32	32
φ25	32 (30 ^{a)})	32 (30 ^{a)})	32	-	32	32
φ26	35	35	35	35	35	35
φ28	35	35	35	35	35	35
φ30	37	-	37	35	37	-
φ32	40	-	40	47	40	-
φ34	45	-	42	47	45	-
φ36	45	-	45	47	47	-
φ40	55	-	57	52	52	-

c) Each of two given values can be used.

d) No cleaning required

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

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

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

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

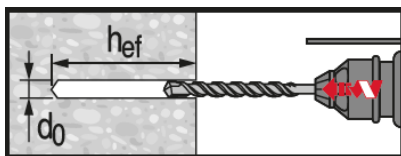
Setting instructions

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

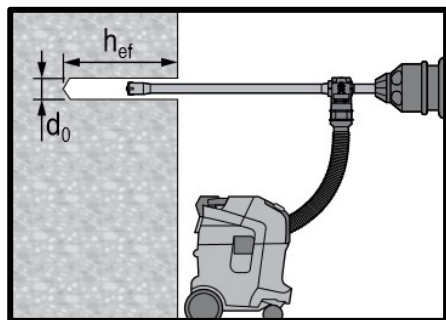


Safety regulations.

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.

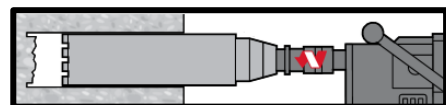


Hammer drilled hole (HD)

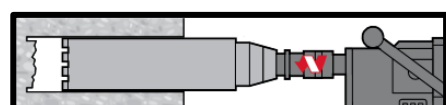


Hammer drilled hole with Hollow Drilled Bit (HDB)

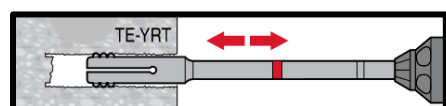
No cleaning required

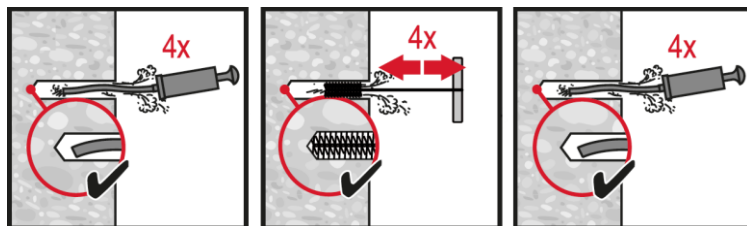


Diamond Drilling (DD)



Diamond Drilling + Roughening Tool (DD+RT)

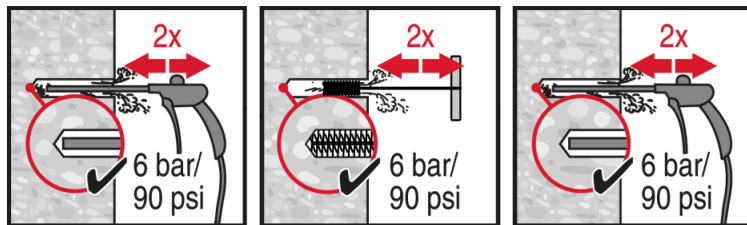




Hammer Drilling:

Manual cleaning (MC)

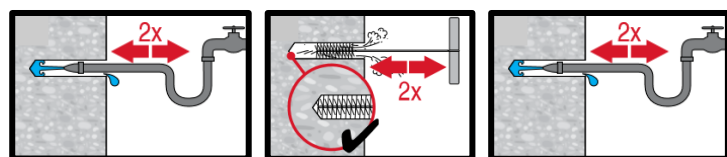
for drill diameters $d_0 \leq 20$ mm and drill hole depth $h_0 \leq 10 \cdot d$.



Hammer Drilling:

Compressed air cleaning (CAC)

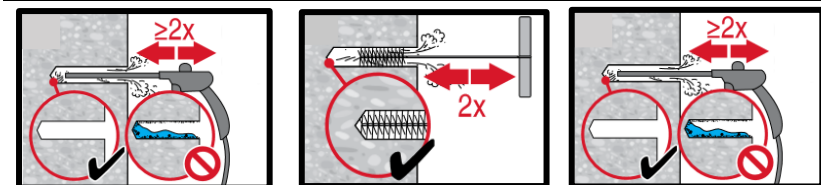
for all drill hole diameters d_0 and drill hole depths $h_0 \leq 20 \cdot d$.



Diamond cored holes:

Compressed air cleaning (CAC)

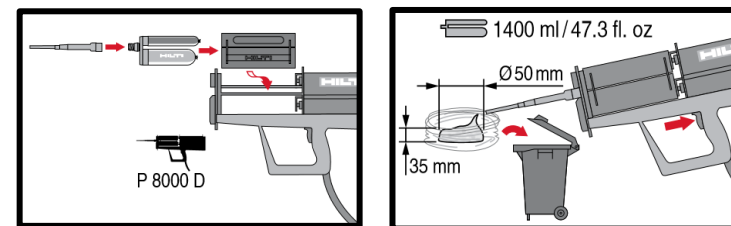
for all drill hole diameters d_0 and drill hole depths h_0 .



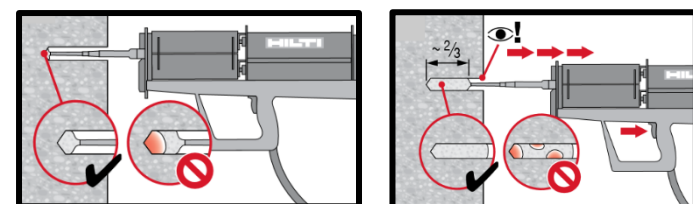
Diamond cored holes with Hilti roughening tool:

Compressed air cleaning (CAC)

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

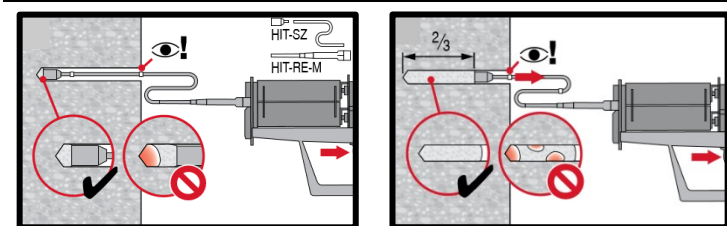


Injection system preparation.



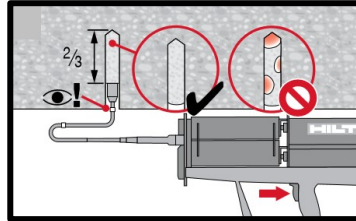
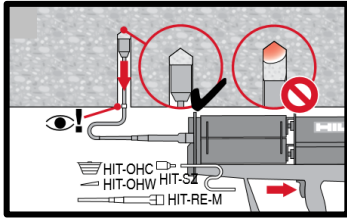
Injection method for drill hole depth

$h_{ef} \leq 250$ mm.

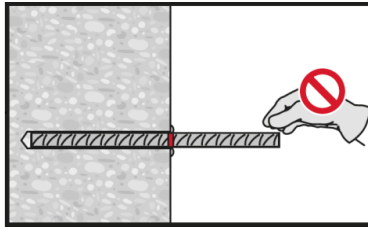
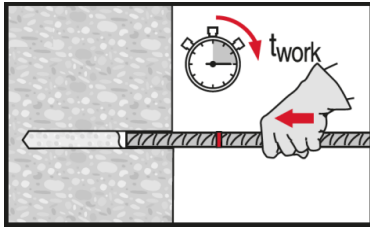


Injection method for drill hole depth

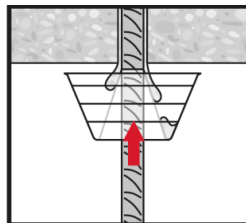
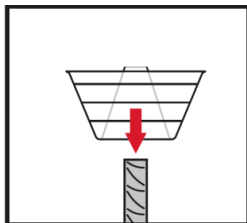
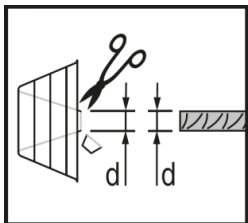
$h_{ef} > 250$ mm.



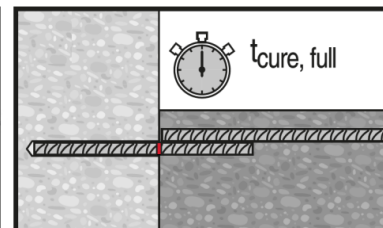
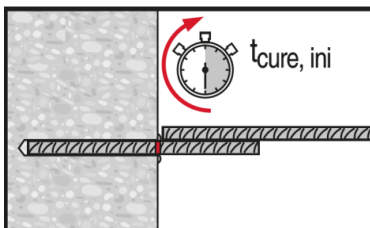
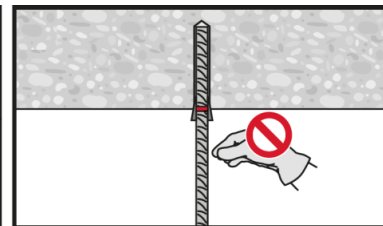
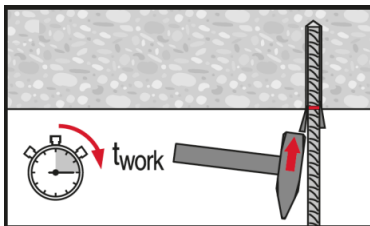
Injection method for overhead application.



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}".