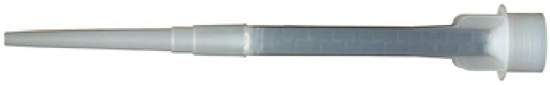
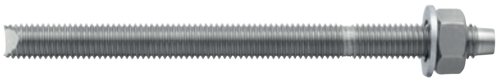
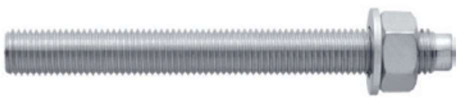
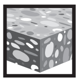
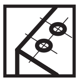
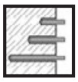
Hilti HIT-RE 500 with HIT-V / HAS in hammer drilled holes

Injection Mortar System		Benefits
	Hilti HIT-RE 500 330 ml foil pack (also available as 500 ml and 1400 ml foil pack)	■ suitable for non-cracked concrete C 20/25 to C 50/60 ■ high loading capacity ■ suitable for dry and water saturated concrete ■ under water application ■ 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
	Static mixer	
	HAS-E rod	
	HIT-V rods HIT-V (Zinc) HIT-V-F (Gal) HIT-V-R (A4-70) HIT-V-HCR rods	


Concrete


Small edge distance & spacing


Variable embedment depth


Fire resistance

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-04/0027 / 2013-06-26
Fire test report	IBMB, Braunschweig	UB 3565 / 4595 / 2006-10-29 UB 3588 / 4825 / 2005-11-15
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26 & suppl. WF 172920 / 2008-05-27

a) All data given in this section according ETA-04/0027, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500 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-04/0027, issue 2013-06-26.

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

The design method is based on the following simplification:

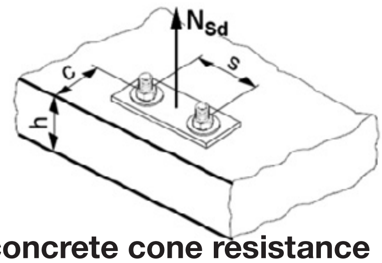
- No different loads are acting on individual anchors (no eccentricity)

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**

  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$ [1]

$N^*_{Rd,p}$ 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

1 Data apply for dry concrete and hammer drilled holes only. For non-dry concrete multiply Nrd,p by the factor 0.83
For diamond cored holes please see chapter "HIT-RE 500 with HIT-V / HAS rods in diamond cored holes"

- **Concrete cone or concrete splitting resistance**

  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$ [2]

$N^*_{Rd,c}$ 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

2 For non dry concrete multiply $N_{Rd,c}$ by the factor 0.83.
The definition of Dry Concrete, as per Hilti is: concrete not in contact with water before/during installation and curing.

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

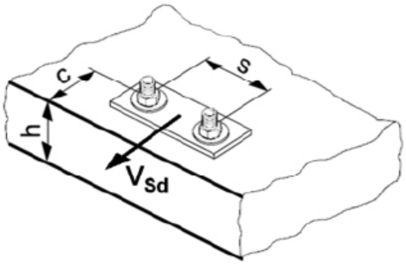
Anchor size			M8	M10	M12	M16	M20	M24	M30
$N_{Rd,s}$	HAS – E 5.8	[kN]	11.3	17.3	25.3	48.0	74.7	106.7	-
	HIT-V 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	187.3
	HIT-V 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	299.3
	HAS-E-R	[kN]	12.3	19.8	28.3	54.0	84.0	119.8	92.0
	HIT-V-R	[kN]	13.9	21.9	31.6	58.8	92.0	132.1	98.3

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

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

STEP 2: SHEAR LOADING

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



- **Design Concrete Edge Resistance**

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

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

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): $V_{Rd,s}$**

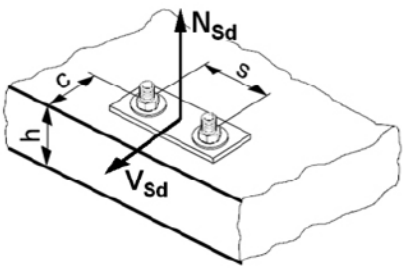
Anchor size			M8	M10	M12	M16	M20	M24	M30
$V_{Rd,s}$	HAS – E 5.8	[kN]	6.8	10.4	15.2	28.8	44.8	64.0	-
	HIT-V 5.8	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	112.0
	HIT-V 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
	HAS-E-R	[kN]	7.7	12,2	17.3	32.7	50.6	71.8	55.5
	HIT-V-R	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	58.8

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

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)
- non-cracked concrete – $f_{c,cyl}$ = 32 MPa
- temperature range I (see service temperature range)
- base material thickness, as specified in the table
- One typical embedment depth, as specified in the tables
- dry concrete, hammer drilled hole
- for non-dry concrete multiply values by the factor 0.83
- for diamond cored holes please see chapter "HIT-RE 500 with HIT-V / HAS rods in diamond cored holes"

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

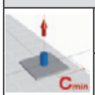
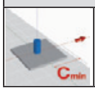
Design resistance [kN] - dry concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete									
Tensile	Pull-out	$N^*_{Rd,p}$	19.2	27.0	39.7	56.4	95.8	132.7	198.1
	Concrete	$N^*_{Rd,c}$	26.1	31.0	42.0	51.0	80.9	111.1	161.9
Shear		$V_{Rd,s}$	Steel governed refer $V_{Rd,s}$ table						

Note: for cracked concrete refer HIT-RE 500-SD section page 205.

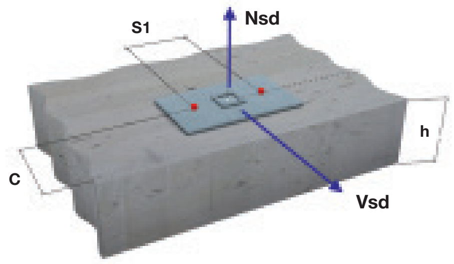
Basic loading data (for a single anchor) – with minimum edge distance

Design resistance [kN] - dry 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 N_{Rd}								
	Pull-out	$N^*_{Rd,p}$	10.4	15.0	22.0	33.2	54.6	74.6
	Concrete	$N^*_{Rd,c}$	12.5	15.1	21.5	30.1	45.6	60.5
Shear V_{Rd}								
	Shear (without lever arm)	$V^*_{Rd,c}$	4.7	6.8	9.3	14.5	21.7	29.8

Two Anchors

Table 1: One edge influence



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 C (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	13.2	13.9	6.3	18.7	18.1	13.2	21.8	20.3	15.4	24.5	26.5	21.0	24.6	29.2	23.2
80	14.8	15.4	7.9	21.0	19.9	15.0	24.4	22.4	17.2	27.5	29.3	22.7	27.5	32.3	24.9
100	15.6	16.1	8.6	22.1	20.9	15.9	25.7	23.5	18.1	28.6	30.7	23.6	28.9	33.8	25.7
120	16.3	16.8	9.4	23.2	21.8	16.9	27.0	24.6	19.0	30.4	32.0	24.5	30.4	35.3	26.6
150	17.5	17.9	9.4	24.8	23.3	18.3	28.9	26.2	20.4	32.5	34.2	25.7	32.5	37.7	27.9
200	19.4	19.8	9.4	27.6	25.7	20.6	32.0	28.9	22.6	36.1	37.7	27.9	36.1	41.5	30.0

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	18.6	17.0	9.0	23.4	20.3	15.0	26.9	22.4	17.4	33.5	28.6	23.4	33.5	35.2	29.3
100	21.2	19.0	11.3	26.8	22.6	17.6	30.7	25.1	19.9	38.3	31.8	25.7	38.3	39.0	31.5
150	23.9	20.9	13.5	30.0	24.7	20.2	34.4	27.5	22.4	43.0	35.0	28.1	43.0	43.0	33.8
200	26.5	22.8	13.5	33.4	27.0	22.8	38.3	30.1	24.9	47.6	38.3	30.4	47.6	46.9	36.1
250	29.0	24.7	13.5	36.6	29.3	24.8	42.0	32.5	27.4	52.3	41.4	32.7	52.3	50.8	38.3
300	30.1	26.6	13.5	37.9	31.6	24.8	43.4	35.2	29.9	54.2	44.6	35.1	54.2	54.7	40.6

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	26.4	24.2	12.3	30.0	26.6	16.7	33.8	29.3	21.4	44.4	36.2	28.2	47.9	43.8	35.0
100	28.9	26.0	14.4	33.0	28.7	18.9	37.2	31.4	23.8	48.7	38.9	30.5	52.6	47.2	37.1
150	32.2	28.3	16.9	36.6	31.2	21.7	41.4	34.2	26.7	54.2	42.4	33.2	58.4	51.2	39.7
200	35.4	30.6	18.5	40.3	33.7	24.5	45.5	37.0	29.7	59.6	45.7	36.0	64.2	55.3	42.4
250	38.6	32.9	18.5	44.0	36.2	26.7	49.7	39.7	32.7	65.2	49.1	38.7	70.1	59.4	45.0
300	41.9	35.2	18.5	47.6	38.8	26.7	53.8	42.5	35.7	70.6	52.6	41.5	76.0	63.6	47.7

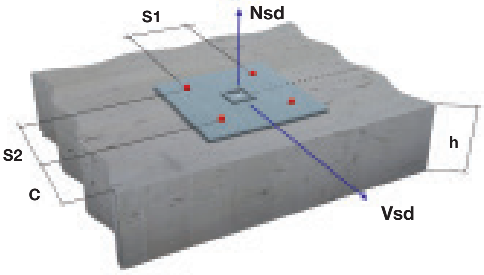
ANCHOR M16	Edge C (mm)														
	80			100			150			200			250		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
80	40.4	36.6	19.3	45.1	40.8	24.4	58.0	52.3	36.2	68.5	61.9	44.1	68.5	61.9	52.0
100	42.2	38.2	20.5	47.2	42.6	25.7	60.5	54.7	37.5	71.5	64.6	45.4	71.5	64.6	53.2
150	46.7	42.2	23.6	52.1	47.0	28.9	66.8	60.5	41.0	79.1	71.4	48.6	79.1	71.4	56.3
200	51.1	46.2	26.6	57.1	51.6	32.1	73.2	66.1	44.4	86.5	78.2	51.9	86.5	78.2	59.4
250	55.6	50.3	29.0	62.0	56.0	35.3	79.6	71.9	47.8	94.1	85.1	55.1	94.1	85.1	62.6
300	60.0	54.2	29.0	67.0	60.6	38.6	85.9	77.3	51.2	101.6	91.8	58.4	101.6	91.8	65.7

ANCHOR M20	Edge C (mm)														
	120			150			200			250			300		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	65.3	52.4	28.9	79.8	61.9	44.0	95.8	72.0	55.5	113.0	82.8	64.6	114.7	94.3	73.5
150	70.7	55.9	32.5	86.4	65.9	48.0	103.6	76.7	59.5	122.3	88.2	68.4	124.2	100.4	77.2
200	76.1	59.3	36.1	93.0	70.0	52.0	111.5	81.4	63.5	131.5	93.6	72.2	133.6	106.1	80.9
250	81.4	62.8	39.7	99.5	74.0	56.0	119.3	86.2	67.4	140.8	99.0	76.0	143.0	112.8	84.6
300	86.8	66.1	43.4	106.1	78.0	60.0	127.2	90.8	71.4	150.0	104.4	79.8	152.4	118.9	88.2
350	92.0	69.6	43.4	112.7	82.1	64.0	135.0	95.5	75.4	159.2	109.8	83.6	161.8	125.2	92.0

ANCHOR M24	Edge C (mm)														
	120			150			200			250			350		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
120	88.9	69.0	39.7	98.3	74.8	49.7	115.1	84.8	67.5	133.0	95.4	77.6	158.0	118.3	97.6
150	92.4	71.2	42.3	102.2	77.0	52.3	119.6	87.5	70.3	138.2	98.4	80.2	164.4	122.0	100.1
200	98.4	74.8	46.4	108.8	81.0	56.6	127.3	91.8	75.0	147.1	103.3	84.7	174.8	128.2	104.2
250	104.3	78.2	50.5	115.3	84.8	61.0	135.0	96.1	79.6	156.0	108.2	89.2	185.4	134.2	108.4
300	110.2	81.8	54.7	121.9	88.7	65.3	142.7	100.6	84.3	164.9	113.2	93.6	196.0	140.2	112.6
350	116.2	85.3	58.8	128.5	92.5	69.7	150.4	104.9	89.0	173.8	118.1	98.1	206.5	146.4	116.8

Four anchors

Table 2: One edge influence



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 C (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	18.5	16.6	12.6	25.1	21.0	17.7	28.8	23.3	19.9	32.0	29.8	25.4	32.0	32.6	30.9
80	24.1	21.2	15.8	31.9	26.4	23.8	36.1	29.2	26.0	40.0	36.6	31.5	40.0	39.8	36.8
100	27.4	23.8	17.2	35.6	29.3	26.8	40.1	32.3	29.0	44.2	40.3	34.4	44.2	43.8	39.7
120	30.6	26.4	18.8	39.5	32.4	29.8	44.3	35.5	32.0	48.7	44.2	37.3	48.7	47.8	42.6
150	35.8	30.7	18.8	45.6	37.2	34.3	50.9	40.8	36.4	55.7	50.2	41.7	55.7	54.2	47.0
200	45.0	38.5	18.8	56.5	46.2	41.2	62.6	50.3	43.7	68.2	61.2	49.0	68.2	65.9	54.2

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	25.1	20.5	17.4	30.6	23.9	21.0	34.6	26.3	23.4	42.0	32.8	29.3	42.0	39.5	35.1
100	34.1	26.6	22.6	40.8	30.6	29.2	45.6	33.4	31.5	54.6	40.9	37.2	54.6	48.8	43.0
150	44.4	33.5	27.0	52.3	38.2	37.2	58.0	41.4	39.4	68.6	50.2	45.1	68.6	59.3	50.7
200	55.9	41.2	27.0	65.2	46.4	45.0	71.9	50.3	47.2	84.2	60.2	52.8	84.2	70.6	58.4
250	68.6	49.6	27.0	79.4	55.7	49.6	87.0	59.3	54.8	101.2	71.2	60.5	101.4	82.9	66.0
300	74.0	58.8	27.0	85.4	65.6	49.6	93.5	70.4	59.8	108.4	83.2	68.0	108.4	96.2	73.5

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	34.3	29.0	24.1	38.3	31.8	26.9	42.6	34.4	29.6	54.2	41.9	36.3	58.0	49.8	42.9
100	42.7	34.8	28.8	47.3	37.8	34.4	52.2	40.8	37.1	65.5	49.0	43.6	69.8	58.0	50.1
150	54.5	42.6	33.8	60.0	46.0	43.4	65.8	49.4	46.2	81.2	58.8	52.7	86.2	68.9	59.1
200	67.7	51.2	37.0	74.0	55.1	49.0	80.6	58.9	55.2	98.5	69.5	61.5	104.2	80.8	67.9
250	82.2	60.6	37.0	89.4	64.8	53.4	97.1	69.2	64.0	117.5	81.0	70.3	124.0	93.6	76.6
300	98.0	70.7	37.0	106.3	75.5	53.4	115.0	80.4	71.4	138.0	93.4	79.0	145.3	107.3	85.2

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	52.6	47.5	37.8	57.7	52.1	40.9	71.6	64.8	48.8	83.2	75.1	56.6	83.2	75.1	64.3
100	58.0	52.4	41.0	63.5	57.5	45.4	78.4	70.9	53.2	90.6	81.8	60.9	90.6	81.8	68.6
150	72.8	65.9	47.2	79.3	71.6	56.3	96.6	86.6	64.0	110.6	100.0	71.5	110.6	100.0	79.1
200	89.4	80.6	53.2	96.7	86.9	64.1	116.6	103.2	74.5	132.7	120.0	82.0	132.7	120.0	89.5
250	107.5	95.9	58.0	115.9	102.8	70.6	138.6	121.2	85.0	156.8	141.1	92.4	156.8	141.7	99.7
300	127.3	112.4	58.0	136.9	120.1	77.2	162.4	140.6	95.2	182.9	163.0	102.6	182.9	165.2	110.0

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	83.8	64.6	55.5	99.6	74.6	64.6	116.9	85.4	73.5	135.4	97.0	82.4	137.3	109.2	91.2
150	100.4	75.2	65.0	118.4	86.4	77.2	137.8	98.3	86.0	158.5	110.9	94.7	160.7	124.3	103.4
200	118.9	86.8	72.2	139.0	99.0	89.6	160.4	112.0	98.2	183.6	125.8	106.8	186.0	140.4	115.4
250	138.7	99.0	79.4	160.9	112.4	101.7	184.9	126.6	110.3	210.5	141.6	118.8	213.1	157.4	127.3
300	160.0	112.1	86.8	184.7	126.6	113.7	211.0	142.0	122.2	239.2	158.3	130.7	242.0	175.4	139.1
350	182.9	126.0	86.8	210.0	141.7	125.6	238.9	158.4	134.0	269.6	175.9	142.4	272.9	194.4	150.8

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	113.4	84.2	75.5	123.7	90.4	81.6	141.8	101.0	91.6	161.2	111.7	101.5	188.2	136.7	121.2
150	124.3	90.7	84.2	135.2	97.2	90.2	154.6	108.4	100.1	175.0	120.2	109.9	203.5	145.6	129.4
200	143.5	102.1	92.8	155.6	109.1	104.2	176.8	121.2	114.0	199.2	133.8	123.7	230.4	161.0	142.9
250	164.2	114.1	101.0	177.4	121.6	118.0	200.5	134.6	127.7	225.0	148.2	137.2	259.1	177.4	156.3
300	186.2	126.7	109.4	200.6	134.8	130.6	225.7	148.7	141.1	252.5	163.3	150.6	289.3	194.5	169.5
350	208.9	140.0	117.6	225.2	148.7	139.4	252.5	163.6	154.5	281.4	179.2	163.9	321.2	212.4	182.6

Materials

Mechanical properties of HIT-V / HAS

			Data according ETA-04/0027, issue 2013-06-26							Additional Hilti technical data
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**
Nominal tensile strength f_{uk}	HIT-V/HAS 5.8	[N/mm²]	500	500	500	500	500	500	500	500
	HIT-V/HAS 8.8	[N/mm²]	800	800	800	800	800	800	800	800
	HIT-V/HAS -R	[N/mm²]	700	700	700	700	700	700	500	500
	HIT-V/HAS -HCR	[N/mm²]	800	800	800	800	800	700	700	500
Yield strength f_{yk}	HIT-V/HAS 5.8	[N/mm²]	400	400	400	400	400	400	400	400
	HIT-V/HAS 8.8	[N/mm²]	640	640	640	640	640	640	640	640
	HIT-V/HAS -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	HAS	[mm²]	32.8	52.3	76.2	144	225	324	519	759
	HIT-V	[mm²]	36.6	58.0	84.3	157	245	353	561	817
Section Modulus Z	HAS	[mm³]	27.0	54.1	93.8	244	474	809	1706	2949
	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
	HAS-E-5.8	[Nm]	13	26	45	118	227	389	NA	NA
	HAS-E-8.8	[Nm]	NA	NA	NA	NA	NA	NA	1310	2265
	HAS-E-R	[Nm]	15	29	51	131	255	436	430	743
	HAS-E-HCR	[Nm]	21	42	72	187	364	389	819	1011

Material quality

Part	Material
Threaded rod HIT-V(F), HAS 5.8 M8 – M24	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), HAS 8.8 M27 – M39	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, HAS-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, HAS-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)	M36 a)
Anchor rod HAS, HAS-E,HAS-R, HAS-ER HAS-HCR	M8x80	M10x90	M12x110	M16x125	M20x170	M24x210	M30x270	M36x330
Anchor embedment depth [mm]	80	90	110	125	170	210	270	330
Anchor rod HIT-V, HIT-V-R, HIT-V-HCR	Anchor rods HIT-V (-R / -HCR) are available in variable length							

a) M30 and M36 please use anchor design software PROFIS anchor.

Setting

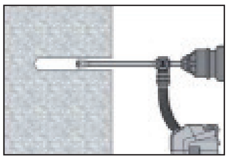
Installation equipment

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

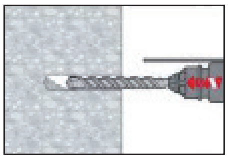
Bore hole drilling

a) Hilti hollow drill bit (for dry and wet concrete only)



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 system removes the dust and cleans the bore hole while drillin when used in accordance with the user's manual.
After drilling is complete, proceed to the "injection preparation" step in the instructions for use.

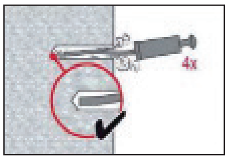
b) Hammer drilling (dry or wet concrete and installation in flooded holes (no sea water))



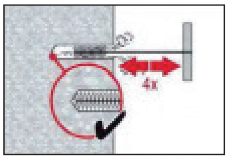
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

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

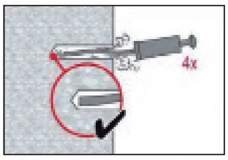
a) Manual Cleaning (MC) for bore hole diameters d_0 ≤ 20mm and bore hole depth h_0 ≤ 20d or h_0 ≤ 250 mm (d = diameter of element)



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

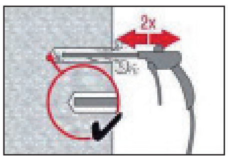


Brush 4 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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

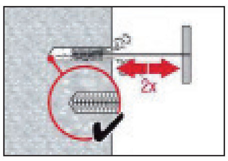


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

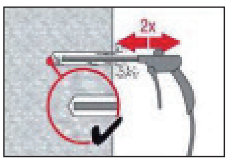
b) Compressed air cleaning (CAC) for all bore hole diameters d_0 and all bore hole depth h_0



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 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.

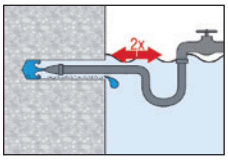


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

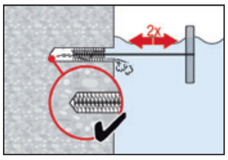
Setting instructions

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

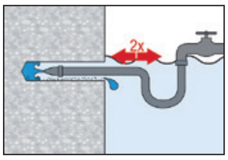
c) Cleaning for under water for all bore hole diameters d_0 and all bore hole depth h_0



Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

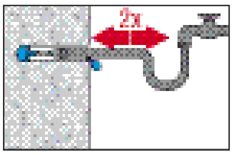


Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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

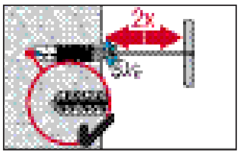


Flush the hole again 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

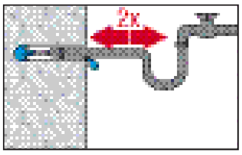
d) Cleaning of hammer drilled flooded holes for all bore hole diameters d_0 and all bore hole depth h_0



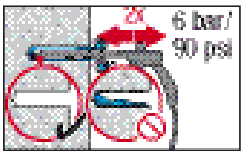
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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.

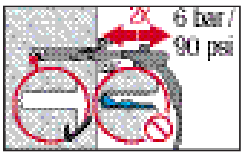


Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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 m^3/h) until return air stream is free of noticeable dust and water
Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m^3/hour.

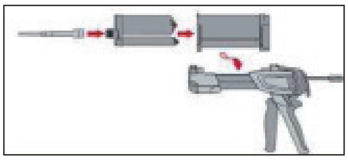
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



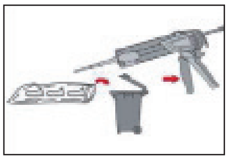
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Setting instructions

Injection preparation

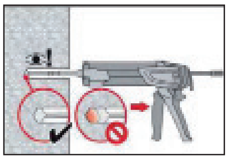


Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT dispenser.

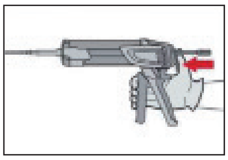


The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:
3 strokes for 330 ml foil pack,
4 strokes for 500 ml foil pack
65 ml for 1400 ml foil pack

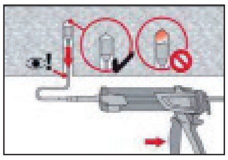
Inject adhesive from the back of the borehole without forming air voids



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.

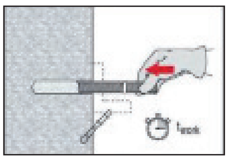


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

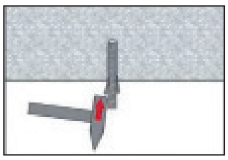


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole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

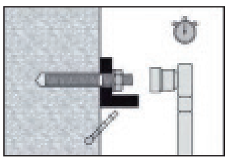
Setting the element



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

For dry concrete curing times may be reduced according to the following table. For installation temperatures below +5 °C all load values have to be reduced according to the load reduction factors given below.

Curing time for dry concrete

Additional Hilti technical data			
Temperature of the base material	Reduced curing time before anchor can be fully loaded $t_{cure,dry}$	Working time in which anchor can be inserted and adjusted t_{gel}	Load reduction factor
40 °C	4 h	12 min	1
30 °C	8 h	12 min	1
20 °C	12 h	20 min	1
15 °C	18 h	30 min	1
10 °C	24 h	90 min	1
5 °C	36 h	120 min	1
0 °C	50 h	3 h	0.7
-5 °C	72 h	4 h	0.6

Setting details

			Data according ETA-04/0027, issue 2013-06-26							Additional Hilti technical data
Anchor size			M8	M10	M12	M16	M20	M24	M30	M36
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	24	28	35	40
Effective anchorage and drill hole depth range a)	$h_{ef,min}$	[mm]	40	40	48	64	80	96	120	144
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	600	720
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	39
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	150	180
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	150	180
Torque moment b)	T_{max} b)	[Nm]	10	20	40	80	150	200	300	360

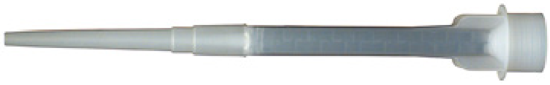
a) hef,min ≤ hef ≤ hef,max (hef: embedment depth)

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

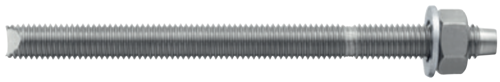
Hilti HIT-RE 500 with HIT-V / HAS in diamond drilled holes

Injection Mortar System

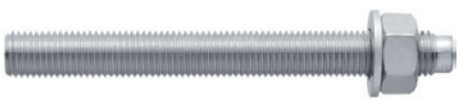
Hilti HIT-RE 500
330 ml foil pack
(also available as 500 ml
and 1400 ml foil pack)



Static mixer



HAS-E rod



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

Benefits

- suitable for non-cracked concrete C 20/25 to C 50/60
- high loading capacity
- suitable for dry and water saturated concrete
- under water application
- 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 | Small edge distance & spacing | Variable embedment depth | Corrosion resistance | High corrosion resistance | Diamond drilled holes | PROFIS anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-04/0027 / 2013-06-26
Fire test report	IBMB, Braunschweig	UB 3565 / 4595 / 2006-10-29 UB 3588 / 4825 / 2005-11-15
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26 & suppl. WF 172920 / 2008-05-27

a) All data given in this section according ETA-04/0027, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500 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-04/0027, issue 2013-06-26.

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

The design method is based on the following simplification:

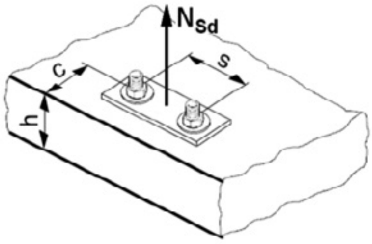
- No different loads are acting on individual anchors (no eccentricity)

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**
  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$ [1]

$N^*_{Rd,p}$ 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

1 Data apply for wet concrete and diamond cored holes.
For hammer drilled holes please see chapter “HIT-RE 500 with HIT-V / HAS rods in hammer drilled holes”.

- **Concrete cone or concrete splitting resistance**
  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$ [2]

$N^*_{Rd,c}$ 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

2 Data apply for wet concrete and diamond cored holes.
For hammer drilled holes please see chapter “HIT-RE 500 with HIT-V / HAS rods in hammer drilled holes”.

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

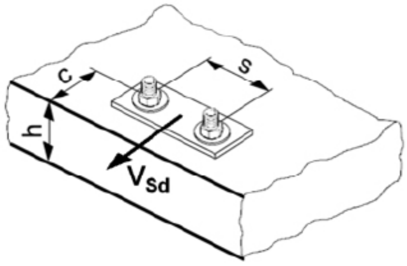
Anchor size			M8	M10	M12	M16	M20	M24	M30
$N_{Rd,s}$	HAS – E 5.8	[kN]	11.3	17.3	25.3	48.0	74.7	106.7	-
	HIT-V 5.8	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	187.3
	HIT-V 8.8	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	299.3
	HAS-E-R	[kN]	12.3	19.8	28.3	54.0	84.0	119.8	92.0
	HIT-V-R	[kN]	13.9	21.9	31.6	58.8	92.0	132.1	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**
  $V_{Rd,c} = f_B \cdot V^*_{Rd,c}$

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

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): $V_{Rd,s}$**

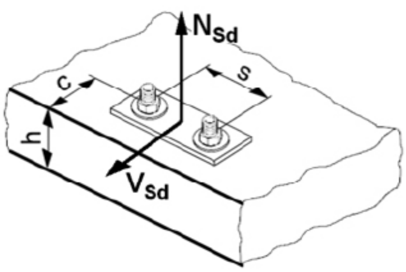
Anchor size			M8	M10	M12	M16	M20	M24	M30
$V_{Rd,s}$	HAS – E 5.8	[kN]	6.8	10.4	15.2	28.8	44.8	64.0	-
	HIT-V 5.8	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	112.0
	HIT-V 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2
	HAS-E-R	[kN]	7.7	12,2	17.3	32.7	50.6	71.8	55.5
	HIT-V-R	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	58.8

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

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

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)
- non-cracked concrete – $f_{c,cyl}$ = 32 MPa
- temperature range I (see service temperature range)
- base material thickness, as specified in the table
- One typical embedment depth, as specified in the tables
- wet concrete, diamond cored holes
- for hammer drilled holes please see chapter “HIT-RE 500 with HIT-V / HAS rods in hammer drilled holes”

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

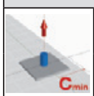
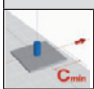
Anchor size	M8	M10	M12	M16	M20	M24	M30
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210	270
Base material thickness h [mm]	110	120	150	200	250	300	350

Design resistance [kN] - wet concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete									
Tensile	Pull-out	$N^*_{Rd,p}$	15.2	21.4	31.4	37.6	58.6	79.0	108.0
	Concrete	$N^*_{Rd,c}$	25.4	30.3	40.9	42.5	67.4	92.6	135.0
Shear		$V_{Rd,s}$	Steel governed refer $V_{Rd,s}$ table						

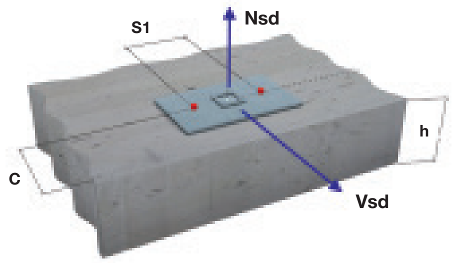
Basic loading data (for a single anchor) – with minimum edge distance

Design resistance [kN] - wet 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 N_{Rd}								
	Pull-out	$N^*_{Rd,p}$	8.5	12.0	17.7	22.2	34.1	47.0
	Concrete	$N^*_{Rd,c}$	12.1	14.7	20.9	25.1	38.0	50.4
Shear V_{Rd}								
	Shear (without lever arm)	$V^*_{Rd,c}$	4.7	6.8	9.3	14.5	21.7	29.8

Two Anchors

Table 1: One edge influence



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 C (mm)														
	40			80			100			150			170		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	11.4	13.5	6.3	16.6	17.6	13.1	19.5	19.8	15.4	20.4	25.8	21.0	20.4	28.4	23.2
80	12.8	14.9	7.9	18.6	19.4	15.0	21.9	21.8	17.2	22.8	28.5	22.7	22.8	31.4	24.9
100	13.5	15.6	8.7	19.6	20.3	15.9	23.0	22.9	18.1	24.0	29.9	23.9	24.0	32.9	25.8
120	14.1	16.4	9.4	20.6	21.2	16.9	24.2	23.9	19.0	25.2	31.2	24.5	25.2	34.4	26.6
150	15.1	17.4	9.4	22.0	22.6	18.3	25.9	25.5	20.4	27.0	33.2	25.7	27.0	36.6	27.9
200	16.8	19.2	9.4	24.4	24.9	20.6	28.6	28.1	22.7	29.8	36.6	27.9	29.8	40.3	30.0

ANCHOR M10	Edge C (mm)														
	50			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
50	15.6	16.6	9.0	19.8	19.7	15.0	22.7	21.9	17.5	27.9	27.8	23.4	27.9	34.1	29.3
100	17.6	18.4	11.3	22.3	21.9	17.6	25.6	24.3	19.9	31.4	30.9	25.8	31.4	38.0	31.6
150	19.6	20.3	13.5	24.8	24.1	20.2	28.5	26.8	22.4	35.0	34.0	28.1	35.0	41.8	33.8
200	21.6	22.2	13.5	27.3	26.3	22.8	31.4	29.2	24.9	38.5	37.2	30.5	38.5	45.6	36.1
250	23.5	24.0	13.5	29.7	28.5	24.9	34.2	31.7	27.4	41.9	40.3	32.8	41.9	49.4	38.3
300	24.0	25.9	13.5	30.4	30.7	24.9	35.0	34.1	29.9	42.8	43.4	35.1	42.8	53.8	40.6

ANCHOR M12	Edge C (mm)														
	60			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	22.6	23.5	12.3	25.8	25.9	16.7	29.2	28.5	21.4	38.6	35.2	28.3	40.2	42.6	35.0
100	24.6	25.3	14.4	28.1	27.9	18.9	31.8	30.6	23.8	42.0	37.8	30.5	43.8	45.8	37.1
150	27.1	27.5	17.0	30.9	30.3	21.7	35.0	33.3	26.8	46.3	41.1	33.2	48.2	49.8	39.8
200	29.6	29.7	18.5	33.8	32.8	24.5	38.3	35.9	29.8	50.6	44.5	36.0	52.7	53.8	42.4
250	32.0	31.9	18.5	36.6	35.2	26.7	41.5	38.6	32.7	54.8	47.8	38.8	57.1	57.8	45.1
300	34.5	34.1	18.5	39.4	37.6	26.7	44.6	41.3	35.7	58.9	51.1	41.6	61.4	61.8	47.7

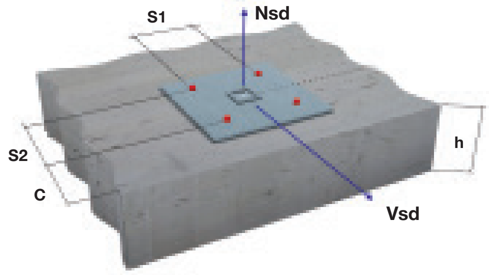
ANCHOR M16	Edge C (mm)														
	80			100			150			200			250		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
80	27.9	30.5	19.4	31.2	34.0	24.4	40.0	43.6	36.2	47.3	51.6	44.1	47.3	51.6	52.0
100	29.1	33.7	20.6	32.4	35.5	25.7	41.6	45.6	37.6	49.2	53.8	45.4	49.2	53.8	53.2
150	31.9	36.9	23.6	35.6	39.2	28.9	45.7	50.4	41.0	54.0	59.5	48.7	54.0	59.5	56.4
200	34.7	38.5	26.6	38.7	43.0	32.1	49.7	55.1	44.4	58.7	65.2	51.9	58.7	65.2	59.5
250	37.5	41.8	29.1	41.9	46.7	35.3	53.7	59.9	47.8	63.5	70.9	55.2	63.5	70.9	62.6
300	40.3	45.2	29.1	45.0	50.5	38.6	57.7	64.4	51.2	68.2	76.5	58.4	68.2	76.5	65.7

ANCHOR M20	Edge C (mm)														
	120			150			200			250			300		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	42.9	45.9	28.9	52.8	51.6	44.1	63.7	60.0	55.6	73.7	69.0	64.6	73.7	78.6	73.6
150	46.2	46.6	32.5	56.9	54.9	48.1	68.7	63.9	59.5	79.4	73.5	68.4	79.4	83.7	77.2
200	49.5	53.4	36.2	61.0	58.3	52.1	73.6	67.8	63.5	85.1	78.0	72.2	85.1	88.8	80.9
250	52.8	52.3	39.8	65.1	61.7	56.1	78.6	71.8	67.5	90.8	82.5	76.0	90.8	94.0	84.6
300	56.2	55.2	43.4	69.2	65.0	60.0	83.5	75.7	71.4	96.5	87.0	79.8	96.5	99.1	88.3
350	59.5	58.0	43.4	73.3	68.4	64.1	88.4	79.6	75.4	102.2	91.5	83.6	102.2	104.3	92.0

ANCHOR M24	Edge C (mm)														
	120			150			200			250			350		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
120	59.8	57.5	39.8	66.8	62.3	49.7	79.3	70.7	67.5	92.8	79.5	77.6	100.5	98.6	97.6
150	62.2	59.3	42.3	69.5	64.2	52.3	82.5	72.9	70.3	96.5	82.0	80.3	104.5	101.7	100.1
200	66.1	62.3	46.4	73.9	67.5	56.7	87.7	76.5	75.0	102.7	86.1	84.7	111.2	106.8	104.3
250	70.1	65.2	50.6	78.3	70.7	61.0	93.0	80.1	79.7	108.8	90.2	89.2	117.9	111.8	108.5
300	74.1	68.2	54.7	82.8	73.9	65.4	98.3	83.8	84.4	115.0	94.3	93.7	124.5	116.9	112.6
350	78.0	71.1	58.9	87.2	77.1	69.7	103.5	87.4	89.1	121.1	98.4	98.1	131.2	122.0	116.8

Four anchors

Table 2: One edge influence



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 C (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	16.9	16.1	12.6	23.4	20.4	17.7	27.0	22.7	19.9	28.0	29.0	25.4	28.0	31.7	30.9
80	22.0	20.6	15.8	29.6	25.6	23.8	33.7	28.3	26.0	34.9	35.6	31.5	34.9	38.7	36.8
100	24.8	23.1	17.4	32.9	28.5	26.9	37.4	31.3	29.0	38.6	39.2	34.4	38.6	42.5	39.8
120	27.7	25.7	18.8	36.3	31.4	29.9	41.1	34.5	32.0	42.4	42.9	37.4	42.4	46.5	42.7
150	32.2	29.9	18.8	41.7	36.2	34.3	46.9	39.6	36.4	48.3	48.8	41.8	48.3	52.7	47.0
200	40.1	37.5	18.8	51.0	44.9	41.2	57.0	48.9	43.7	58.6	59.5	49.0	58.6	64.1	54.2

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	22.4	19.9	17.5	27.4	23.2	21.0	31.0	25.5	23.4	37.2	31.8	29.3	37.2	38.4	35.1
100	29.7	25.9	22.6	35.6	29.8	29.2	39.8	32.5	31.6	47.0	39.8	37.3	47.0	47.5	43.0
150	37.8	32.6	27.0	44.7	37.1	37.2	49.6	40.2	39.5	57.9	48.7	45.1	57.9	57.6	50.8
200	46.7	40.0	27.0	54.6	45.2	45.0	60.2	48.8	47.3	69.7	58.5	52.8	69.7	68.6	58.4
250	56.2	48.2	27.0	65.2	54.1	49.8	71.5	58.2	54.8	82.2	69.2	60.5	82.2	80.6	66.0
300	58.9	57.2	27.0	68.1	63.8	49.8	74.7	68.5	59.8	85.6	80.8	68.1	85.6	93.6	73.6

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	31.6	28.3	24.2	35.5	30.9	26.9	39.6	33.5	29.6	50.7	40.7	36.3	52.6	48.5	42.9
100	38.6	33.8	28.8	43.0	36.7	34.5	47.6	39.7	37.1	60.0	47.6	43.7	62.1	56.3	50.2
150	48.3	41.4	34.0	53.3	44.7	43.4	58.6	48.1	46.2	72.7	57.1	52.7	75.1	66.9	59.1
200	58.8	49.8	37.0	64.5	53.5	49.0	70.5	57.3	55.2	86.5	67.5	61.6	89.2	78.5	67.9
250	70.2	58.9	37.0	76.6	63.0	53.4	83.3	67.3	64.0	101.3	78.7	70.3	104.3	90.9	76.6
300	82.3	68.7	37.0	89.5	73.4	53.4	97.0	78.1	71.4	116.9	90.8	79.0	120.3	104.3	85.3

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	38.1	39.6	37.8	41.8	43.5	41.0	51.9	54.0	48.8	60.2	62.6	56.6	60.2	62.6	64.3
100	41.7	43.7	41.2	45.7	47.9	45.4	56.4	59.1	53.2	65.1	68.2	60.9	65.1	74.6	68.6
150	51.4	54.9	46.2	56.0	59.7	56.3	68.2	72.2	64.6	78.1	83.3	71.6	78.1	83.3	79.1
200	62.2	67.2	53.2	67.3	72.4	64.2	81.1	86.0	74.6	92.3	99.9	82.1	92.3	99.9	89.5
250	73.8	79.9	58.2	79.6	85.7	70.6	95.1	101.0	85.0	107.6	117.6	92.4	107.6	118.1	99.8
300	86.3	93.7	58.2	92.8	101.0	77.2	110.1	117.3	95.3	124.0	135.8	102.6	124.0	137.7	110.0

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	58.5	53.8	55.6	70.0	62.2	64.6	82.5	71.2	73.6	93.9	80.8	82.4	93.9	91.0	91.2
150	69.5	62.7	65.0	82.3	72.0	77.2	96.2	81.9	86.0	108.8	92.4	94.8	108.8	103.6	103.4
200	81.4	72.3	72.4	95.6	82.5	89.6	110.9	93.3	98.3	124.7	104.8	106.9	124.7	117.0	115.5
250	94.2	82.5	79.6	109.8	93.7	101.8	126.6	105.5	110.3	141.7	118.0	118.9	141.8	131.2	127.3
300	107.8	93.4	86.8	124.9	105.5	113.8	143.3	118.3	122.3	159.8	131.9	130.7	159.8	146.2	139.1
350	122.2	105.0	86.8	140.9	118.1	125.6	160.9	132.0	134.1	178.8	146.6	142.4	178.8	162.0	150.8

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	82.6	70.2	75.6	90.8	75.3	81.6	105.4	84.2	91.6	120.9	93.7	101.6	129.8	113.9	121.2
150	90.4	75.6	84.3	99.1	80.1	90.2	114.4	90.3	100.1	130.8	100.2	110.0	140.2	121.3	129.4
200	104.1	85.1	92.8	113.6	90.9	104.3	130.3	101.0	114.0	148.2	111.5	123.7	158.4	134.3	143.0
250	118.6	95.1	101.2	129.0	101.3	118.1	147.2	112.2	127.7	166.6	123.5	137.3	177.6	147.9	156.3
300	134.1	105.6	109.4	145.3	112.3	130.8	165.0	123.9	141.2	186.0	136.1	150.7	197.9	162.1	169.5
350	150.3	116.7	117.8	162.5	123.9	139.4	183.8	136.3	154.5	206.4	149.3	163.9	219.2	177.0	182.6

Materials

Mechanical properties of HIT-V / HAS

			Data according ETA-04/0027, issue 2013-06-26							Additional Hilti technical data
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**
Nominal tensile strength f_{uk}	HIT-V/HAS 5.8	[N/mm²]	500	500	500	500	500	500	500	500
	HIT-V/HAS 8.8	[N/mm²]	800	800	800	800	800	800	800	800
	HIT-V/HAS -R	[N/mm²]	700	700	700	700	700	700	500	500
	HIT-V/HAS -HCR	[N/mm²]	800	800	800	800	800	700	700	500
Yield strength f_{yk}	HIT-V/HAS 5.8	[N/mm²]	400	400	400	400	400	400	400	400
	HIT-V/HAS 8.8	[N/mm²]	640	640	640	640	640	640	640	640
	HIT-V/HAS -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	HAS	[mm²]	32.8	52.3	76.2	144	225	324	519	759
	HIT-V	[mm²]	36.6	58.0	84.3	157	245	353	561	817
Section Modulus Z	HAS	[mm³]	27.0	54.1	93.8	244	474	809	1706	2949
	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
	HAS-E-5.8	[Nm]	13	26	45	118	227	389	NA	NA
	HAS-E-8.8	[Nm]	NA	NA	NA	NA	NA	NA	1310	2265
	HAS-E-R	[Nm]	15	29	51	131	255	436	430	743
	HAS-E-HCR	[Nm]	21	42	72	187	364	389	819	1011

Material quality

Part	Material
Threaded rod HIT-V(F), HAS 5.8 M8 – M24	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), HAS 8.8 M27 – M39	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, HAS-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, HAS-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)	M36 a)
Anchor rod HAS, HAS-E,HAS-R, HAS-ER HAS-HCR	M8x80	M10x90	M12x110	M16x125	M20x170	M24x210	M30x270	M36x330
Anchor embedment depth [mm]	80	90	110	125	170	210	270	330
Anchor rod HIT-V, HIT-V-R, HIT-V-HCR	Anchor rods HIT-V (-R / -HCR) are available in variable length							

a) M30 and M36 please use anchor design software PROFIS anchor.

Setting

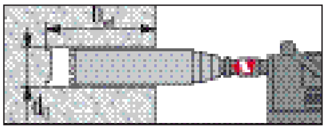
Installation equipment

Anchor size	M8	M10	M12	M16	M20	M24	M30
Drilling tools	DD EC-1, DD 100...DD XXX						
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser						

Setting instructions

Bore hole drilling

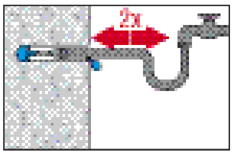
Diamond cored holes (for dry and wet concrete only)



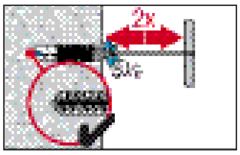
Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

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

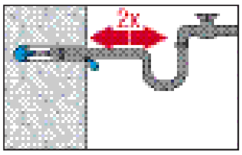
Cleaning of diamond cored hole for all bore hole diameters d_0 and all bore hole depth h_0



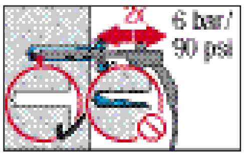
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



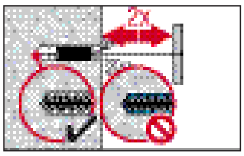
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



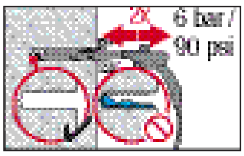
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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 m^3/h) until return air stream is free of noticeable dust and water
Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m^3/hour.



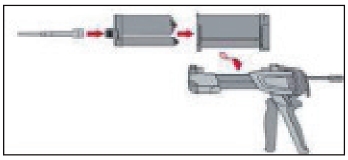
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



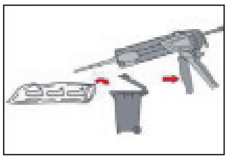
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

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.

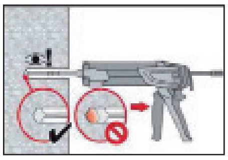
Discard quantities are:

3 strokes for 330 ml foil pack,

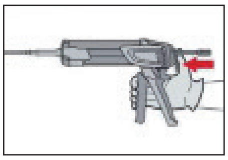
4 strokes for 500 ml foil pack

65 ml for 1400 ml foil pack

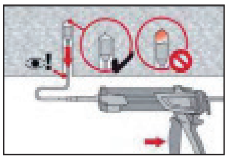
Inject adhesive from the back of the borehole without forming air voids



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.

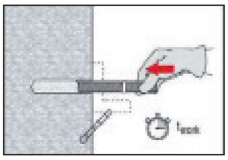


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

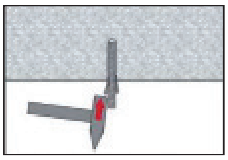


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole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

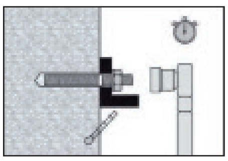
Setting the element



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-04/0027, issue 2013-06-26							Additional Hilti technical data
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**	**M36**
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	24	28	35	40
Effective anchorage and drill hole depth range a)	$h_{ef,min}$	[mm]	40	40	48	64	80	96	120	144
	$h_{ef,max}$	[mm]	160	200	240	320	400	480	600	720
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	39
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	150	180
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	150	180
Torque moment b)	T_{max} b)	[Nm]	10	20	40	80	150	200	300	360

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 with rebar in hammer drilled holes

Injection Mortar System		Benefits
	Hilti HIT-RE 500 330 ml foil pack (also available as 500 ml and 1400 ml foil pack)	■ suitable for non-cracked concrete C 20/25 to C 50/60 ■ high loading capacity ■ suitable for dry and water saturated concrete ■ under water application ■ large diameter applications ■ high corrosion resistant ■ long working time at elevated temperatures ■ odourless epoxy ■ embedment depth range: from 60 ... 160 mm for Ø8 to 128 ... 640 mm for Ø32
	Static mixer	
	Rebar BSt 500 S	

Concrete | Small edge distance & spacing | Variable embedment depth | 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-04/0027 / 2013-06-26

a) All data given in this section according ETA-04/0027, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500 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-04/0027, issue 2013-06-26.

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

The design method is based on the following simplification:

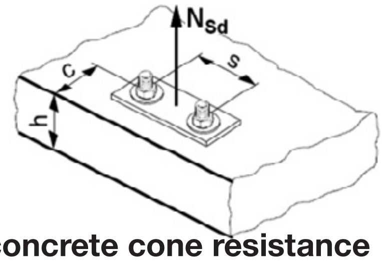
- No different loads are acting on individual anchors (no eccentricity)

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**
  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$ [1]

$N^*_{Rd,p}$ 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

1 Data apply for dry concrete and hammer drilled holes only. For non-dry concrete multiply Nrd,p by the factor 0.83
For diamond cored holes please see chapter “HIT-RE 500 with rebar in diamond cored holes”

- **Concrete cone or concrete splitting resistance**
  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$ [2]

$N^*_{Rd,c}$ 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

2 For non dry concrete multiply $N_{Rd,c}$ by the factor 0.83.
The definition of Dry Concrete, as per Hilti is: concrete not in contact with water before/during installation and curing.

- **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

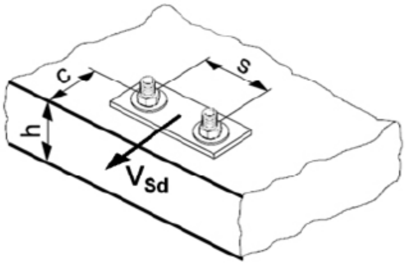
$$N_{Rd} = \min\{ N_{Rd,p}, N_{Rd,c}, N_{Rd,s} \}$$

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

STEP 2: SHEAR LOADING

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

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



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

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

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

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

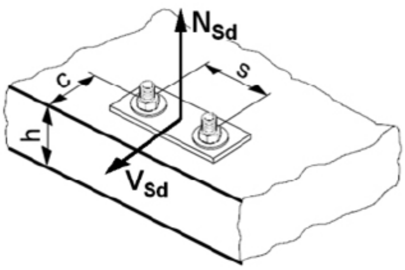
STEP 3: COMBINED TENSION AND SHEAR LOADING

The following equations must be satisfied:

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

and

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



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)
- non-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
- for non-dry concrete multiply values by the factor 0.83
- for diamond cored holes please see chapter "HIT-RE 500 with rebar in diamond cored holes"

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 – dry concrete – no edge and spacing influences

Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	60	60	72	96	120	144	168	192
Base material thickness		[mm]	100	100	104	136	170	210	238	272
Tensile Single anchor no edge										
Pull-out	$N^*_{Rd,p}$	[kN]	13.6	16.9	24.4	40.4	63.1	88.0	115.1	150.2
Concrete	$N^*_{Rd,c}$	[kN]	16.9	16.9	22.2	34.3	48.0	63.0	79.4	97.1
Shear Single anchor no edge										
Shear	$V_{Rd,s}$	[kN]	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		[mm]	80	90	110	125	170	210	270	300
Base material thickness		[mm]	110	120	142	165	220	270	340	380
Tensile Single anchor no edge										
Pull-out	$N^*_{Rd,p}$	[kN]	18.0	25.4	37.2	52.7	89.5	128.4	184.9	234.8
Concrete	$N^*_{Rd,c}$	[kN]	26.0	31.2	42.0	51.0	80.9	111.0	161.9	189.6
Shear Single anchor no edge										
Shear	$V_{Rd,s}$	[kN]	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		[mm]	96	120	144	192	240	288	336	384
Base material thickness		[mm]	126	150	176	232	290	348	406	464
Tensile Single anchor no edge										
Pull-out	$N^*_{Rd,p}$	[kN]	21.7	33.8	48.7	80.9	126.4	176.0	230.0	300.5
Concrete	$N^*_{Rd,c}$	[kN]	34.3	48.0	63.1	97.1	135.7	178.3	224.8	274.7
Shear Single anchor no edge										
Shear	$V_{Rd,s}$	[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

Single anchor – minimum edge distance influence

Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	60	60	72	96	120	144	168	192
Base material thicknes		[mm]	100	100	104	136	170	210	238	272
Edge Dist $c = c_{min}$		[mm]	40	50	60	80	100	120	140	160
Tensile Single anchor min edge										
Pull-out	$N^*_{Rd,p}$	[kN]	8.2	11.4	16.4	27.2	42.6	60.7	77.5	101.3
Concrete	$N^*_{Rd,c}$	[kN]	9.8	11.0	13.0	19.8	27.7	37.9	46.0	56.2
Shear Single anchor min edge										
Shear (without lever arm)	$V^*_{Rd,c}$	[kN]	4.4	6.2	8.4	13.6	19.9	28.6	35.0	43.8

Embedment 2

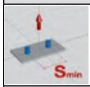
Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	80	90	110	125	170	210	270	300
Base material thicknes		[mm]	110	120	142	165	220	270	340	380
Edge Dist $c = c_{min}$		[mm]	40	50	60	80	100	125	140	160
Tensile Single anchor min edge										
Pull-out	$N^*_{Rd,p}$	[kN]	9.8	14.0	20.5	31.1	50.9	73.4	103.8	131.5
Concrete	$N^*_{Rd,c}$	[kN]	12.5	15.1	20.2	25.8	39.6	54.7	76.4	90.2
Shear Single anchor min edge										
Shear (without lever arm)	$V^*_{Rd,c}$	[kN]	4.7	6.7	9.3	14.5	21.7	31.6	40.0	49.8

Embedment 3

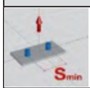
Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	96	120	144	192	240	288	336	384
Base material thicknes		[mm]	126	150	176	232	290	348	406	464
Edge Dist $c = c_{min}$		[mm]	40	50	60	80	100	125	140	160
Tensile Single anchor min edge										
Pull-out	$N^*_{Rd,p}$	[kN]	11.8	18.5	26.5	44.8	69.8	98.9	129.2	168.7
Concrete	$N^*_{Rd,c}$	[kN]	15.4	21.5	28.2	43.4	60.7	82.3	100.6	122.8
Shear Single anchor min edge										
Shear (without lever arm)	$V^*_{Rd,c}$	[kN]	4.9	7.2	9.9	16.3	23.9	34.7	42.8	53.9

2 Anchors – min spacing influence

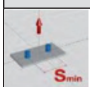
Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	60	60	72	96	120	144	168	192
Base material thicknes		[mm]	100	100	104	136	170	210	238	272
Spacing Dist s= s_{min}		[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}										
 Pull-out	$N^*_{Rd,p}$	[kN]	17.5	21.6	31.2	51.6	80.8	113.5	147.0	101.3
Concrete	$N^*_{Rd,c}$	[kN]	20.5	21.4	26.9	41.3	57.7	77.4	95.6	56.2
Shear V_{Rd}										
$V_{Rd,s}$ steel (per anchor)		[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.6	147.3
$V^*_{Rd,c}$ pryout		[kN]	N/A				113.0	190.0	236.9	289.5

Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	80	90	110	125	170	210	270	300
Base material thicknes		[mm]	110	120	142	165	220	270	340	380
Spacing Dist s= s_{min}		[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}										
 Pull-out	$N^*_{Rd,p}$	[kN]	23.4	31.9	45.7	64.0	107.2	151.4	220.0	279.4
Concrete	$N^*_{Rd,c}$	[kN]	29.2	35.0	47.2	58.3	91.4	125.8	180.5	211.9
Shear V_{Rd}										
$V_{Rd,s}$ steel (per anchor)		[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.6	147.3

Embedment 3

Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	96	120	144	192	240	288	336	384
Base material thicknes		[mm]	126	150	176	232	290	348	406	464
Spacing Dist s= s_{min}		[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}										
 Pull-out	$N^*_{Rd,p}$	[kN]	28.4	43.7	61.7	101.0	152.9	210.1	273.8	357.6
Concrete	$N^*_{Rd,c}$	[kN]	37.4	52.4	68.9	106.1	148.2	199.9	245.5	300.0
Shear V_{Rd}										
$V_{Rd,s}$ steel (per anchor)		[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.6	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	452.0	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

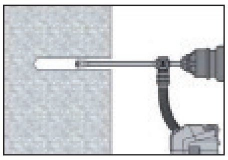
installation equipment

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø28	Ø32
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

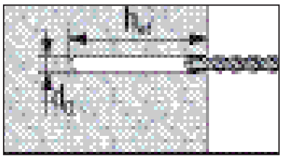
Bore hole drilling

a) Hilti hollow drill bit (for dry and wet concrete only)



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 system removes the dust and cleans the bore hole while drillin when used in accordance with the user's manual.
After drilling is complete, proceed to the "injection preparation" step in the instructions for use.

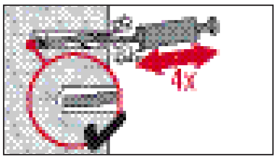
b) Hammer drilling (dry or wet concrete and installation in flooded holes (no sea water))



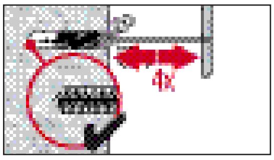
Drill Hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.

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

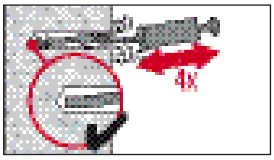
a) Manual Cleaning (MC) for bore hole diameters d_0 ≤ 20mm and bore hole depth h_0 ≤ 20d or h_0 ≤ 250 mm (d = diameter of element)



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

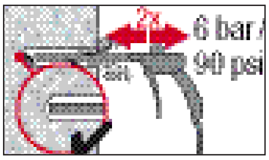


Brush 4 times with the specified brush size (brush Ø ≥ bore hole Ø) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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

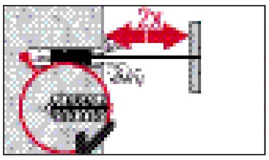


Blow out again with manual pump at least 4 times until return air stream is free of noticeable dust.

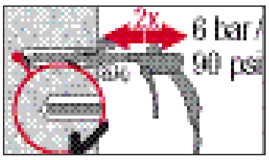
b) Compressed air cleaning (CAC) for all bore hole diameters d_0 and all bore hole depth h_0



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 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.

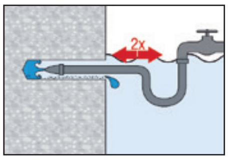


Blow again with compressed air 2 times until return air stream is free of noticeable dust.

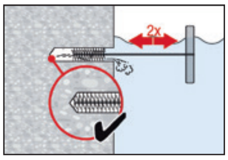
Setting instructions

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

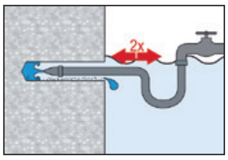
c) Cleaning for under water for all bore hole diameters d_0 and all bore hole depth h_0



Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

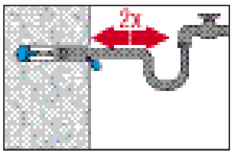


Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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

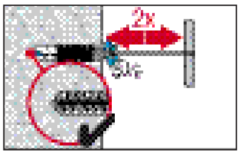


Flush the hole again 2 times by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.

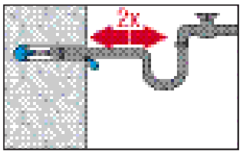
d) Cleaning of hammer drilled flooded holes for all bore hole diameters d_0 and all bore hole depth h_0



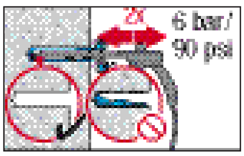
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



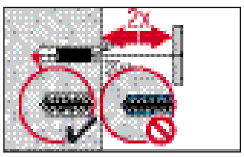
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



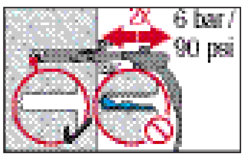
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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 m^3/h) until return air stream is free of noticeable dust and water
Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m^3/hour.



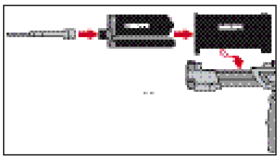
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



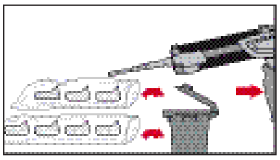
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

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.

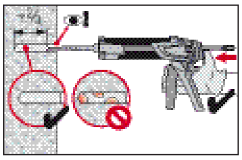
Discard quantities are:

3 strokes for 330 ml foil pack,

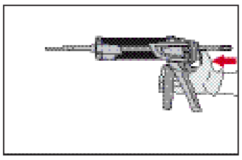
4 strokes for 500 ml foil pack

65 ml for 1400 ml foil pack

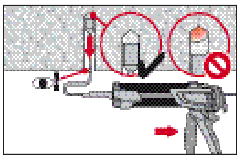
Inject adhesive from the back of the borehole without forming air voids



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.

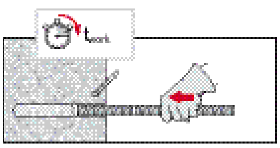


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

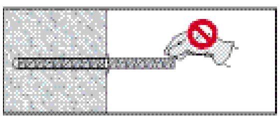


Overhead installation and/or installation with embedment depth h_{ef} > 250mm.
For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole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

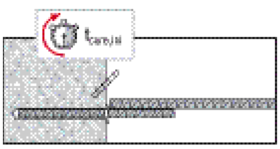
Setting the element

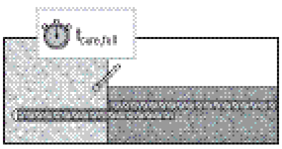


Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth untill working time t_{work} has elapsed



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-04/0027, 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

For dry concrete curing times may be reduced according to the following table. For installation temperatures below +5 °C all load values have to be reduced according to the load reduction factors given below.

Curing time for dry concrete

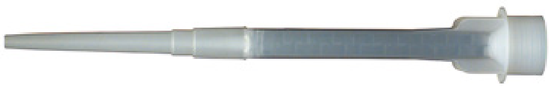
Additional Hilti technical data			
Temperature of the base material	**Reduced curing time before anchor can be fully loaded $t_{cure,dry}$**	**Working time in which anchor can be inserted and adjusted t_{gel}**	**Load reduction factor**
40 °C	4 h	12 min	1
30 °C	8 h	12 min	1
20 °C	12 h	20 min	1
15 °C	18 h	30 min	1
10 °C	24 h	90 min	1
5 °C	36 h	120 min	1
0 °C	50 h	3 h	0.7
-5 °C	72 h	4 h	0.6

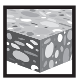
Setting details

			Data according ETA-04/0027, 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)

Hilti HIT-RE 500 with rebar in diamond drilled holes

Injection Mortar System	Benefits
 Hilti HIT-RE 500 330 ml foil pack (also available as 500 ml and 1400 ml foil pack)  Static mixer  Rebar BSt 500 S	■ suitable for non-cracked concrete C 20/25 to C 50/60 ■ high loading capacity ■ suitable for dry and water saturated concrete ■ under water application ■ large diameter applications ■ high corrosion resistant ■ long working time at elevated temperatures ■ odourless epoxy ■ embedment depth range: from 60 ... 160 mm for Ø8 to 128 ... 640 mm for Ø32


Concrete


Small edge distance & spacing


Variable embedment depth


Diamond drilled holes


PROFIS anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-04/0027 / 2013-06-26

a) All data given in this section according ETA-04/0027, issue 2013-06-26.

Service temperature range

Hilti HIT-RE 500 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-04/0027, issue 2013-06-26.

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

The design method is based on the following simplification:

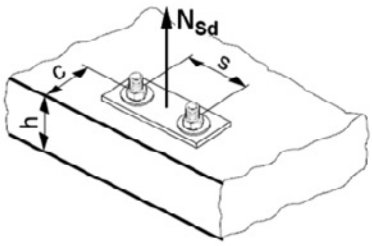
- No different loads are acting on individual anchors (no eccentricity)

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**
  $N_{Rd,p} = f_{B,p} \cdot N^*_{Rd,p}$ [1]

$N^*_{Rd,p}$ 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	24	32	40	50
$f_{B,p}$	0.95	0.97	1.00	1.02	1.04

1 Data apply for wet concrete and diamond cored holes.
For hammer drilled holes please see chapter "HIT-RE 500 with rebar in hammer drilled holes".

- **Concrete cone or concrete splitting resistance**
  $N_{Rd,c} = f_B \cdot N^*_{Rd,c}$ [2]

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

f_B influence of concrete strength on concrete cone resistance

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	24	32	40	50
f_B	0.79	0.87	1.00	1.11	1.22

2 Data apply for wet concrete and diamond cored holes.
For hammer drilled holes please see chapter "HIT-RE 500 with rebar in hammer drilled holes".

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

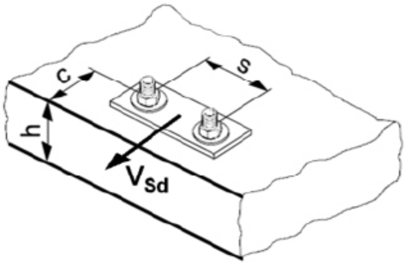
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
$N_{Rd,s}$	BSt 500 S	[kN]	20.0	30.7	44.3	60.7	79.3	123.6	177.8	242.1	315.7

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

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

STEP 2: SHEAR LOADING

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



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

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

f_B influence of concrete strength

Concrete Strengths $f'_{c,cyl}$ (MPa)	20	24	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 $V_{Rd,s}$**

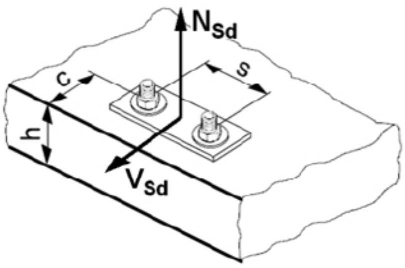
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
$V_{Rd,s}$	BSt 500 S	[kN]	9.3	14.7	20.7	28.0	36.7	57.3	83.0	112.7	147.3

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

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)
- non-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
- wet concrete, diamond cored holes
- for hammer drilled holes please see chapter "HIT-RE 500 with rebar in hammer drilled holes"

The following tables give design values for 3 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

Embedment 1

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

Embedment 2

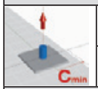
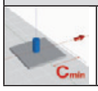
Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	80	90	110	125	170	210	270	300
Base material thickness		[mm]	110	120	142	165	220	274	340	380
Tensile Single anchor no edge										
Pull-out	$N^*_{Rd,p}$	[kN]	14.0	19.8	29.0	34.5	53.3	70.0	94.8	105.4
Concrete	$N^*_{Rd,c}$	[kN]	25.4	30.3	40.9	42.5	67.4	92.6	135.0	158.1
Shear Single anchor no edge										
Shear	$V_{Rd,s}$	[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

Embedment 3

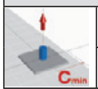
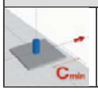
Design Resistance $f_{c,cyl}$ - 32Mpa										
Rebar size			**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth		[mm]	96	120	144	192	240	288	336	384
Base material thickness		[mm]	126	150	176	232	290	352	406	464
Tensile Single anchor no edge										
Pull-out	$N^*_{Rd,p}$	[kN]	16.9	26.3	37.9	53.0	75.3	96.0	118.0	134.9
Concrete	$N^*_{Rd,c}$	[kN]	33.4	46.6	61.3	80.9	113.1	148.7	187.3	228.9
Shear Single anchor no edge										
Shear	$V_{Rd,s}$	[kN]	9.3	14.7	20.7	36.7	57.3	83.0	112.7	147.3

Single anchor – minimum edge distance influence

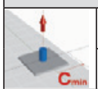
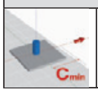
Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa		Ø8	Ø10	Ø12	Ø16	Ø20	Ø24	Ø28	Ø32
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	[mm]	60	60	72	96	120	144	168	192
Base material thickness	[mm]	100	100	104	136	170	210	238	272
Edge Dist c= c_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile Single anchor min edge									
 Pull-out $N^*_{Rd,p}$	[kN]	6.3	8.9	12.8	17.9	25.4	33.1	39.8	45.5
Concrete $N^*_{Rd,c}$	[kN]	9.6	10.7	12.7	16.5	23.1	31.7	38.3	46.8
Shear Single anchor min edge									
 Shear $V^*_{Rd,c}$ (without lever arm)	[kN]	4.4	6.2	8.4	13.6	19.9	28.6	35.0	43.8

Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa		Ø8	Ø10	Ø12	Ø16	Ø20	Ø24	Ø28	Ø32
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	[mm]	80	90	110	125	170	210	270	300
Base material thickness	[mm]	110	120	142	165	220	274	340	380
Edge Dist c= c_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile Single anchor min edge									
 Pull-out $N^*_{Rd,p}$	[kN]	8.0	11.3	16.5	20.4	31.7	43.2	59.5	68.4
Concrete $N^*_{Rd,c}$	[kN]	12.1	14.7	19.6	21.5	33.1	45.6	63.8	75.3
Shear Single anchor min edge									
 Shear $V^*_{Rd,c}$ (without lever arm)	[kN]	4.7	6.7	9.3	14.5	21.7	31.6	40.0	49.8

Embedment 3

Design Resistance $f_{c,cyl}$ - 32Mpa		Ø8	Ø10	Ø12	Ø16	Ø20	Ø24	Ø28	Ø32
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	[mm]	96	120	144	192	240	288	336	384
Base material thickness	[mm]	126	150	176	232	290	352	406	464
Edge Dist c= c_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile Single anchor min edge									
 Pull-out $N^*_{Rd,p}$	[kN]	9.6	15.0	21.7	30.8	44.8	59.3	74.0	87.5
Concrete $N^*_{Rd,c}$	[kN]	15.0	20.9	27.4	36.2	50.6	67.1	83.8	102.4
Shear Single anchor min edge									
 Shear $V^*_{Rd,c}$ (without lever arm)	[kN]	4.9	7.2	9.9	16.3	23.9	34.7	42.8	53.9

2 Anchors – min spacing influence

Embedment 1

Design Resistance $f_{c,cyl}$ - 32Mpa									
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	[mm]	60	60	72	96	120	144	168	192
Base material thickness	[mm]	100	100	104	136	170	210	238	272
Spacing Dist s= s_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}									
Pull-out $N^*_{Rd,p}$	[kN]	14.2	17.8	25.0	34.5	48.8	63.3	77.7	90.1
Concrete $N^*_{Rd,c}$	[kN]	19.9	20.8	26.2	34.4	48.1	64.5	79.7	97.4
Shear V_{Rd}									
$V_{Rd,s}$ steel (per anchor)	[kN]	9.3	14.7	20.7	36.7	57.3	83	112.6	147.3
$V^*_{Rd,c}$ pryout	[kN]	N/A					177.2	217.5	252.3

Embedment 2

Design Resistance $f_{c,cyl}$ - 32Mpa									
Rebar size		**Ø8**	**Ø10**	**Ø12**	**Ø16**	**Ø20**	**Ø24**	**Ø28**	**Ø32**
Embedment depth	[mm]	80	90	110	125	170	210	270	300
Base material thickness	[mm]	110	120	142	165	220	270	340	380
Spacing Dist s= s_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}									
Pull-out $N^*_{Rd,p}$	[kN]	19.1	26.2	37.9	44.3	69.0	92.6	127.9	144.8
Concrete $N^*_{Rd,c}$	[kN]	28.4	34.1	45.9	48.6	76.2	104.8	150.4	176.7
Shear V_{Rd}									
$V_{Rd,s}$ steel (per anchor)	[kN]	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	[mm]	96	120	144	192	240	288	336	384
Base material thickness	[mm]	126	150	176	232	290	348	406	464
Spacing Dist s= s_{min}	[mm]	40	50	60	80	100	125	140	160
Tensile N_{Rd}									
Pull-out $N^*_{Rd,p}$	[kN]	23.1	35.7	50.8	70.6	100.8	130.6	161.9	188.6
Concrete $N^*_{Rd,c}$	[kN]	36.5	51.0	67.0	88.4	123.5	162.9	204.6	250.0
Shear V_{Rd}									
$V_{Rd,s}$ steel (per anchor)	[kN]	9.3	14.7	20.7	36.7	57.3	90	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	452.0	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

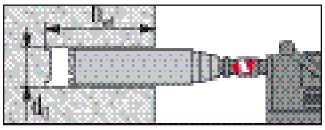
installation equipment

Anchor size	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø28	Ø32
Drilling tools	DD EC-1, DD 100 ... DD xxx								
Other tools	compressed air gun or blow out pump, set of cleaning brushes, dispenser								

Setting instructions

Bore hole drilling

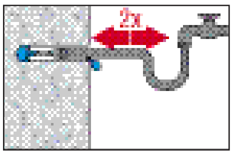
Diamond coring



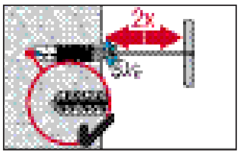
Diamond coring is permissible when diamond core drilling machine and the corresponding core bit are used.

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

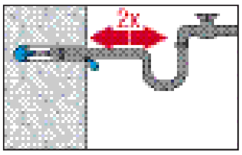
Cleaning of diamond cored holes for all bore hole diameters d_0 and all bore hole depth h_0



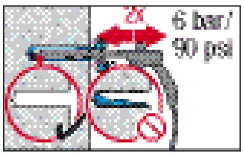
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



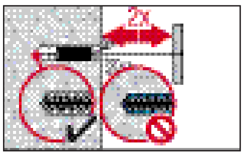
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



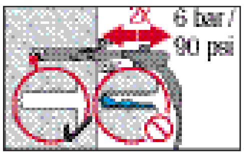
Flush 2 times the hole by inserting a water hose (water-line pressure) to the back of the hole until water runs clear.



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 m^3/h) until return air stream is free of noticeable dust and water
Bore hole diameter ≥ 32 mm the compressor must supply a minimum air flow of 140 m^3/hour.



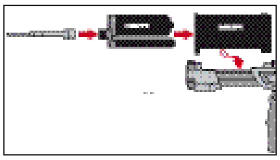
Brush 2 times with the specified brush size (brush ∅ ≥ bore hole ∅) by inserting the steel brush Hilti HIT-RB to the back of the hole (if needed with extension) in a twisting motion and removing it.
The brush must produce natural resistance as it enters the bore hole -- if not the brush is too small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



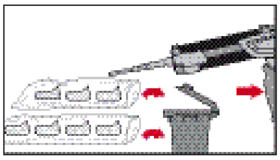
Blow again with compressed air 2 times until return air stream is free of noticeable dust.

Setting instructions

Injection preparation

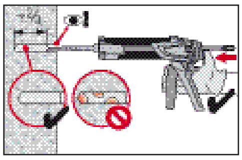


Tightly attach new Hilti mixing nozzle HIT-RE-M to foil pack manifold (snug fit). Do not modify the mixing nozzle. Observe the instruction for use of the dispenser. Check foil pack holder for proper function. Do not use damaged foil packs / holders. Swing foil pack holder with foil pack into HIT dispenser.

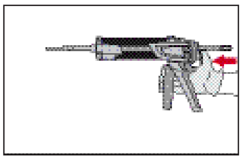


The foil pack opens automatically as dispensing is initiated. Discard initial adhesive. Depending on the size of the foil pack an initial amount of adhesive has to be discarded.
Discard quantities are:
3 strokes for 330 ml foil pack,
4 strokes for 500 ml foil pack
65 ml for 1400 ml foil pack

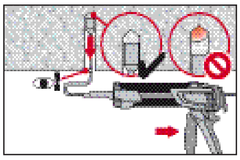
Inject adhesive **from the back of the borehole without forming air voids**



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.

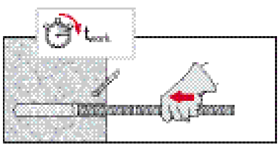


After injection is completed, depressurise the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.

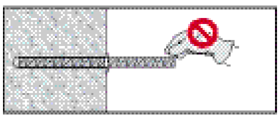


Overhead installation and/or installation with embedment depth h_{ef} > 250mm. For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble HIT-RE-M mixer, extension(s) and appropriately sized piston plug HIT-SZ. Insert piston plug to back of the hole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

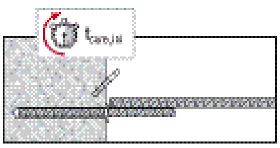
Setting the element

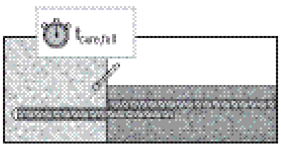


Before use, verify that the element is dry and free of oil and other contaminants.
Mark and set element to the required embedment depth untill working time t_{work} has elapsed



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 rebar 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-04/0027, issue 2013-06-26								Additional Hilti technical data
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)