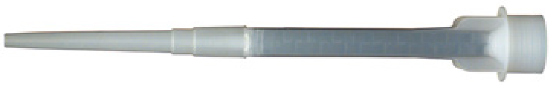
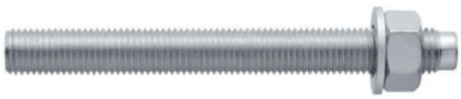
Hilti HIT-RE 500-SD with HIT-V

Injection Mortar System

Hilti HIT-RE 500-SD
330 ml foil pack
(also available as 500 ml
and 1400 ml foil pack)



Static mixer



HIT-V rods
HIT-V (Zinc)
HIT-V-F (Gal)
HIT-V-R (A4-70)
HIT-V-HCR rods

Benefits

- suitable for cracked concrete C 20/25 to C 50/60
- high loading capacity
- suitable for dry and water saturated concrete
- large diameter applications
- high corrosion resistant
- long working time at elevated temperatures
- odourless epoxy
- embedment depth range: from 40 ... 160 mm for M8 to 120 ... 600 mm for M30

Concrete | Tensile zone | Small edge distance & spacing | Variable embedment depth | Fire resistance | Shock | Seismic | Corrosion resistance | High corrosion resistance | European Technical Approval | CE conformity | PROFIS anchor design software | SAFEset approved automatic cleaning

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-07/0260 / 2013-06-26
ES report	ICC evaluation service	ESR 2322 / 2007-11-01
Fire test report	MFPA, Leipzig	GS-III/B-07-070 / 2008-01-18
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26 & suppl. WF 172920 / 2008-05-27

a) All data given in this section according ETA-07/0260, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500-SD 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 +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +58 °C	+35 °C	+58 °C
Temperature range III	-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

Design process for typical anchor layouts

The design values in the tables are obtained from Profis V2.4.2 in compliance with the design method according to EOTA TR 029. Design resistance according to data given in ETA-07/0260, issue 2013-06-26.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing

The design method is based on the following simplification:

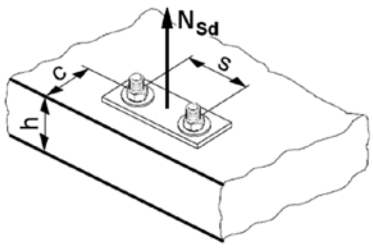
- No different loads are acting on individual anchors (no eccentricity)

The values are valid for the anchor configuration.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

STEP 1: TENSION LOADING

The design tensile resistance N_{Rd} is the lower of:



- **Combined pull-out and concrete cone resistance**
  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$

$N^*_{Rd,p}$ is obtained from the relevant design tables

$f_{B,p}$ influence of concrete strength on combined pull-out and concrete cone resistance

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
$f_{B,p}$	0.95	0.97	1.00	1.021	1.04

- **Concrete cone or concrete splitting resistance**
  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$

$N^*_{Rd,c}$ is obtained from the relevant design tables

f_B influence of concrete strength on concrete cone resistance

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
f_B	0.79	0.87	1.00	1.11	1.22

- **Design steel resistance (tension) $N_{Rd,s}$**

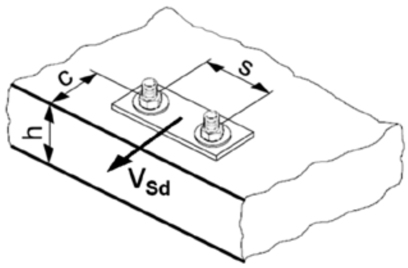
Anchor size			M8	M10	M12	M16	M20	M24	M30
$N_{Rd,s}$	HIT-V 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	187.3
	HIT-V 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	299.3
	HIT-V-R	[kN]	13.9	21.9	31.6	58.8	92.0	132.1	98.3

$$N_{Rd} = \min \{ N_{Rd,p}, N_{Rd,c}, N_{Rd,s} \}$$

CHECK $N_{Rd} \geq N_{Sd}$

STEP 2: SHEAR LOADING

The design shear resistance V_{Rd} is the lower of:



- **Design Concrete Edge Resistance**

  $V_{Rd,c} = f_B \cdot V^*_{Rd,c} \cdot \psi_{re,V}$

$V^*_{Rd,c}$ is obtained from the relevant design table

The factor $\psi_{re,V}$ takes account of the effect of the type of reinforcement used in cracked concrete.

$\psi_{re,V} = 1.0$ anchorage in cracked concrete without edge reinforcement

$\psi_{re,V} = 1.2$ anchorage in cracked concrete with straight edge reinforcement (≥ ⌀12 mm)

$\psi_{re,V} = 1.4$ anchorage in cracked concrete with edge reinforcement and closely spaced stirrups (a ≤ 100 mm)

f_B influence of concrete strength

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
f_B	0.79	0.87	1.00	1.11	1.22

Shear load acting parallel to edge:

These tables are for a single free edge only

2 anchors:

For shear loads acting parallel to this edge, the concrete resistance **$V^*_{Rd,c}$ can be multiplied by the factor = 2.5**

4 anchors:

For shear loads acting parallel to the edge - the anchor row closest to the edge is checked to resist half the total design load. To obtain the concrete resistance use the corresponding 2 anchor configuration **$V^*_{Rd,c}$ and multiply by the factor = 2.5**

- **Design steel resistance (shear): $V_{Rd,s}$**

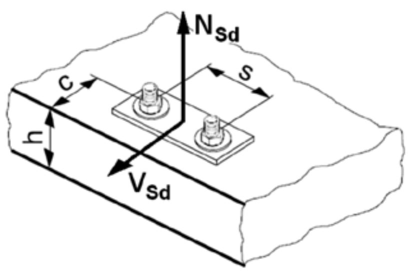
Anchor size			M8	M10	M12	M16	M20	M24	M30
$V_{Rd,s}$	HIT-V 5.8	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	112.0
	HIT-V 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
	HIT-V-R	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	58.8

$$V_{Rd} = \min \{ V_{Rd,c}, V_{Rd,s} \}$$

CHECK $V_{Rd} \geq V_{Sd}$

STEP 3: COMBINED TENSION AND SHEAR LOADING

The following equations must be satisfied:



$$N_{Sd}/N_{Rd} + V_{Sd}/V_{Rd} \leq 1.2$$

and

$$N_{Sd}/N_{Rd} \leq 1, \; V_{Sd}/V_{Rd} \leq 1$$

Precalculated table values – design resistance values

General:

The following tables provide the total ultimate limit state design resistance for the configurations.
All tables are based upon:

- correct setting (See setting instruction)
- cracked concrete – $f_{c,cyl}$ = 32 MPa
- temperature range I (see service temperature range)
- base material thickness, as specified in the table
- <u>One</u> typical embedment depth, as specified in the tables
- hammer drilled hole

The following tables give design values for typical embedment depths. The latest version of the Hilti software Profis allows the engineer to optimise their design by varying the embedment depth according to the applied loads to achieve an economical solution every time. This is done by selecting HIT-V-Rods.

For more information on the HIT V rods please refer to the Chemical Anchor Components & Accessories section on page 266.

The anchor design software program Profis can be download from the Hilti Australia website, www.hilti.com.au.

Basic loading data (for a single anchor) – no edge distance and spacing influence

Embedment depth and base material thickness for the basic loading data

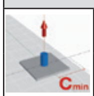
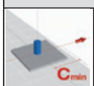
Anchor size	M8	M10	M12	M16	M20	M24	M30
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210	270
Base material thickness h [mm]	110	120	150	200	250	300	350

Design resistance [kN]: dry cracked concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20	M24	M30
Cracked concrete									
Tensile	Pull-out	$N^*_{Rd,p}$	9.4	13.1	18.1	22.0	37.3	55.3	76.2
	Concrete	$N^*_{Rd,c}$	18.1	21.6	29.2	30.3	48.1	66.0	96.2
Shear		$V_{Rd,s}$	Steel governed refer $V_{Rd,s}$ table						

Basic loading data (for a single anchor) – with minimum edge distance

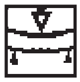
Design resistance [kN] - dry cracked concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20	M24
Min. edge distance		c_{min} [mm]	40	50	60	80	100	120
Min Base thickness		h_{min} [mm]	110	120	150	200	250	300
Tensile NRd								
	Pull-out	$N^*_{Rd,p}$	5.0	7.3	10.0	13.0	21.2	31.1
	Concrete	$N^*_{Rd,c}$	8.6	10.5	14.9	17.9	27.1	35.9
Shear VRd								
	Shear (without lever arm)	$V^*_{Rd,c}$	3.3	4.8	6.6	10.3	15.4	21.1

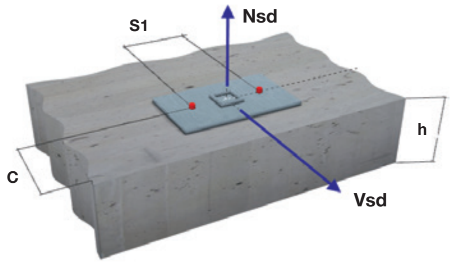
Two Anchors

Table 1: One edge influence – cracked concrete

Design Data: $f_{c,cyl}$=32 MPa



Tensile zone



Anchor size	M8	M10	M12	M16	M20	M24
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210
Base material thickness h [mm]	110	120	150	200	250	300

ANCHOR M8	Edge E (mm)														
	40			80			100			150			170		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	6.8	9.6	4.5	9.6	12.5	9.3	11.2	14.1	10.9	12.6	18.4	14.9	12.6	20.2	16.5
80	7.5	10.6	5.6	10.6	13.8	10.6	12.4	15.6	12.2	13.9	20.3	16.1	13.9	22.4	17.7
100	7.9	11.2	6.1	11.1	14.5	11.3	12.9	16.3	12.8	14.6	21.3	16.7	14.6	23.4	18.3
120	8.2	11.7	6.7	11.6	15.1	12.0	13.5	17.0	13.5	15.2	22.2	17.3	15.2	24.5	18.9
150	8.7	12.4	6.7	12.3	16.1	13.0	14.3	18.2	14.4	16.2	23.7	18.2	16.2	26.1	19.8
200	9.5	13.7	6.7	13.5	17.8	14.6	15.7	20.0	16.1	17.7	26.1	19.8	17.7	28.7	21.2

ANCHOR M10	Edge C (mm)														
	50			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
50	9.8	11.8	6.4	12.3	14.0	10.6	14.1	15.6	12.4	17.5	19.8	16.6	17.5	24.3	20.8
100	10.9	13.1	8.0	13.7	15.6	12.5	15.7	17.3	14.1	19.6	22.0	18.3	19.6	27.1	22.3
150	12.0	14.5	9.6	15.1	17.2	14.3	17.4	19.1	15.9	21.6	24.3	19.9	21.6	29.8	24.0
200	13.1	15.8	9.6	16.5	18.7	16.2	19.0	20.8	17.7	23.6	26.5	21.6	23.6	32.5	25.5
250	14.2	17.1	9.6	17.9	20.3	17.6	20.5	22.6	19.4	25.6	28.7	23.2	25.6	35.2	27.1
300	14.6	18.4	9.6	18.4	21.9	17.6	21.1	24.3	21.2	26.3	30.9	24.9	26.3	38.0	28.7

ANCHOR M12	Edge C (mm)														
	60			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	13.2	16.8	8.7	15.1	18.5	11.8	17.0	20.3	15.2	22.3	25.1	20.0	24.0	30.4	24.8
100	14.3	18.0	10.2	16.2	19.9	13.4	18.3	21.8	16.9	24.0	27.0	21.6	25.9	32.6	26.3
150	15.5	19.6	12.0	17.7	21.6	15.4	19.9	23.7	19.0	26.2	29.3	23.6	28.2	35.5	28.2
200	16.8	21.2	13.1	19.1	23.4	17.4	21.6	25.6	21.1	28.3	31.7	25.5	30.5	38.4	30.0
250	18.0	22.8	13.1	20.5	25.1	18.9	23.2	27.5	23.2	30.4	34.1	27.5	32.7	41.2	31.9
300	19.3	24.3	13.1	21.9	26.8	18.9	24.7	29.4	25.3	32.4	36.4	29.4	34.9	44.0	33.8

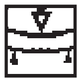
ANCHOR M16	Edge C (mm)														
	80			100			150			200			250		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
80	17.1	21.7	13.7	19.1	24.2	17.3	24.5	31.1	25.6	28.9	36.8	31.3	28.9	36.8	36.8
100	17.7	22.7	14.6	19.8	25.3	18.2	25.3	32.5	26.6	29.9	38.4	32.2	29.9	38.4	37.7
150	19.2	25.1	16.7	21.5	28.0	20.5	27.5	35.9	29.0	32.5	42.4	34.5	32.5	42.4	39.9
200	20.7	27.4	18.9	23.2	30.6	22.7	29.7	39.3	31.4	35.1	46.5	36.8	35.1	46.5	42.1
250	22.2	29.8	20.6	24.8	33.3	25.0	31.9	42.7	33.9	37.7	50.5	39.1	37.7	50.5	44.3
300	23.7	32.2	20.6	26.5	36.0	27.3	34.0	45.9	36.3	40.2	54.5	41.4	40.2	54.5	46.6

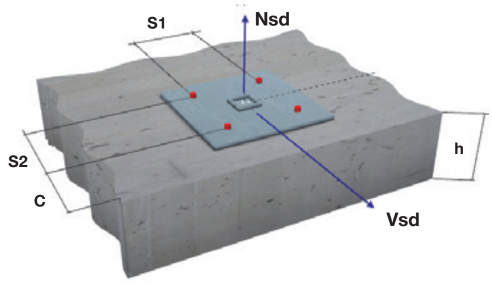
ANCHOR M20	Edge C (mm)														
	120			150			200			250			300		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	27.3	31.2	20.5	33.3	36.7	31.2	40.0	42.8	39.4	47.1	49.2	45.8	47.9	56.0	52.1
150	29.1	33.2	23.1	35.6	39.2	34.0	42.7	45.6	42.2	50.4	52.4	48.5	51.2	59.7	54.7
200	31.0	35.2	25.6	37.9	41.6	36.9	45.5	48.4	45.0	53.7	55.6	51.1	54.5	63.3	57.3
250	32.9	37.3	28.2	40.2	44.0	39.7	48.2	51.1	47.8	56.9	58.8	53.8	57.8	67.0	59.9
300	34.8	39.3	30.7	42.5	46.4	42.6	51.0	54.0	50.6	60.1	62.0	56.5	61.1	70.7	62.5
350	36.6	41.4	30.7	44.8	48.8	45.4	53.7	56.7	53.4	63.4	65.2	59.2	64.4	74.3	65.1

ANCHOR M24	Edge C (mm)														
	120			150			200			250			350		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
120	39.1	41.0	28.2	43.2	44.4	35.2	50.6	50.4	47.8	58.5	56.7	55.0	69.5	70.3	69.1
150	40.4	42.3	29.9	44.7	45.8	37.0	52.3	51.9	49.8	60.5	58.4	56.9	71.9	72.5	70.9
200	42.7	44.4	32.9	47.3	48.1	40.1	55.3	54.4	53.1	63.9	61.4	60.0	76.0	76.1	73.9
250	45.0	46.5	35.8	49.8	50.4	43.2	58.3	57.1	56.4	67.4	64.3	63.2	80.1	79.7	76.8
300	47.3	48.6	38.8	52.3	52.7	46.3	61.2	59.7	59.8	70.8	67.2	66.3	84.1	83.3	79.8
350	49.6	50.7	41.7	54.9	54.9	49.4	64.2	62.3	63.1	74.2	70.1	69.5	88.2	87.0	82.7

Four anchors

Table 2: One edge influence – cracked concrete


Tensile zone



Design Data: $f_{c,cyl}$=32 MPa

Anchor size	M8	M10	M12	M16	M20	M24
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210
Base material thickness h [mm]	110	120	150	200	250	300

ANCHOR M8	Edge E (mm)														
	40			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	10.2	11.5	9.0	13.7	14.5	12.5	15.8	16.2	14.1	17.6	20.7	18.0	17.6	22.6	19.6
80	12.9	14.7	11.2	17.0	18.2	16.9	19.3	20.2	18.4	21.3	25.4	22.3	21.3	27.6	23.8
100	14.4	16.5	12.2	18.7	20.3	19.0	21.1	22.3	20.6	23.2	27.9	24.4	23.2	30.3	25.9
120	15.9	18.3	13.4	20.5	22.4	21.2	23.0	24.6	22.7	25.3	30.6	26.5	25.3	33.1	28.0
150	18.2	21.3	13.4	23.3	25.8	24.3	26.0	28.2	25.8	28.4	34.8	29.6	28.4	37.6	31.1
200	22.3	26.7	13.4	28.0	32.0	29.2	31.1	34.8	31.0	33.8	42.4	34.7	33.8	45.6	36.2

ANCHOR M10	Edge C (mm)														
	50			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
50	14.3	14.2	12.4	17.5	16.5	14.9	19.7	18.2	16.6	24.0	22.7	20.8	24.0	27.4	24.9
100	18.6	18.4	16.0	22.3	21.2	20.7	24.9	23.1	22.4	29.8	28.4	26.4	29.8	33.9	30.4
150	23.4	23.2	19.2	27.6	26.4	26.4	30.5	28.7	28.0	36.1	34.7	32.0	36.1	41.1	36.0
200	28.5	28.5	19.2	33.2	32.2	31.9	36.6	34.8	33.5	42.8	41.7	37.4	42.8	48.9	41.4
250	33.8	34.4	19.2	39.1	38.6	35.2	42.9	41.5	38.8	49.8	49.3	42.9	49.8	57.5	46.8
300	36.0	40.8	19.2	41.5	45.5	35.2	45.4	48.8	42.4	52.7	57.6	48.2	52.7	66.7	52.1

ANCHOR M12	Edge C (mm)														
	60			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	19.4	20.2	17.1	21.6	22.0	19.1	24.1	23.9	21.0	30.6	29.0	25.7	32.8	34.5	30.4
100	23.1	24.1	20.4	25.7	26.2	24.4	28.3	28.3	26.3	35.5	34.0	30.9	37.9	40.1	35.6
150	28.3	29.5	24.0	31.1	31.9	30.8	34.1	34.3	32.7	42.2	40.7	37.3	44.7	47.7	41.9
200	33.7	35.5	26.2	36.9	38.1	34.8	40.2	40.9	39.1	49.2	48.1	43.6	52.0	55.9	48.1
250	39.5	42.0	26.2	43.1	44.9	37.8	46.7	48.0	45.4	56.5	56.1	49.8	59.7	64.8	54.3
300	45.6	49.0	26.2	49.4	52.3	37.8	53.4	55.7	50.6	64.2	64.7	56.0	67.6	74.4	60.4

Shear design: The concrete edge resistance value in this table uses all 4 anchors in shear. You will need to ensure the gap between anchor and the plate is filled. This can be achieved using the Hilti Dynamic Set. (Refer page 41 for further details)

The concrete edge resistance values have been obtained by taking the lesser of:

1. First row resistance multiplied by number of rows and
2. The concrete edge resistance of the furthest row.

ANCHOR M16	Edge C (mm)														
	80			100			150			200			250		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
80	24.7	28.2	26.8	27.1	31.0	29.0	33.7	38.5	34.6	39.0	44.6	40.1	39.0	44.6	45.6
100	26.8	31.1	29.2	29.3	34.1	32.2	36.2	42.1	37.7	41.8	48.6	43.2	41.8	48.6	48.6
150	32.4	39.1	33.4	35.2	42.6	39.9	42.9	51.4	45.3	49.1	59.4	50.7	49.1	59.4	56.0
200	38.4	47.9	37.8	41.6	51.6	45.4	50.1	61.3	52.8	57.0	71.2	58.1	57.0	71.2	63.4
250	44.7	57.7	41.2	48.3	61.1	50.0	57.7	72.0	60.2	65.3	83.9	65.4	65.3	84.9	70.7
300	51.5	66.8	41.2	55.4	71.4	54.6	65.7	83.6	67.5	74.0	96.8	72.7	74.0	98.2	77.9

ANCHOR M20	Edge C (mm)														
	100			150			200			250			300		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	38.4	38.4	39.3	45.6	44.4	45.7	53.5	50.8	52.1	62.0	57.6	58.4	62.9	64.8	64.6
150	44.8	44.7	46.2	52.8	51.3	54.7	61.4	58.4	60.9	70.7	65.8	67.1	71.6	73.8	73.3
200	51.7	51.5	51.2	60.5	58.8	63.5	69.9	66.5	69.6	79.9	74.7	75.7	81.0	83.4	81.8
250	59.1	58.8	56.4	68.6	66.8	72.1	78.8	75.2	78.2	89.7	84.1	84.2	90.8	93.5	90.2
300	66.9	66.6	61.4	77.2	75.2	80.6	88.2	84.4	86.6	99.9	94.0	92.6	101.1	104.2	98.5
350	75.0	74.9	61.4	86.1	84.2	89.0	98.0	94.1	95.0	110.6	104.5	100.9	111.9	115.5	106.8

ANCHOR M24	Edge C (mm)														
	120			150			200			250			350		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1=s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
120	53.5	50.0	53.4	58.4	53.7	57.8	67.0	60.1	64.9	76.1	66.8	72.0	88.9	81.2	85.9
150	58.1	53.9	59.7	63.2	57.7	63.9	72.2	64.4	70.9	81.8	71.4	77.9	95.1	86.5	91.7
200	66.0	60.6	65.8	71.5	64.8	73.9	81.3	72.0	80.8	91.6	79.5	87.6	105.9	95.7	101.2
250	74.4	67.8	71.6	80.4	72.2	83.6	90.9	80.0	90.4	102.0	88.1	97.2	117.4	105.4	110.7
300	83.3	75.3	77.6	89.7	80.1	92.6	101.0	88.3	100.0	112.9	97.0	106.7	129.4	115.5	120.1
350	92.5	83.2	83.4	99.5	88.3	98.8	111.5	97.2	109.5	124.3	106.4	116.1	141.9	126.2	129.4

Materials

Mechanical properties of HIT-V / HAS

			Data according ETA-04/0027, issue 2008-11-03							Additional Hilti technical data
Anchor size			M8	M10	M12	M16	M20	M24	M30	M36
Nominal tensile strength f_{uk}	HIT-V 5.8	[N/mm²]	500	500	500	500	500	500	500	500
	HIT-V 8.8	[N/mm²]	800	800	800	800	800	800	800	800
	HIT-V-R	[N/mm²]	700	700	700	700	700	700	500	500
	HIT-V-HCR	[N/mm²]	800	800	800	800	800	700	700	500
Yield strength f_{yk}	HIT-V 5.8	[N/mm²]	400	400	400	400	400	400	400	400
	HIT-V 8.8	[N/mm²]	640	640	640	640	640	640	640	640
	HIT-V-R	[N/mm²]	450	450	450	450	450	450	210	210
	HIT-V/HAS -HCR	[N/mm²]	600	600	600	600	600	400	400	250
Stressed cross-section A_s	HIT-V	[mm²]	36.6	58.0	84.3	157	245	353	561	817
Section Modulus Z	HIT-V	[mm³]	31.2	62.3	109	277	541	935	1874	3294
Steel failure with lever arm			M8	M10	M12	M16	M20	M24	M30	M36
Design bending moment $M_{Rd,s}$	HIT-V-5.8	[Nm]	15	30	53	134	260	449	900	1581
	HIT-V-8.8	[Nm]	24	48	84	213	415	718	1439	2530
	HIT-V-R	[Nm]	17	33	59	149	291	504	472	830
	HIT-V-HCR	[Nm]	24	48	84	213	416	449	899	1129

Material quality

Part	Material
Threaded rod HIT-V(F)	Strength class 5.8, EN ISO 898-1, A5 > 8% ductile steel galvanized ≥ 5 µm, EN ISO 4042 (F) hot dipped galvanized ≥ 45 µm, EN ISO 10684
Threaded rod HIT-V(F)	Strength class 8.8, EN ISO 898-1, A5 > 8% ductile steel galvanized ≥ 5 µm, EN ISO 4042 (F) hot dipped galvanized ≥ 45 µm, EN ISO 10684
Threaded rod HIT-V-R	Stainless steel grade A4, A5 > 8% ductile strength class 70 for ≤ M24 and class 50 for M27 to M30, EN ISO 3506-1, EN 10088: 1.4401
Threaded rod HIT-V-HCR	High corrosion resistant steel, EN ISO 3506-1, EN 10088: 1.4529; 1.4565 strength ≤ M20: Rm = 800 N/mm², Rp 0.2 = 640 N/mm², A5 > 8% ductile M24 to M30: Rm = 700 N/mm², Rp 0.2 = 400 N/mm², A5 > 8% ductile
Washer ISO 7089	Steel galvanized, EN ISO 4042; hot dipped galvanized, EN ISO 10684
	Stainless steel, EN 10088: 1.4401
	High corrosion resistant steel, EN 10088: 1.4529; 1.4565
Nut EN ISO 4032	Strength class 8, ISO 898-2 steel galvanized ≥ 5 µm, EN ISO 4042 hot dipped galvanized ≥ 45 µm, EN ISO 10684
	Strength class 70, EN ISO 3506-2, stainless steel grade A4, EN 10088: 1.4401
	Strength class 70, EN ISO 3506-2, high corrosion resistant steel, EN 10088: 1.4529; 1.4565

Anchor dimensions

Anchor size	M8	M10	M12	M16	M20	M24	M30 [a)]
Anchor embedment depth [mm]	80	90	110	125	170	210	270
Anchor rod HIT-V, HIT-V-R, HIT-V-HCR	Anchor rods HIT-V (-R / -HCR) are available in variable length						

a) M30 please use anchor design software PROFIS anchor.

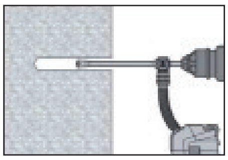
Setting

Installation equipment

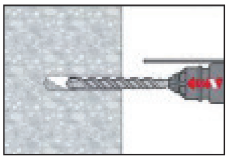
Anchor size	M8	M10	M12	M16	M20	M24	M30
Rotary hammer	TE 2 – TE 30				TE 40 – TE 70		
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser						

Setting instructions

Bore hole drilling



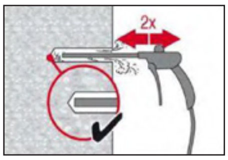
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling.
After drilling is complete, proceed to the “injection preparation” step in the instructions for use



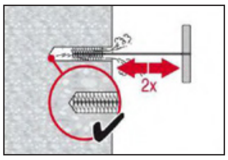
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Bore hole cleaning **Just before setting an anchor, the bore hole must be free of dust and debris.**

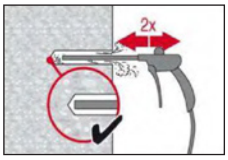
b) Compressed air cleaning (CAC) for all bore hole diameters d_0 and all bore hole depth h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.

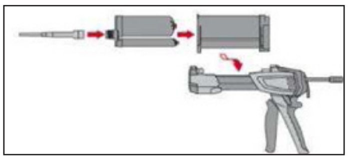


Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

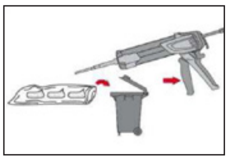


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Injection preparation



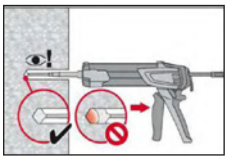
Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT dispenser.



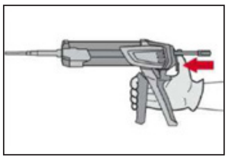
The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:
3 strokes for 330 ml foil pack,
4 strokes for 500 ml foil pack
65 ml for 1400 ml foil pack

Setting instructions

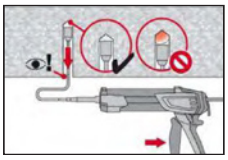
Inject adhesive from the back of the borehole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full. It is required that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

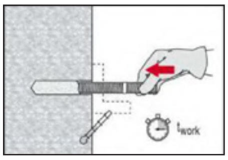


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

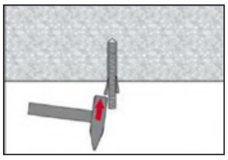


Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

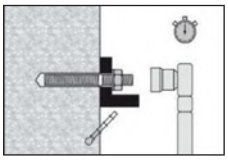
Setting the element



Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth untill working time t_{work} has elapsed



For overhead installation use piston plugs and fix embedded parts with e.g. wedges HIT-OHW



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

Curing time for general conditions

Data according ETA-07/0260, issue 2013-06-26		
Temperature of the base material	**Working time in which anchor can be inserted and adjusted t_{gel}**	**Curing time before anchor can be fully loaded t_{cure}**
40 °C	12 min	4 h
30 °C to 39 °C	12 min	8 h
20 °C to 29 °C	20 min	12 h
15 °C to 19 °C	30 min	24 h
10 °C to 14 °C	90 min	48 h
5 °C to 9 °C	120 min	72 h

Setting details

			Data according ETA-07/0260, issue 2013-06-26						
Anchor size			M8	M10	M12	M16	M20	M24	M30
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	24	28	35
Effective anchorage and drill hole depth range a)	$h_{ef,min}$	[mm]	40	40	48	64	80	96	120
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	600
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + 2 d_0			
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	33
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	150
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	150
Torque moment b)	T_{max} b)	[Nm]	10	20	40	80	150	200	300

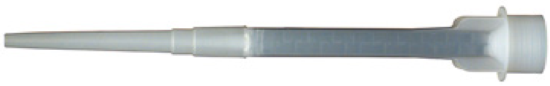
a) hef,min ≤ hef ≤ hef,max (hef: embedment depth)

b) This is the maximum recommended torque moment to avoid splitting during installation for anchors with minimum spacing and/or edge distance.

Hilti HIT-RE 500-SD with rebar

Injection Mortar System

Hilti HIT-RE 500-SD
330 ml foil pack
(also available as 500 ml
and 1400 ml foil pack)

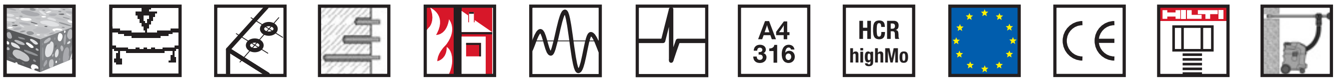


Static mixer

Rebar BSt 500 S

Benefits

- suitable for cracked concrete C 20/25 to C 50/60
- high loading capacity
- suitable for dry and water saturated concrete
- large diameter applications
- high corrosion resistant
- long working time at elevated temperatures
- odourless epoxy



Concrete | Tensile zone | Small edge distance & spacing | Variable embedment depth | Fire resistance | Shock | Seismic | Corrosion resistance | High corrosion resistance | European Technical Approval | CE conformity | PROFIS anchor design software | SAFEset approved automatic cleaning

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-07/0260 / 2013-06-26
ES report	ICC evaluation service	ESR 2322 / 2007-11-01
Fire test report	MFPA, Leipzig	GS-III/B-07-070 / 2008-01-18
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26 & suppl. WF 172920 / 2008-05-27

a) All data given in this section according ETA-07/0260, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500-SD 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 +40 °C	+24 °C	+40 °C
Temperature range II	-40 °C to +58 °C	+35 °C	+58 °C
Temperature range III	-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

Design process for typical anchor layouts

The design values in the tables are obtained from Profis V2.4.2 in compliance with the design method according to EOTA TR 029. Design resistance according to data given in ETA-07/0260, issue 2013-06-26.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing

The design method is based on the following simplification:

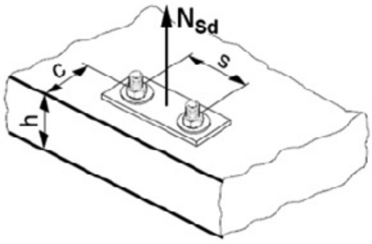
- No different loads are acting on individual anchors (no eccentricity)

The values are valid for the anchor configuration.

For more complex fastening applications please use the anchor design software PROFIS Anchor.

STEP 1: TENSION LOADING

The design tensile resistance N_{Rd} is the lower of:



- **Combined pull-out and concrete cone resistance**
  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$

$N^*_{Rd,p}$ is obtained from the relevant design tables

$f_{B,p}$ influence of concrete strength on combined pull-out and concrete cone resistance

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
$f_{B,p}$	0.95	0.97	1.00	1.02	1.04

- **Concrete cone or concrete splitting resistance**
  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$

$N^*_{Rd,c}$ is obtained from the relevant design tables

f_B influence of concrete strength on concrete cone resistance

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
f_B	0.79	0.87	1.00	1.11	1.22

- **Design steel resistance $N_{Rd,s}$**

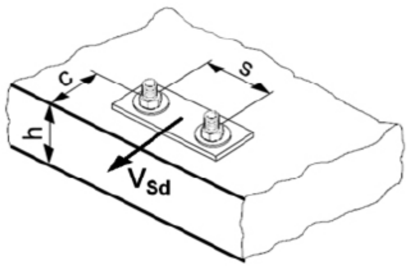
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
$N_{Rd,s}$	BSt 500 S	[kN]	20.0	30.7	44.3	60.7	79.3	123.6	177.8	242.1	315.7

$N_{Rd} = \min \{ N_{Rd,p}, N_{Rd,c}, N_{Rd,s} \}$

CHECK $N_{Rd} \geq N_{Sd}$

STEP 2: SHEAR LOADING

The design shear resistance V_{Rd} is the lower of:



- **Design Concrete Edge Resistance**
  $V_{Rd,c} = f_B \cdot V^*_{Rd,c} \cdot \psi_{re,V}$

$V^*_{Rd,c}$ is obtained from the relevant design table

The factor $\psi_{re,V}$ takes account of the effect of the type of reinforcement used in cracked concrete.
$\psi_{re,V} = 1.0$ anchorage in cracked concrete without edge reinforcement
$\psi_{re,V} = 1.2$ anchorage in cracked concrete with straight edge reinforcement (≥ Ø12 mm)
$\psi_{re,V} = 1.4$ anchorage in cracked concrete with edge reinforcement and closely spaced stirrups (a ≤ 100 mm)

f_B influence of concrete strength

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	25	32	40	50
f_B	0.79	0.87	1.00	1.11	1.22

Shear load acting parallel to edge:
These tables are for a single free edge only

2 anchors:
For shear loads acting parallel to this edge, the concrete resistance **$V^*_{Rd,c}$ can be multiplied by the factor = 2.5**

4 anchors:
For shear loads acting parallel to the edge - the anchor row closest to the edge is checked to resist half the total design load. To obtain the concrete resistance use the corresponding 2 anchor configuration **$V^*_{Rd,c}$ and multiply by the factor = 2.5**

- **Design steel resistance $V_{Rd,s}$**

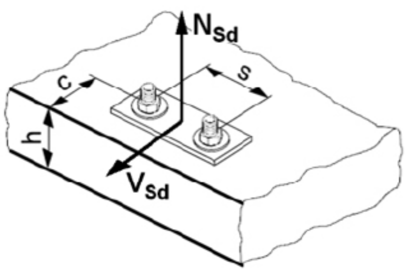
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
$V_{Rd,s}$	BSt 500 S	[kN]	9.3	14.7	20.7	28.0	36.7	57.3	83.0	112.7	147.3

$$V_{Rd} = \min\{ V_{Rd,c}, V_{Rd,s} \}$$

$$\text{CHECK } V_{Rd} \geq V_{Sd}$$

STEP 3: COMBINED TENSION AND SHEAR LOADING

The following equations must be satisfied:



$$N_{Sd}/N_{Rd} + V_{Sd}/V_{Rd} \leq 1.2$$

and

$$N_{Sd}/N_{Rd} \leq 1,\ V_{Sd}/V_{Rd} \leq 1$$

Precalculated table values – design resistance values

General:

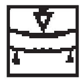
The following tables provide the total ultimate limit state design resistance for the configurations.
All tables are based upon:

- correct setting (See setting instruction)
- cracked concrete – $f_{c,cyl}$ = 32 MPa
- temperature range I (see service temperature range)
- base material thickness, as specified in the table
- Three typical embedment depths, as specified in the tables
- dry concrete, hammer drilled hole

The following tables give design values for typical embedment depths. The latest version of the Hilti software Profis allows the engineer to optimise their design by varying the embedment depth according to the applied loads to achieve an economical solution every time. This is done by selecting rebar.

The anchor design software program Profis can be download from the Hilti Australia website, www.hilti.com.au.

Single anchor – no edge and spacing influences



Tensile zone

Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa									
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		60	60	72	96	120	144	168	192
Base material thickness		100	100	104	136	170	210	238	272
Tensile Single anchor no edge									
Pull-out	$N^*_{Rd,p}$	10.5	13.2	19.0	26.5	37.6	48.0	59.0	67.4
Concrete	$N^*_{Rd,c}$	16.5	16.5	21.7	28.6	40.0	52.5	66.2	80.9
Shear Single anchor no edge									
Shear	$V_{Rd,s}$	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

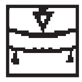
Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa									
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		80	90	110	125	170	210	270	300
Base material thickness		110	120	142	165	220	274	340	380
Tensile Single anchor no edge									
Pull-out	$N^*_{Rd,p}$	9.4	13.1	18.1	22.0	37.3	57.6	77.0	90.3
Concrete	$N^*_{Rd,c}$	18.1	21.6	29.2	30.3	48.1	66.0	96.2	112.6
Shear Single anchor no edge									
Shear	$V_{Rd,s}$	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

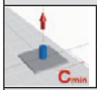
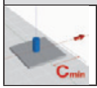
Embedment 3

Design Resistance $f_{c,cyl}$ - 32Mpa									
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		96	120	144	192	240	288	336	384
Base material thickness		126	150	176	232	290	352	406	464
Tensile Single anchor no edge									
Pull-out	$N^*_{Rd,p}$	11.2	17.5	23.7	33.7	52.7	79.0	95.9	115.6
Concrete	$N^*_{Rd,c}$	23.8	33.2	43.7	57.7	80.6	106.0	133.5	163.2
Shear Single anchor no edge									
Shear	$V_{Rd,s}$	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

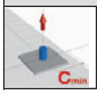
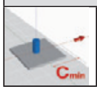
Single anchor – minimum edge distance


Tensile zone

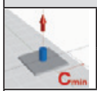
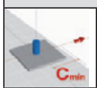
Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	60	60	72	96	120	144	168	192
Base material thickness	100	100	104	136	170	210	238	272
Edge Dist c= c_{min}	40	50	60	80	100	120	140	160
Tensile Single anchor min edge								
 Pull-out $N^*_{Rd,p}$	4.2	5.9	8.0	11.4	17.8	27.2	32.5	39.0
Concrete $N^*_{Rd,c}$	6.9	7.7	9.0	11.8	16.5	22.6	27.3	33.3
Shear Single anchor min edge								
 Shear $V^*_{Rd,c}$ (without lever arm)	3.1	4.4	6.0	9.7	14.1	20.3	24.8	31.0

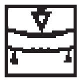
Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	80	90	110	125	170	210	270	300
Base material thickness	110	120	142	165	220	270	340	380
Edge Dist c= c_{min}	40	50	60	80	100	125	140	160
Tensile Single anchor min edge								
 Pull-out $N^*_{Rd,p}$	5.1	7.3	10.0	13.0	21.2	33.0	43.3	50.7
Concrete $N^*_{Rd,c}$	8.6	10.5	14.0	15.3	23.6	32.5	45.5	53.7
Shear Single anchor min edge								
 Shear $V^*_{Rd,c}$ (without lever arm)	3.3	4.8	6.6	10.3	15.4	22.4	28.3	35.3

Embedment 3

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	96	120	144	192	240	288	336	384
Base material thickness	126	150	176	232	290	348	406	464
Edge Dist c= c_{min}	40	50	60	80	100	125	140	160
Tensile Single anchor min edge								
 Pull-out $N^*_{Rd,p}$	6.1	9.6	12.9	18.6	29.1	44.4	53.8	64.9
Concrete $N^*_{Rd,c}$	10.7	14.9	19.6	25.8	36.1	47.9	59.7	73.0
Shear Single anchor min edge								
 Shear $V^*_{Rd,c}$ (without lever arm)	3.5	5.1	7.0	11.5	17.0	24.6	30.3	38.2

2 anchors – minimum spacing influence


Tensile zone

Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	60	60	72	96	120	144	168	192
Base material thickness	100	100	104	136	170	210	238	272
Spacing dist $s=s_{min}$	40	50	60	80	100	120	140	160
Tensile N_{Rd}								
Pull-out $N^*_{Rd,p}$	9.6	12.0	16.1	22.6	34.4	50.9	61.3	73.9
Concrete $N^*_{Rd,c}$	7.8	14.8	18.7	24.5	34.3	46.0	56.8	69.4
Shear V_{Rd}								
$V_{Rd,s}$ steel (per anchor)	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3
$V^*_{Rd,c}$ pryout	N/A	28.8	38.7	63.3	96.4	135.2	168.9	206.4

Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	80	90	110	125	170	210	270	300
Base material thickness	110	120	142	165	220	270	340	380
Spacing dist $s=s_{min}$	40	50	60	80	100	125	140	160
Tensile N_{Rd}								
Pull-out $N^*_{Rd,p}$	12.7	17.5	24.1	28.9	47.9	72.0	97.8	114.7
Concrete $N^*_{Rd,c}$	20.2	24.3	32.7	34.7	54.3	74.7	107.2	126.0
Shear V_{Rd}								
$V_{Rd,s}$ steel (per anchor)	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3
$V^*_{Rd,c}$ pryout	N/A			81.0	134.2	201.7	273.9	321.0

Embedment 3

Design Resistance $f_{c,cyl}$ - 32Mpa								
Rebar size	**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	96	120	144	192	240	288	336	384
Base material thickness	126	150	176	232	290	348	406	464
Spacing dist $s=s_{min}$	40	50	60	80	100	125	140	160
Tensile N_{Rd}								
Pull-out $N^*_{Rd,p}$	15.4	23.7	31.9	45.1	69.3	101.9	124.8	150.6
Concrete $N^*_{Rd,c}$	26.0	36.2	47.7	63.0	88.1	116.2	145.9	178.2
Shear V_{Rd}								
$V_{Rd,s}$ (per anchor)	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

Materials

Mechanical properties of rebar BSt 500S

Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
Nominal tensile strength f_{uk}	BSt 500 S	[N/mm²]	550	550	550	550	550	550	550	550	550
Yield strength f_{yk}	BSt 500 S	[N/mm²]	500	500	500	500	500	500	500	500	500
Stressed cross-section A_s	BSt 500 S	[mm²]	50.3	78.5	113.1	153.9	201.1	314.2	452	615.8	804.2
Moment of resistance	BSt 500 S	[mm³]	50.3	98.2	169.6	269.4	402.1	785.4	1415	2155	3217

Material quality

Part	Material
rebar BSt 500 S	Geometry and mechanical properties according to DIN 488-2:1986 or E DIN 488-2:2006

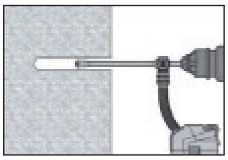
Setting

installation equipment

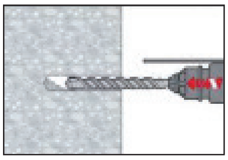
Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
Rotary hammer	TE 2 – TE 16					TE 40– TE 70			
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser								

Setting instructions

Bore hole drilling



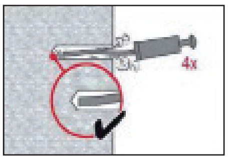
Drill hole to the required embedment depth with an appropriately sized Hilti TE-CD or TE-YD hollow drill bit with Hilti vacuum attachment. This drilling method properly cleans the borehole and removes dust while drilling. After drilling is complete, proceed to the “injection preparation” step in the instructions for use



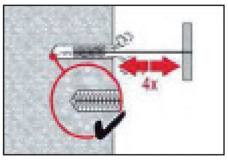
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

Bore hole cleaning **Just before setting an anchor, the bore hole must be free of dust and debris.**

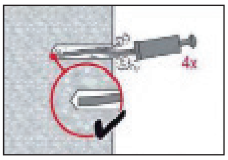
a) Manual Cleaning (MC) non-cracked concrete only for bore hole diameters d_0 ≤ 20mm and bore hole depth h_0 ≤ 10d



The Hilti manual pump may be used for blowing out bore holes up to diameters d_0 ≤ 20 mm and embedment depths up to h_{ef} ≤ 10d.
Blow out at least 4 times from the back of the bore hole until return air stream is free of noticeable dust

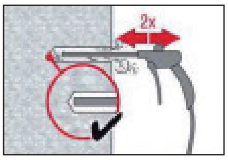


Brush 4 times with the specified brush size by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.

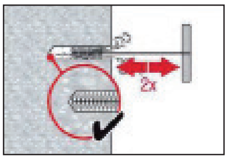


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

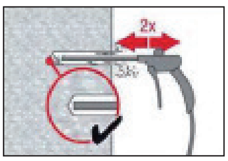
b) Compressed air cleaning (CAC) for all bore hole diameters d_0 and all bore hole depth h_0



Blow 2 times from the back of the hole (if needed with nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6 m³/h) until return air stream is free of noticeable dust. Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m³/hour.



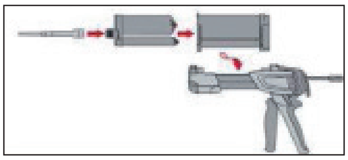
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small and must be replaced with the proper brush diameter.



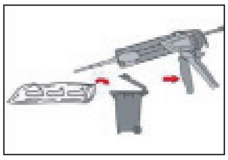
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Setting instructions

Injection preparation



Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT dispenser.



The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.

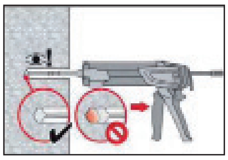
Discard quantities are:

3 strokes for 330 ml foil pack,

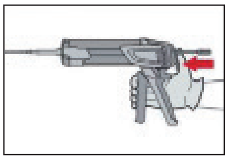
4 strokes for 500 ml foil pack

65 ml for 1400 ml foil pack

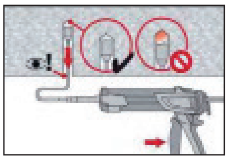
Inject adhesive from the back of the borehole without forming air voids



Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full. It is required that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment length.

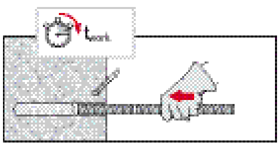


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.



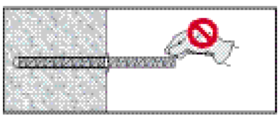
Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.

Setting the element

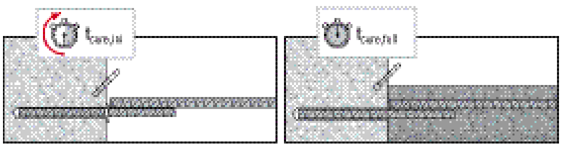


Before use, verify that the element is dry and free of oil and other contaminants.

Mark and set element to the required embedment depth untill working time t_{work} has elapsed



For overhead installation use piston plugs and fix embedded parts with e.g. wedges HIT-OHW



Loading the anchor:

After required curing time t_{cure} the anchor can be loaded.

Curing time for general conditions

Data according ETA-07/0260, issue 2013-06-26		
Temperature of the base material	**Working time in which anchor can be inserted and adjusted t_{gel}**	**Curing time before anchor can be fully loaded t_{cure}**
40 °C	12 min	4 h
30 °C to 39 °C	12 min	8 h
20 °C to 29 °C	20 min	12 h
15 °C to 19 °C	30 min	24 h
10 °C to 14 °C	90 min	48 h
5 °C to 9 °C	120 min	72 h

Setting details

			Data according ETA-07/0260, issue 2013-06-26								
Anchor size			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Nominal diameter of drill bit	d_0	[mm]	12	14	16	18	20	25	32	35	40
Effective anchorage and drill hole depth range a)	$h_{ef,min}$	[mm]	60	60	70	75	80	90	100	112	128
	$h_{ef,max}$	[mm]	160	200	240	280	320	400	500	560	640
Minimum base material thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm	h_{ef} + 2 d_0							
Minimum spacing	s_{min}	[mm]	40	50	60	70	80	100	125	140	160
Minimum edge distance	c_{min}	[mm]	40	50	60	70	80	100	125	140	160

a) hef,min ≤ hef ≤ hef,max (hef: embedment depth)