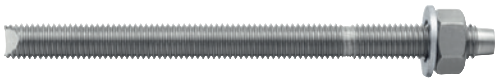
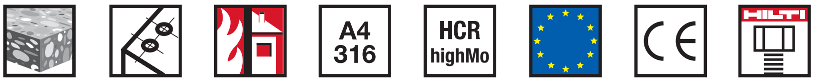
HVU with HAS-E rod adhesive anchor

Mortar System		Benefits
	Hilti HVU foil capsule	■ suitable for non-cracked concrete C 20/25 to C 50/60 ■ high loading capacity ■ suitable for dry and water saturated concrete ■ large diameter applications ■ high corrosion resistant
	HAS rods HAS-E (Zinc) HAS-E-F (Gal) HAS-E-R (A4-70) HAS-HCR rods	



Concrete | Small edge distance & spacing | Fire resistance | Corrosion resistance | High corrosion resistance | European Technical Approval | CE conformity | PROFIS anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-05/0255 / 2011-06-23
Fire test report	IBMB, Braunschweig	UB-3333/0891-1 / 2004-03-26
Fire test report ZTV-Tunnel	IBMB, Braunschweig	UB 3333/0891-2 / 2003-08-12
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-05/0255, issue 2011-06-23

Service temperature range

Hilti HVU adhesive 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 +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °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 the design method according to ETAG 001, Annex C and Hilti simplified design method. Design resistance according to data given in ETA-05/0255, issue 2011-06-23.

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

The design method is based on the following simplification:

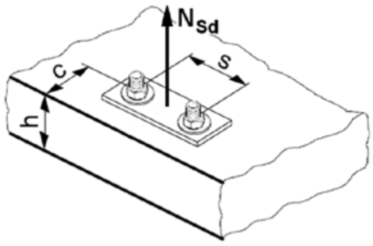
- No different loads are acting on individual anchors (no eccentricity)

The values are valid for the anchor configuration.

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

STEP 1: TENSION LOADING

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



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

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

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

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

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

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

f_B influence of concrete strength on concrete cone resistance

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

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

Anchor size			M8	M10	M12	M16	M20	M24
$N_{Rd,s}$	HAS – E 5.8	[kN]	11.3	17.3	25.3	48.0	74.7	106.7
	HAS-E-R	[kN]	12.3	19.8	28.3	54.0	84.0	119.8

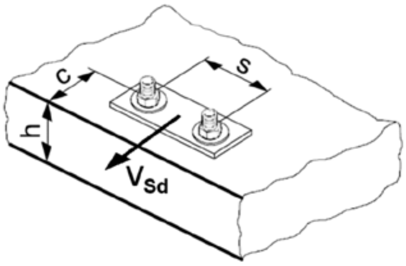
$$N_{Rd} = \min\{ N_{Rd,p}, N_{Rd,c}, N_{Rd,s} \}$$

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
$V_{Rd,s}$	HAS – E 5.8	[kN]	6.8	10.4	15.2	28.8	44.8	64.0
	HAS-E-R	[kN]	7.7	11.5	17.3	32.7	50.6	71.8

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

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

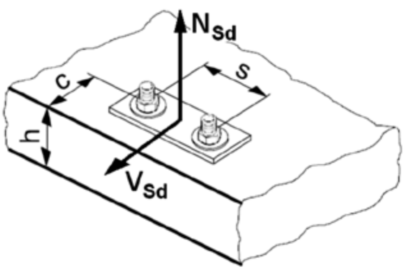
STEP 3: COMBINED TENSION AND SHEAR LOADING

The following equations must be satisfied:

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

and

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



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
- One typical embedment depth, as specified in the tables

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

Embedment depth and base material thickness for the basic loading data

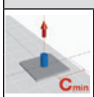
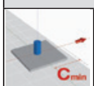
Anchor size	M8	M10	M12	M16	M20	M24
Typical embedment depth h_{ef} [mm]	80	90	110	125	170	210
Base material thickness h [mm]	110	120	140	170	220	270

Design resistance [kN] – uncracked concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20	M24
Non-cracked concrete								
Tensile	Pull-out	$N^*_{Rd,p}$	17.9	25.0	35.8	42.9	82.3	100.2
	Concrete	$N^*_{Rd,c}$	30.5	36.4	49.1	59.5	94.4	129.6
Shear		$V_{Rd,s}$	Steel governed refer $V_{Rd,s}$ table					

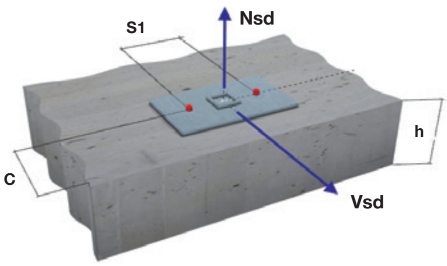
Basic loading data (for a single anchor) – with minimum edge distance

Design resistance [kN] - uncracked concrete, 32 Mpa

Anchor size		M8	M10	M12	M16	M20	M24
Min. edge distance	c_{min} [mm]	40	45	55	65	90	120
Min Base thickness	h_{min} [mm]	110	120	140	170	220	270
Tensile N_{Rd}							
	Pull-out $N^*_{Rd,p}$ [kN]	10.1	13.6	19.7	23.6	46.0	61.3
	Concrete $N^*_{Rd,c}$ [kN]	14.5	17.1	23.0	28.5	44.9	63.0
Shear V_{Rd}							
	Shear (without lever arm) $V^*_{Rd,c}$	4.7	5.9	8.3	11.2	19.1	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	140	170	220	270

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	13.6	16.2	6.3	19.9	21.1	13.1	23.5	23.7	15.4	24.1	30.9	21.0	24.1	34.1	23.2
80	15.3	17.9	7.9	22.3	23.3	15.0	26.3	26.2	17.2	27.0	34.2	22.7	27.0	37.6	24.9
100	16.1	18.8	8.7	23.5	24.4	15.9	27.7	27.4	18.1	28.4	35.8	23.6	28.4	39.4	25.8
120	16.9	19.6	9.4	24.7	25.5	16.9	29.1	28.7	19.0	29.8	37.4	24.5	29.8	41.2	26.6
150	18.1	20.9	9.4	26.5	27.2	18.3	31.2	30.6	20.4	31.9	39.9	25.7	31.9	43.9	27.9
200	20.0	23.0	9.4	29.3	29.9	20.6	34.5	33.7	22.7	35.4	43.9	27.9	35.4	48.4	30.0

ANCHOR M10	Edge C (mm)														
	45			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
45	17.6	19.1	7.9	23.3	23.3	14.8	26.9	25.9	17.2	32.4	33.0	23.2	32.4	40.5	29.1
100	20.2	21.5	10.3	26.7	26.3	17.6	30.8	29.2	19.9	37.1	37.1	25.8	37.1	45.5	31.6
150	22.4	23.6	11.8	29.7	28.9	20.2	34.3	32.1	22.4	41.3	40.9	28.1	41.3	50.1	33.8
200	24.7	25.8	11.8	32.7	31.5	22.8	37.7	35.1	24.9	45.4	45.6	30.5	45.4	54.7	36.0
250	26.9	28.0	11.8	35.6	34.2	24.9	41.1	38.0	27.4	49.5	48.3	32.8	49.5	59.3	38.3
300	27.2	30.1	11.8	36.0	36.8	24.9	41.6	41.0	29.9	50.1	52.1	35.1	50.1	63.9	40.6

ANCHOR M12	Edge C (mm)														
	55			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
55	25.3	25.5	11.1	30.1	28.7	16.4	34.2	31.4	20.4	45.5	38.5	27.0	46.0	46.3	33.5
100	27.9	27.6	13.3	33.2	31.1	18.9	37.7	34.0	23.0	50.1	41.7	29.4	50.7	50.1	35.8
150	30.7	29.9	15.8	36.6	33.7	21.7	41.5	36.8	25.9	55.2	45.2	32.1	55.9	54.3	38.4
200	33.6	32.2	16.6	39.9	36.3	24.5	45.4	39.6	28.8	60.3	48.7	34.8	61.0	58.5	41.0
250	36.4	34.6	16.6	43.3	38.9	26.7	49.1	42.5	31.6	65.4	52.1	37.5	66.1	62.7	43.5
300	39.1	36.9	16.6	46.5	41.5	26.7	52.9	45.3	34.5	70.3	55.6	40.2	71.1	66.9	46.1

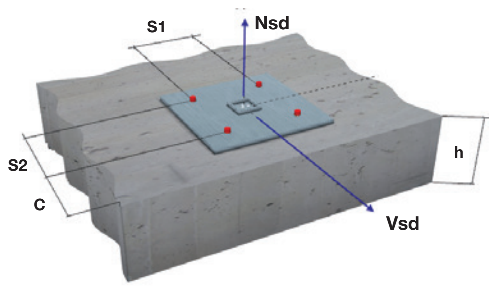
ANCHOR M16	Edge C (mm)														
	65			100			150			200			250		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
65	30.4	32.0	15.0	37.2	37.1	23.5	48.0	45.1	32.4	55.3	53.7	39.8	55.3	63.0	47.0
100	32.4	33.8	17.0	39.7	39.3	25.7	51.2	47.7	34.6	58.9	56.8	41.9	58.9	66.6	49.1
150	35.3	36.5	19.8	43.2	42.4	28.9	55.8	51.4	37.8	64.2	61.2	44.9	64.2	71.9	52.0
200	38.1	39.2	22.4	46.7	45.4	32.1	60.3	55.1	40.9	69.4	65.7	47.9	69.4	77.1	54.8
250	41.0	41.8	22.4	50.2	48.5	35.3	64.8	58.9	44.1	74.6	70.1	50.9	74.6	82.3	57.7
300	43.8	44.5	22.4	53.6	51.6	38.6	69.2	62.6	47.2	79.7	74.6	53.9	79.7	87.5	60.6

ANCHOR M20	Edge C (mm)														
	90			150			200			250			300		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
90	56.9	50.1	25.4	73.5	59.9	42.8	88.8	68.6	51.4	101.9	77.9	59.9	101.9	87.7	68.3
150	62.4	53.6	29.7	80.5	64.1	47.5	97.3	73.4	55.8	111.6	83.4	64.2	111.6	93.9	72.5
200	66.9	56.5	33.2	86.4	67.6	51.5	104.3	77.4	59.6	119.7	87.9	67.7	119.7	99.0	75.9
250	71.4	59.5	36.7	92.2	71.1	55.4	111.4	81.4	63.6	127.8	92.4	71.3	127.8	104.1	79.4
300	75.9	62.4	38.1	98.1	74.6	59.4	118.4	85.4	67.0	135.9	97.0	74.9	135.9	109.2	82.8
350	80.4	65.3	38.1	103.9	78.0	63.4	125.4	89.4	70.7	143.9	101.5	78.4	143.9	114.3	86.3

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	80.5	70.9	39.8	90.5	76.3	49.7	108.2	85.7	64.0	127.4	95.6	73.6	131.6	116.8	92.6
150	83.7	72.9	42.3	94.1	78.5	52.3	112.5	88.1	66.7	132.4	98.3	76.2	136.8	120.1	95.0
200	89.0	76.3	46.4	100.0	82.1	56.7	119.6	92.2	71.1	140.8	102.8	80.4	145.5	125.6	98.9
250	94.4	79.6	50.6	106.0	85.6	61.0	126.7	96.2	75.6	149.2	107.2	84.6	154.2	131.0	102.9
300	99.6	82.9	54.7	111.9	89.2	65.4	133.8	100.2	80.0	157.5	111.7	88.9	162.8	136.5	106.9
350	104.9	86.2	58.9	117.8	92.8	69.7	140.9	104.2	84.5	165.8	116.2	93.1	171.4	142.0	110.8

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	140	170	220	270

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	20.2	19.3	12.6	28.2	24.4	17.7	32.6	27.2	19.9	33.3	34.8	25.4	33.3	38.1	30.9
80	26.5	24.7	15.7	35.7	30.7	23.8	40.8	34.0	26.0	41.6	42.7	31.4	41.6	46.5	36.8
100	29.8	27.7	17.3	39.7	34.1	26.9	45.2	37.6	29.0	46.0	47.0	34.4	46.0	51.0	39.8
120	33.3	30.8	18.9	43.9	37.7	29.9	49.7	41.4	32.0	50.6	51.5	37.4	50.6	55.8	42.7
150	38.8	35.8	18.9	50.4	43.5	34.3	56.7	47.5	36.4	57.7	58.6	41.8	57.7	63.3	47.0
200	48.3	45.0	18.9	61.6	53.9	41.2	68.9	58.6	43.7	70.0	71.4	49.0	70.0	76.9	54.2

ANCHOR M10	Edge C (mm)														
	45			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1= s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
45	17.3	22.6	15.7	32.1	27.1	20.2	36.5	29.9	22.6	43.1	37.3	28.5	43.1	45.1	34.3
100	34.6	30.3	20.6	42.9	35.7	29.2	48.1	39.0	31.6	56.0	47.8	37.3	56.0	57.0	43.0
150	44.2	38.2	23.6	54.0	44.5	37.2	60.0	48.3	39.5	69.1	58.5	45.1	69.1	69.1	50.8
200	54.7	47.0	23.6	65.9	54.2	45.0	72.8	58.6	47.3	83.1	70.2	52.9	83.1	82.4	58.4
250	65.9	56.7	23.6	78.6	64.9	49.8	86.4	69.9	54.8	98.0	83.1	60.5	98.0	96.8	66.0
300	67.5	67.3	23.6	80.4	76.6	49.8	88.3	82.2	59.8	100.2	97.0	68.1	100.2	112.3	73.6

ANCHOR M12	Edge C (mm)														
	55			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	t	n	shear
s1= s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
55	35.7	30.2	22.1	41.5	33.5	25.1	46.5	36.4	27.7	60.0	43.9	34.2	60.6	52.0	40.6
100	45.0	36.7	26.6	51.6	40.5	33.3	57.2	43.7	35.8	72.5	52.1	42.2	73.2	61.3	48.5
150	56.3	44.7	31.7	63.9	49.0	43.4	70.4	52.6	44.7	87.8	62.2	50.9	88.6	72.5	57.1
200	68.7	53.5	33.2	77.3	58.3	49.0	84.6	62.4	53.3	104.3	73.1	59.5	105.2	84.6	65.6
250	81.9	63.0	33.2	91.7	68.4	53.5	99.8	73.0	63.3	121.8	84.9	68.0	122.8	97.7	74.0
300	96.0	73.3	33.2	106.8	79.3	53.5	115.9	84.3	69.0	140.3	97.5	76.3	141.4	111.6	82.4

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

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

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

ANCHOR M16	Edge C (mm)														
	65			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
65	43.0	38.2	29.5	51.2	43.7	34.6	64.3	52.0	42.0	73.0	61.1	49.2	73.0	70.9	56.4
100	50.1	44.0	33.9	59.1	49.9	41.9	73.3	59.0	49.1	82.7	68.9	56.2	82.7	79.5	63.2
150	61.1	52.9	39.7	71.3	59.6	52.0	87.2	69.8	59.0	97.7	80.9	66.0	97.7	92.6	72.9
200	73.0	62.6	44.9	84.4	70.1	61.8	102.1	81.5	68.7	113.8	93.7	75.6	113.8	106.8	82.5
250	85.7	73.1	44.9	98.4	81.4	70.7	118.0	94.0	78.4	130.8	107.5	85.2	130.8	122.0	92.0
300	99.2	84.4	44.9	113.1	93.5	77.1	134.7	107.4	87.9	148.8	122.3	94.6	148.8	138.1	101.4

ANCHOR M20	Edge C (mm)														
	90			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
90	76.6	59.6	47.9	95.7	70.0	58.2	113.1	79.2	66.6	127.9	89.0	75.0	127.9	99.3	83.3
150	94.8	70.6	59.3	116.6	82.1	72.5	136.4	92.3	80.7	153.1	103.1	88.9	153.1	114.4	97.0
200	111.4	80.4	66.4	135.5	92.9	84.1	157.4	103.9	92.2	175.8	115.6	100.3	175.8	127.9	108.3
250	129.2	90.8	73.5	155.8	104.3	95.5	179.8	116.3	103.5	200.0	128.9	111.5	200.0	142.1	119.5
300	148.2	101.9	76.3	177.3	116.4	106.7	203.6	129.3	114.7	225.7	142.8	122.6	225.7	157.1	130.5
350	168.4	113.5	76.3	200.2	129.2	117.9	228.8	143.0	125.8	252.8	157.5	133.6	252.8	172.8	141.5

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	115.5	85.3	71.7	127.5	91.0	77.4	148.7	101.0	86.9	171.5	111.5	96.4	176.5	133.8	115.0
150	126.2	91.3	79.9	138.8	97.3	85.6	161.1	107.8	95.0	185.1	118.6	104.3	190.4	142.0	122.8
200	144.9	101.9	92.8	158.7	108.3	98.9	183.0	119.5	108.2	209.1	131.1	117.4	214.8	156.0	135.6
250	164.9	113.0	101.1	179.8	119.9	112.0	206.2	131.8	121.1	234.4	144.2	130.2	240.6	170.8	148.3
300	185.9	124.7	109.4	202.1	132.0	124.9	230.6	144.7	133.9	260.9	158.0	142.9	267.6	186.2	160.8
350	207.9	137.0	117.7	225.4	144.8	139.5	256.0	158.2	146.6	288.6	172.3	155.5	295.8	202.2	173.3

Materials

Mechanical properties of HAS

			Data according ETA-05/0255, issue 2011-06-23						
Anchor size			M8	M10	M12	M16	M20	M24	M30
Nominal tensile strength f_{uk}	HAS-(E) 5.8	[N/mm²]	500	500	500	500	500	500	-
	HAS-(E)(F) 8.8	[N/mm²]	800	800	800	800	800	800	800
	HAS –(E)R	[N/mm²]	700	700	700	700	700	700	500
	HAS –(E)HCR	[N/mm²]	800	800	800	800	800	700	-
Yield strength f_{yk}	HAS-(E)	[N/mm²]	400	400	400	400	400	400	-
	HAS-(E)(F) 8.8	[N/mm²]	640	640	640	640	640	640	640
	HAS –(E)R	[N/mm²]	450	450	450	450	450	450	210
	HAS –(E)HCR	[N/mm²]	640	640	640	640	640	400	-
Stressed cross-section A_s	HAS	[mm²]	32.8	52.3	76.2	144	225	324	519
Section modulus Z	HAS	[mm³]	27.0	54.1	93.8	244	474	809	1706
Steel failure with lever arm			M8	M10	M12	M16	M20	M24	M30
Design bending moment $M_{Rd,s}$	HAS-E-5.8	[Nm]	13	26	45	118	227	389	NA
	HAS-E-8.8	[Nm]	NA	NA	NA	NA	NA	NA	1310
	HAS-E-R	[Nm]	15	29	51	131	255	436	430
	HAS-E-HCR	[Nm]	21	42	72	187	364	389	819

Material quality

Part	Material
Threaded rod HAS-(E) M8-M24 HAS-(E) M27+M30	Strength class 5.8, EN ISO 898-1, A_s > 8% ductile steel galvanized ≥ 5 µm, EN ISO 4042 (F) hot dipped galvanized ≥ 45 µm, EN ISO 10684
Threaded rod HAS-(E)F M8-M30 HAS-(E) M27+M30	Strength class 8.8, EN ISO 898-1, A_s > 8% ductile steel galvanized ≥ 5 µm, EN ISO 4042 (F) hot dipped galvanized ≥ 45 µm, EN ISO 10684
Threaded rod HAS-(E)R	Stainless steel grade A4, A_s > 8% ductile strength class 70 for ≤ M24 and class 50 for M27 to M30, EN ISO 3506-1, EN 10088: 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
Threaded rod HAS-(E)HCR	High corrosion resistant steel, EN ISO 3506-1, EN 10088: 1.4529; 1.4565 strength ≤ M20: R_m = 800 N/mm², $R_{p\,0.2}$ = 640 N/mm², A_s > 8% ductile M24: R_m = 700 N/mm², $R_{p\,0.2}$ = 400 N/mm², A_s > 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; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362
	Strength class 70, EN ISO 3506-2, high corrosion resistant steel, EN 10088: 1.4529; 1.4565

Anchor dimensions

Anchor size	M8	M10	M12	M16	M20	M24	M30 a)
Anchor rod HAS-E,HAS-R, HAS-ER HAS-HCR	M8x80	M10x90	M12x110	M16x125	M20x170	M24x210	M30x270
Anchor embedment depth [mm]	80	90	110	125	170	210	270

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

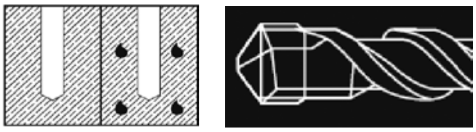
Setting

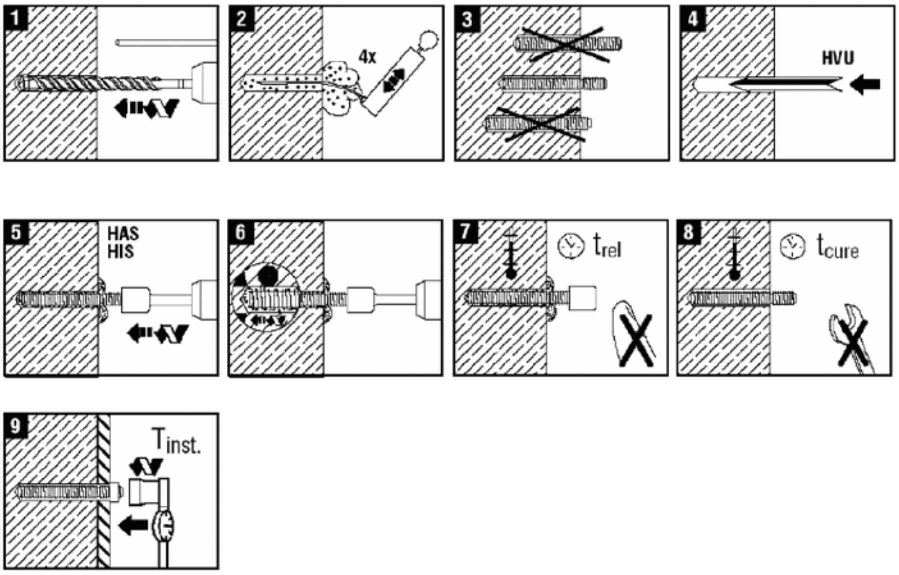
Installation equipment

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

Dry and water-saturated concrete, hammer drilling





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

Curing time for general conditions

Data according ETA-05/0255, issue 2011-06-23	
Temperature of the base material	**Curing time before anchor can be fully loaded t_{cure}**
20 °C to 40 °C	20 min
10 °C to 19 °C	30 min
0 °C to 9 °C	1 h
-5 °C to - 1 °C	5 h

Setting details

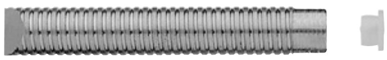
			Data according ETA-05/0255, issue 2011-06-23						
Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Nominal diameter of drill bit	d_0	[mm]	10	12	14	18	24	28	35
Effective anchorage and drill hole depth	$h_{ef,min}$	[mm]	80	90	110	125	170	210	270
Max. fixture thickness	$t_{fix\ max}$	[mm]	14	21	28	38	48	54	70
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22	26	33
Minimum spacing	s_{min}	[mm]	40	45	55	65	90	120	135
Minimum edge distance	c_{min}	[mm]	40	45	55	65	90	120	135
Torque moment [a)]	t_{max}	[Nm]	10	20	40	80	150	200	300

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

HVU with HIS-(R)N adhesive anchor

Mortar System

Hilti HVU foil capsule



Internal threaded sleeve
HIS-N
HIS-RN (A4-70)

Benefits

- suitable for non-cracked concrete C 20/25 to C 50/60
- high loading capacity
- suitable for dry and water saturated concrete

Concrete | Small edge distance & spacing | Fire resistance | Corrosion resistance | European Technical Approval | CE conformity | PROFIS anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-05/0255 / 2011-06-23
Fire test report	IBMB, Braunschweig	UB-3333/0891-1 / 2004-03-26
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-05/0255, issue 2011-06-23

Service temperature range

Hilti HVU adhesive 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 +80 °C	+50 °C	+80 °C
Temperature range III	-40 °C to +120 °C	+72 °C	+120 °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 the design method according to ETAG 001, Annex C and Hilti simplified design method. Design resistance according to data given in ETA-05/0255, issue 2011-06-23.

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

The design method is based on the following simplification:

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

The values are valid for the anchor configuration.

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

STEP 1: TENSION LOADING

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

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

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

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

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

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

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

f_B influence of concrete strength on concrete cone resistance

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

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

Anchor size				M8	M10	M12	M16	M20
$N_{Rd,s}$	HIS-N		[kN]	17.5	30.7	44.7	80.3	74.1
	HIS-RN		[kN]	13.9	21.9	31.6	58.8	69.2
	Bolt	Grade 5.8	[kN]	12.0	19.3	28.0	52.7	82.0
	Bolt	Grade 8.8	[kN]	19.3	30.7	44.7	84.0	130.7
	Bolt	Grade A 4-70 / 316	[kN]	13.9	21.9	31.6	58.8	92.0

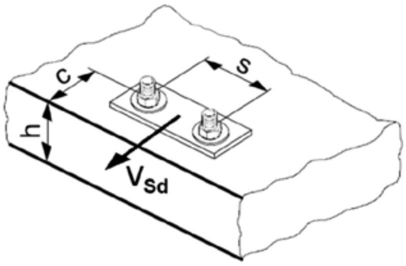
Note: Designer needs to check the bolt tensile resistance.

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

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
$V_{Rd,s}$	HIS-N		[kN]	10.4	18.4	26.0	39.3	36.7
	HIS-RN		[kN]	8.3	12.8	19.2	35.3	41.5
	Bolt	Grade 5.8	[kN]	7.2	12.0	16.8	31.2	48.8
	Bolt	Grade 8.8	[kN]	12.0	18.4	27.2	50.4	78.4
	Bolt	Grade A 4-70 / 316	[kN]	8.3	12.8	19.2	35.3	55.1

Note: Designer needs to check the bolt shear resistance.

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

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

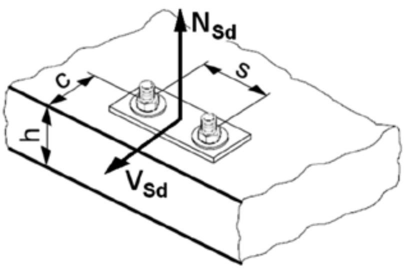
STEP 3: COMBINED TENSION AND SHEAR LOADING

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
- One typical embedment depth, as specified in the tables

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

Embedment depth and base material thickness for the basic loading data

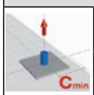
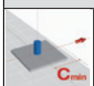
Anchor size	M8	M10	M12	M16	M20
Embedment depth [mm]	90	110	125	170	205
Base material thickness [mm]	120	150	170	230	270

Design resistance [kN] – uncracked concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20
Non-cracked concrete							
Tensile	Pull-out	$N^*_{Rd,p}$	19.0	30.4	45.7	72.3	106.6
	Concrete	$N^*_{Rd,c}$	36.4	49.1	59.5	94.4	125.0
Shear		$V_{Rd,s}$	Steel governed refer $V_{Rd,s}$ table				

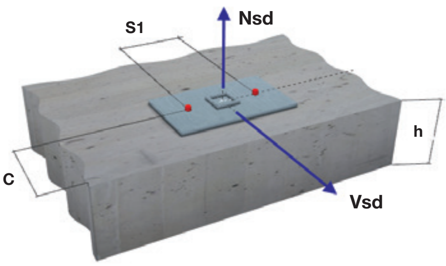
Basic loading data (for a single anchor) – with minimum edge distance

Design resistance [kN] - uncracked concrete, 32 Mpa

Anchor size			M8	M10	M12	M16	M20
Min. edge distance		c_{min} [mm]	40	45	60	80	125
Min Base thickness		h_{min} [mm]	120	150	170	230	270
Tensile N_{Rd}							
	Pull-out	$N^*_{Rd,p}$ [kN]	10.1	15.3	24.0	38.2	64.0
	Concrete	$N^*_{Rd,c}$ [kN]	16.6	22.1	27.9	44.0	62.2
Shear V_{Rd}							
	Shear (without lever arm)	$V^*_{Rd,c}$	5.3	7.0	10.7	17.4	32.1

Two anchors

Table 1: One edge influence



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

Anchor size	M8	M10	M12	M16	M20
Typical embedment depth h_{ef} [mm]	90	110	125	170	205
Base material thickness h [mm]	120	150	170	230	270

ANCHOR M8	Edge C (mm)														
	40			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	13.6	18.3	7.1	19.0	23.1	15.1	22.1	25.7	17.5	25.5	32.6	23.6	25.5	40.0	29.6
80	14.9	20.0	8.9	20.9	25.2	17.2	24.2	28.0	19.6	28.1	35.6	25.6	28.1	43.7	31.5
100	15.6	20.8	9.8	21.8	26.3	18.3	25.3	29.2	20.6	29.3	37.1	26.5	29.3	45.5	32.4
120	16.2	21.7	10.7	22.8	27.3	19.4	26.4	30.4	21.7	30.6	38.6	27.5	30.6	47.4	33.3
150	17.2	22.9	10.7	24.2	28.9	21.0	28.0	32.1	23.2	32.4	40.9	28.9	32.5	50.1	34.7
200	18.9	25.0	10.7	26.5	31.5	23.7	30.7	35.1	25.8	35.5	44.6	31.4	35.5	54.7	37.0

ANCHOR M10	Edge C (mm)														
	45			80			100			150			200		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
45	19.8	24.3	9.3	25.1	28.9	16.8	28.4	31.7	21.7	37.4	39.2	28.7	39.3	47.4	35.6
100	22.0	26.8	12.1	27.9	32.0	20.1	31.6	35.1	25.1	41.6	43.4	31.9	43.7	52.5	38.7
150	24.0	29.2	13.9	30.5	34.8	23.0	34.5	38.1	28.3	45.5	47.2	34.8	47.7	57.1	41.4
200	26.0	31.5	13.9	33.0	37.5	26.0	37.3	41.2	31.4	49.3	51.0	37.7	51.7	61.7	44.2
250	28.0	33.9	13.9	35.5	40.3	28.3	40.2	44.3	34.6	53.0	54.7	40.6	55.6	66.2	47.0
300	29.9	36.2	13.9	37.9	43.1	28.3	42.9	47.3	37.7	56.6	58.5	43.5	59.4	70.8	49.7

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	30.1	31.0	14.3	33.8	33.9	19.1	37.7	36.8	24.2	48.4	44.7	33.4	57.2	53.2	40.9
100	32.4	33.1	16.7	36.4	36.1	21.6	40.6	39.3	26.9	52.1	47.7	36.0	61.6	56.8	43.3
150	35.2	35.7	19.7	39.6	39.0	24.8	44.2	42.4	30.2	56.8	51.4	39.3	67.1	61.2	46.4
200	38.1	38.3	21.5	42.9	41.8	28.0	47.8	45.4	33.6	61.4	55.1	42.5	72.6	65.7	49.5
250	41.0	40.9	21.5	46.1	44.6	30.5	51.4	48.5	37.0	66.0	58.9	45.8	78.0	70.1	52.6
300	43.8	43.5	21.5	49.2	47.5	30.5	55.0	51.6	40.3	70.5	62.6	49.1	83.4	74.6	55.7

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	48.0	48.7	23.3	52.6	52.0	28.9	64.6	60.6	44.3	77.9	69.7	53.8	90.8	79.4	62.7
100	49.4	49.9	24.7	54.1	53.3	30.4	66.5	62.0	46.0	80.1	71.4	55.3	93.5	81.4	64.2
150	52.9	52.9	28.4	57.9	56.5	34.2	71.2	65.8	50.1	85.8	75.7	59.3	100.1	86.2	67.9
200	56.4	55.9	32.0	61.8	59.7	38.0	75.9	69.5	54.3	91.5	80.0	63.3	106.7	91.1	71.7
250	59.9	58.9	34.9	65.6	62.9	41.8	80.7	73.2	58.5	97.1	84.2	67.2	113.3	96.0	75.5
300	63.4	61.9	34.9	69.4	66.0	45.6	85.3	76.9	62.7	102.8	88.5	71.2	119.9	108.0	79.3

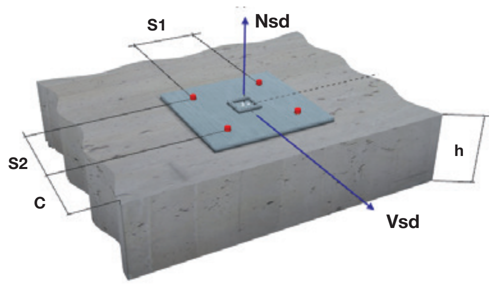
ANCHOR M20	Edge C (mm)														
	125			150			200			250			300		
spacing s1 (mm)	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	81.7	70.8	42.7	89.4	75.3	51.2	105.9	84.9	65.7	123.7	95.0	75.3	136.0	105.6	84.9
150	84.3	72.5	44.9	92.3	77.2	53.4	109.3	86.9	68.0	127.7	97.3	77.5	140.4	108.1	87.0
200	89.6	75.9	49.2	98.1	80.8	57.8	116.2	91.0	72.5	135.7	101.8	81.8	149.3	113.2	91.1
250	94.9	79.3	53.4	103.9	84.4	62.3	123.1	95.1	77.0	143.7	106.4	86.1	158.1	118.3	95.3
300	100.2	82.7	57.7	109.7	88.0	66.7	129.9	99.2	81.5	151.7	111.0	90.4	166.9	123.3	99.4
350	105.4	86.1	62.0	115.5	91.7	71.2	136.8	103.3	86.1	159.7	115.5	94.7	175.7	128.4	103.5

Four anchors

Table 2: One edge influence

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

Anchor size	M8	M10	M12	M16	M20
Typical embedment depth h_{ef} [mm]	90	110	125	170	205
Base material thickness h [mm]	120	150	170	230	270



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	20.1	21.4	14.2	27.1	26.4	20.0	30.9	29.1	22.4	35.3	36.4	28.4	35.3	44.1	34.3
80	25.4	26.7	17.8	33.3	32.4	26.8	37.6	35.5	29.1	42.5	43.8	35.0	42.5	52.5	40.8
100	28.2	29.6	19.6	36.6	35.7	30.1	41.2	39.0	32.4	46.3	47.8	38.2	46.3	57.0	44.0
120	31.2	32.6	21.4	40.0	39.1	33.3	44.8	42.6	35.6	50.3	51.9	41.4	50.3	61.7	47.1
150	35.7	37.4	21.4	45.3	44.5	38.2	50.5	48.3	40.5	56.4	58.5	46.2	56.4	69.1	51.8
200	43.6	46.0	21.4	54.5	54.2	46.1	60.3	58.6	48.4	66.9	70.2	54.0	66.9	82.4	59.6

ANCHOR M10	Edge C (mm)														
	45			80			100			150			200		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1= s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
45	28.1	28.1	18.5	34.7	33.0	25.2	38.8	35.9	28.0	49.9	43.8	34.9	52.2	52.3	41.8
100	36.6	36.4	24.2	44.3	42.1	36.0	49.0	45.5	38.7	61.7	54.6	45.4	64.3	64.5	52.0
150	45.3	44.8	27.8	53.9	51.2	45.4	59.2	55.1	48.0	73.4	65.5	54.6	76.3	76.7	61.1
200	54.5	54.0	27.8	64.2	61.3	52.0	70.0	65.7	57.2	85.9	77.3	63.7	89.1	89.9	70.1
250	64.2	64.0	27.8	75.0	72.2	56.7	81.5	77.2	66.2	98.9	90.2	72.6	102.5	104.2	79.0
300	74.4	74.9	27.8	86.2	84.1	56.8	93.4	89.6	75.1	112.5	104.0	81.5	116.4	119.6	87.8

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	41.3	36.7	28.6	45.7	39.7	31.9	50.4	42.8	34.9	63.0	51.1	42.4	73.4	60.0	49.7
100	49.3	43.2	33.4	54.3	46.5	40.4	59.4	49.9	43.4	73.4	59.0	50.6	84.7	68.9	57.9
150	60.3	52.0	40.0	65.9	55.7	49.6	71.8	59.6	53.6	87.4	69.8	60.8	100.1	80.8	67.9
200	72.3	61.6	42.9	78.6	65.7	56.0	85.1	70.1	63.7	102.6	81.5	70.7	116.7	93.7	77.7
250	85.1	71.9	43.0	92.1	76.6	61.0	99.4	81.4	73.5	118.7	94.0	80.5	134.4	107.5	87.4
300	98.8	83.1	43.0	106.5	88.3	61.0	114.5	93.5	80.6	135.8	107.4	90.1	153.0	122.3	97.0

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	66.1	57.5	46.5	71.5	60.9	50.2	85.9	69.9	59.1	101.5	79.5	67.9	116.7	89.7	76.7
100	70.9	61.1	49.5	76.5	64.7	55.3	91.4	74.0	64.2	107.6	84.0	72.9	123.4	94.5	81.6
150	83.5	70.6	56.7	89.7	74.6	67.9	106.1	84.8	76.5	123.9	95.7	85.1	141.2	107.2	93.6
200	97.1	80.9	64.0	103.9	85.1	76.0	121.9	96.3	88.6	141.2	108.1	97.1	160.1	120.6	105.5
250	111.6	91.8	69.8	119.0	96.4	83.6	138.6	108.5	100.5	159.6	121.3	108.9	180.0	134.8	117.1
300	126.8	103.3	69.8	134.9	108.4	91.2	156.1	121.4	112.3	178.9	135.2	120.5	201.0	149.8	128.7

ANCHOR M20	Edge C (mm)														
	125			150			200			250			300		
spacing	tension		shear	tension		shear	tension		shear	tension		shear	tension		shear
s1= s2 (mm)	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,p}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	113.2	86.0	75.3	122.3	90.9	80.1	141.5	101.1	89.7	162.1	111.8	99.2	176.3	123.0	108.6
150	121.8	91.1	82.2	131.3	96.2	87.0	151.4	106.8	96.4	172.9	117.9	105.8	187.7	129.5	115.2
200	139.9	101.9	95.8	150.3	107.4	100.4	172.2	118.7	109.7	195.5	130.6	119.0	211.6	143.1	128.2
250	159.1	113.3	106.9	170.4	119.2	113.7	194.2	131.3	122.8	219.5	144.0	132.0	237.0	157.3	141.1
300	179.5	125.3	115.4	191.7	131.5	126.7	217.4	144.5	135.7	244.8	158.1	144.8	263.6	172.2	153.8
350	200.9	137.8	124.0	214.2	144.5	139.5	241.9	158.3	148.5	271.3	172.7	157.5	291.6	187.8	166.4

Materials

Mechanical properties of HIS-(R)N

Anchor size			M8x90	M10x110	M12x125	M16x170	M20x205
Nominal tensile strength f_{uk}	HIS-N	[N/mm²]	490	490	460	460	460
	Screw 8.8	[N/mm²]	800	800	800	800	800
	HIS-RN	[N/mm²]	700	700	700	700	700
	Screw A4-70	[N/mm²]	700	700	700	700	700
Yield strength f_{yk}	HIS-N	[N/mm²]	410	410	375	375	375
	Screw 8.8	[N/mm²]	640	640	640	640	640
	HIS-RN	[N/mm²]	350	350	350	350	350
	Screw A4-70	[N/mm²]	450	450	450	450	450
Stressed cross-section A_s	HIS-(R)N	[mm²]	51.5	108.0	169.1	256.1	237.6
	Screw	[mm²]	36.6	58	84.3	157	245
Section modulus Z	HIS-(R)N	[mm³]	145	430	840	1595	1543
	Screw	[mm³]	31.2	62.3	109	277	541

Material quality

Part	Material
Internal threaded sleeve [a)] HIS-N	C-steel 1.0718 Steel galvanized ≥ 5µm
Internal threaded sleeve [b)] HIS-RN	Stainless steel 1.4401; 1.4571

a) related fastening screw: strength class 8.8 EN ISO 898-1, A_s > 8% Ductile
steel galvanized ≥ 5µm

b) related fastening screw: strength class 70 EN ISO 3506-1, A_s > 8% Ductile
stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362

Anchor dimensions

Anchor size	M8	M10	M12	M16	M20
Internal sleeve HIS-(R)N	M8x90	M10x110	M12x125	M16x170	M20x205
Anchor embedment depth [mm]	90	110	125	170	205

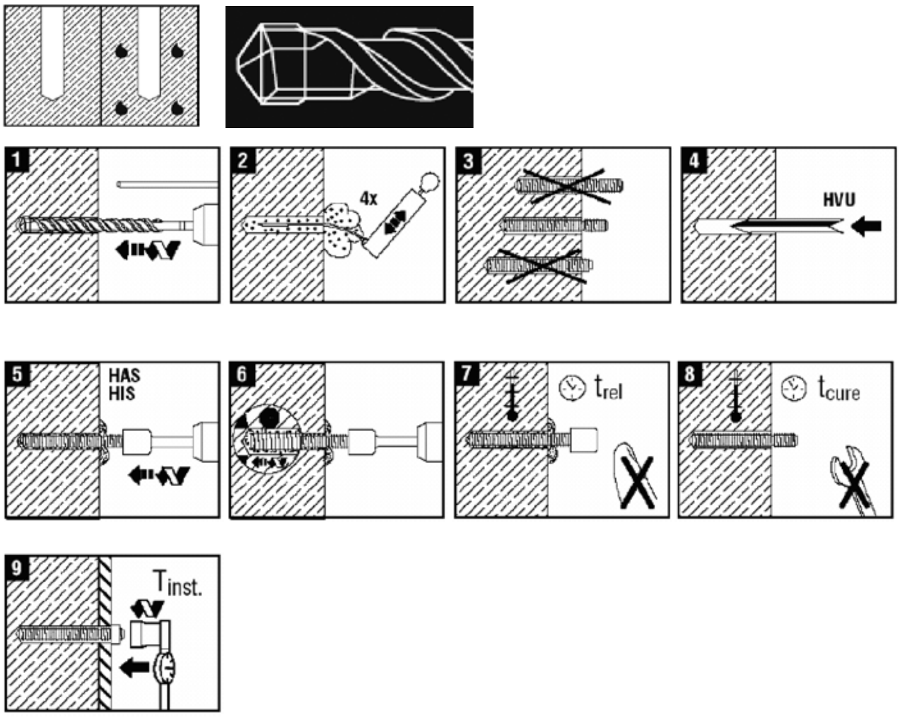
Setting

Installation equipment

Anchor size	M8	M10	M12	M16	M20
Rotary hammer	TE 2 – TE 30		TE 40 – TE 70		
Other tools	blow out pump or compressed air gun, setting tools				

Setting instructions

Dry and water-saturated concrete, hammer drilling



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

Curing time for general conditions

Data according ETA-05/0255, issue 2011-06-23	
Temperature of the base material	**Curing time before anchor can be fully loaded t_{cure}**
20 °C to 40 °C	20 min
10 °C to 19 °C	30 min
0 °C to 9 °C	1 h
-5 °C to - 1 °C	5 h

Setting details

			Data according ETA-05/0255, issue 2011-06-23				
Anchor size	**Sleeve HIS-(R)N foil capsule**		**M8x90 M10x90**	**M10x110 M12x110**	**M12x125 M16x125**	**M16x170 M20x170**	**M20x205 M24x210**
Nominal diameter of drill bit	d_0	[mm]	14	18	22	28	32
Diameter of element	d	[mm]	12.5	16.5	20.5	25.4	27.6
Effective anchorage and drill hole depth	$h_{ef,min}$	[mm]	90	110	125	170	205
Diameter of clearance hole in the fixture	d_f	[mm]	9	12	14	18	22
Thread engagement length; min - max	h_s	[mm]	8-20	10-25	12-30	16-40	20-50
Minimum spacing	s_{min}	[mm]	40	45	60	80	125
Minimum edge distance	c_{min}	[mm]	40	45	60	80	125
Torque moment [a)]	t_{max}	[Nm]	10	20	40	80	150

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