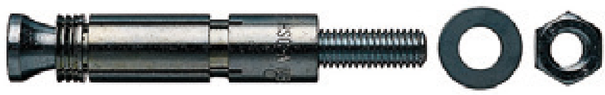
HSC-A safety anchor

Anchor version		Benefits
	Bolt version HSC-A Carbon Steel version HSC-AR Stainless steel version	■ the perfect solution for small edge and space distance ■ suitable for thin concrete blocks due to low embedment depth ■ suitable for cracked and non cracked concrete ■ self-cutting undercut anchor ■ available as bolt version for through applications ■ stainless steel available for external applications

Concrete | Tensile zone | Small edge distance & spacing | Fire resistance | Shock | Corrosion resistance | European Technical Approval | CE conformity | Hilti anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	CSTB, Paris	ETA-02/0027 / 2012-09-20
Shockproof fastenings in civil defence installations	Bundesamt für Bevölkerungsschutz, Bern	BZS D 06-601 / 2006-07-17
Fire test report	IBMB, Braunschweig	UB 3177/1722-1 / 2006-06-28
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-02/0027 issue 2007-09-20

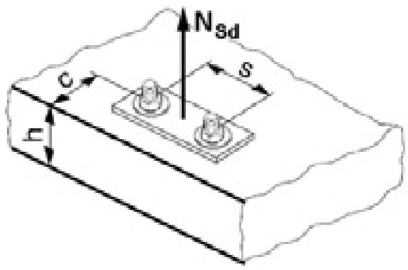
Design process for typical anchors layout in non cracked concrete

Background of the design method:
Values of the design resistances are obtained from PROFIS 2.1.1 in compliance with ETAG No.001 Annex C Design Method.

Design Process:

STEP 1: TENSION LOADING

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



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

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

f_B influence of concrete strength

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

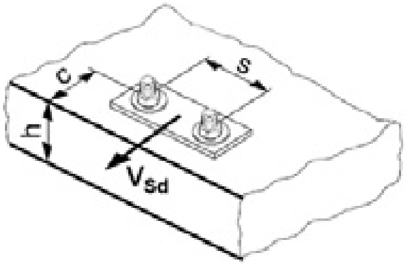
- **Design steel resistance (tension) $N_{Rd,s}$**

Anchor size			M8x40	M10x40	M12x60
$N_{Rd,s}$	HSC-A	[kN]	19.5	30.9	44.9
	HSC-AR	[kN]	13.7	21.7	31.6

$$N_{Rd} = \min\{ N_{Rd,c} , N_{Rd,s} \}$$
$$\text{CHECK } N_{Rd} \geq N_{Sd}$$

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 tables

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			M8x40	M10x40	M12x60
$V_{Rd,s}$	HSC-A	[kN]	11.7	18.6	27.0
	HSC-AR	[kN]	8.2	13.0	18.9

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

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

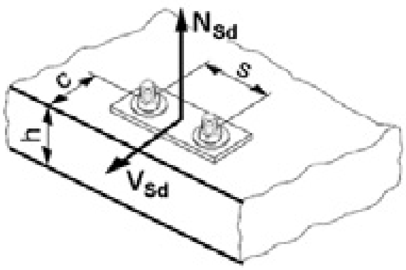
STEP 3: COMBINED TENSION AND SHEAR LOADING

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
- minimum base material thickness, as specified in the table below

Anchor size	M8 x 40	M10 x 40	M12x60
h = h_{min} [mm]	100	100	130

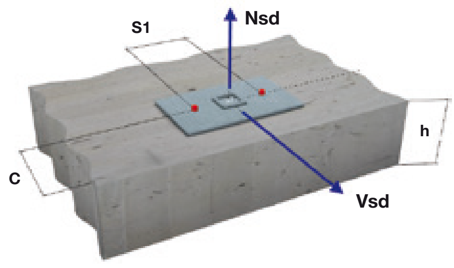
Basic loading data (for a single anchor) – no edge or spacing influence

Anchor size			**M8 x 40**	**M10 x 40**	**M12 x 60**
Tensile $N^*_{rd,c}$	HSC-A	[kN]	10.7	10.7	19.8
Shear $V_{Rd,s}$	HSC-A	[kN]	Steel governed refer $V_{Rd,s}$ table		

Two Anchors

Table 1: One edge influence

h=h_{min}



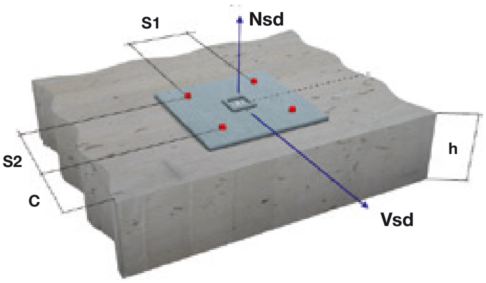
ANCHOR M8	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	10.8	6.0	14.4	9.4	14.4	14.2	14.4	16.4	14.4	19.5
60	12.1	6.8	16.2	10.3	16.2	15.0	16.2	17.1	16.2	20.3
100	14.8	8.3	19.8	12.0	19.8	16.7	19.8	18.8	19.8	21.9
120	16.2	9.0	21.6	12.8	21.6	17.5	21.6	19.6	21.6	22.6
150	16.2	9.0	21.6	14.1	21.6	18.8	21.6	20.8	21.6	23.9

ANCHOR M10	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	10.8	6.1	14.4	9.6	14.4	14.4	14.4	16.6	14.4	19.7
60	12.1	6.9	16.2	10.5	16.2	15.3	16.2	17.4	16.2	20.5
100	14.8	8.4	19.8	12.2	19.8	17.0	19.8	19.0	19.8	22.2
120	16.2	9.2	21.6	13.1	21.6	17.8	21.6	19.9	21.6	23.0
150	16.2	9.2	21.6	14.4	21.6	19.1	21.6	21.1	21.6	24.1

ANCHOR M12	Edge C (mm)									
	60		90		120		180		250	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	19.8	11.6	26.4	17.7	26.4	21.4	26.4	28.9	26.4	37.4
90	22.3	13.0	29.7	19.3	29.7	23.0	29.7	30.3	29.7	38.7
120	24.8	14.5	33.0	20.9	33.0	24.5	33.0	31.8	33.0	40.0
180	29.7	17.4	39.6	24.1	39.6	27.5	39.6	34.6	39.6	42.9
250	29.7	17.4	39.6	27.9	39.6	31.1	39.6	38.0	39.6	46.1

Four anchors

Table 2: One edge influence $h=h_{min}$



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 M8	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	15.1	12.0	19.2	14.2	19.2	18.4	19.2	20.5	19.2	23.6
60	19.4	13.6	24.2	17.2	24.2	21.3	24.2	23.4	24.2	26.4
100	29.6	16.6	36.2	22.9	36.2	27.0	36.2	29.0	36.2	32.0
120	35.6	18.0	43.1	25.6	43.1	29.8	43.1	31.8	43.1	34.8
150	35.6	18.0	43.1	28.2	43.1	33.9	43.1	35.9	43.1	38.9

ANCHOR M10	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	15.1	12.2	19.2	14.4	19.2	18.7	19.2	20.8	19.2	23.9
60	19.4	13.8	24.2	17.4	24.2	21.6	24.2	23.6	24.2	26.7
100	29.6	17.0	36.2	23.2	36.2	27.3	36.2	29.3	36.2	32.4
120	35.6	18.4	43.1	26.0	43.1	30.1	43.1	32.1	43.1	35.2
150	35.6	18.4	43.1	28.8	43.1	34.3	43.1	36.3	43.1	39.3

ANCHOR M12	Edge C (mm)									
	60		90		120		180		250	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	27.7	21.4	35.2	25.1	35.2	28.8	35.2	36.1	35.2	44.5
90	35.7	26.0	44.5	30.3	44.5	33.9	44.5	41.1	44.5	49.4
120	44.5	29.0	55.0	35.3	55.0	38.9	55.0	46.0	55.0	54.3
180	65.3	34.8	79.2	45.2	79.2	48.7	79.2	55.8	79.2	63.9
250	65.3	34.8	79.2	55.6	79.2	60.0	79.2	66.9	79.2	75.0

Materials

Mechanical properties

Anchor size			HSC	M8x40	M10x40	M12x60
Nominal tensile strength	f_{uk}	[N/mm²]	-A	800	800	800
			-AR	700	700	700
Yield strength	f_{yk}	[N/mm²]	-A	640	640	640
			-AR	450	450	450
Stressed cross-section for bolt version	$A_{s,A}$	[mm²]	-A, AR	36.6	58.0	84.3
Section modulus	Z	[mm³]	-A, AR	31.2	62.3	109.2
Design bending resistance without sleeve	$M_{Rd,s}$	[Nm]	-A	24	48	84
			-AR	16.7	33.3	59.0

Material quality

	Part	Material
HSC-A	Cone bolt with , with internal or external thread	steel grade 8.8 according ISO 898-1, galvanised to min. 5 µm
	Expansion sleeve and washer	Galvanised steel
	Hexagon nut	Grade 8 according to ISO 898-2
HSC-AR	Cone bolt with , with internal or external thread	steel grade 1.4401, 1.4571 A4-70 according EN 10088, EN ISO 3506
	Expansion sleeve and washer	steel grade 1.4401, 1.4571 according EN 10088
	Hexagon nut	steel grade 1.4401, 1.4571 A4-70 according EN 10088, EN ISO 3506

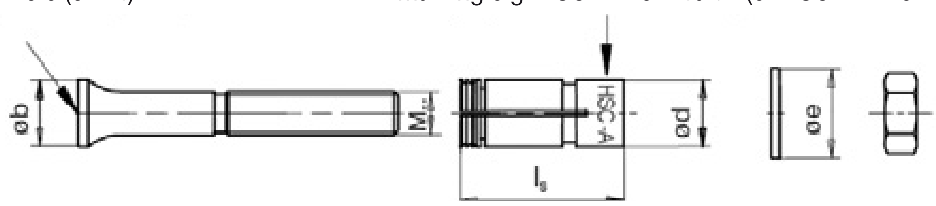
Anchor dimensions

Dimensions of HSC-A and HSC-AR

Anchor version	Thread size	t_{fix} (mm) max	b (mm)	l_s (mm)	d (mm)	e (mm)
HSC-A(R) M8x40	M8	15	13.5	40.8	13.5	16
HSC-A(R) M10x40	M10	20	15.5	40.8	15.5	20
HSC-A(R) M12x60	M12	20	17.5	60.8	17.5	24

marking HILTI 8.8 (or A4)

marking e.g. HSC-A M8 x 40 t_{fix} (or HSC-AR M8 x 40 t_{fix} A4)

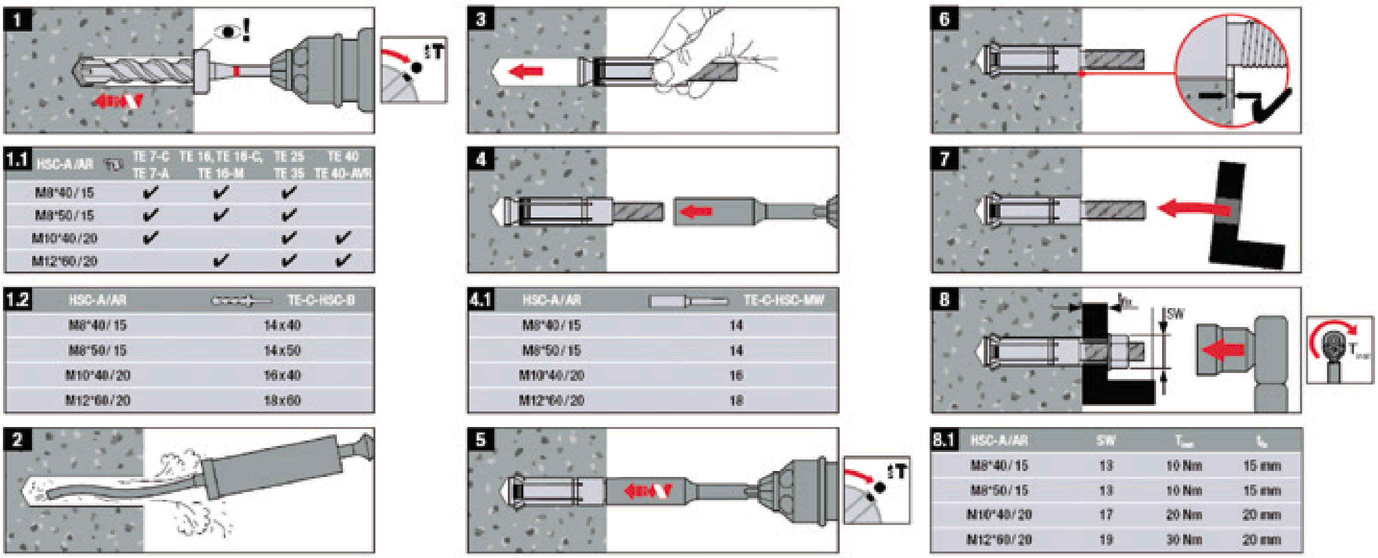


Setting

Installation equipment

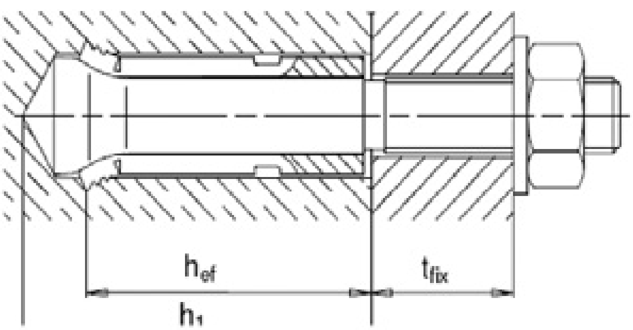
Anchor size		HSC-A/AR M8x40	HSC-A/AR M10x40	HSC-A/AR M12x60
Rotary hammer for setting		TE 7-C; TE 7-A; TE 16; TE 16-C;TE 16-M; TE 25; TE 35	TE 7-C; TE 7-A; TE 25; TE 35	TE 16; TE 16-C; TE 16-M; TE 25; TE 35; TE 40; TE 40-AVR
Stop drill bit	TE-C-HSC-B	14x40	16x40	16x60
Setting Tool	TE-C-HSC-MW	14	16	18

Setting instruction



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

Setting details: depth of drill hole h_1 and effective anchorage depth h_{ef}



Setting details HSC-A (R)

Anchor version			M8x40	M10x40	M12x60
Nominal diameter of drill bit	d_0	[mm]	14	16	18
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	14.5	16.5	18.5
Depth of drill hole	$h_1 \geq$	[mm]	46	46	68
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14
Effective anchorage depth	h_{ef}	[mm]	40	40	60
Maximum fastening thickness	t_{fix}	[mm]	15	20	20
Torque moment	T_{inst}	[Nm]	10	20	30
Width across	SW	[mm]	13	17	19

Base material thickness, anchor spacing and edge distance

Anchor version			M8x40	M10x40	M12x60
Minimum base material thickness	h_{min}	[mm]	100	100	130
Minimum spacing	s_{min}	[mm]	40	40	60
Minimum edge distance	c_{min}	[mm]	40	40	60

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

Critical spacing and critical edge distance for splitting failure apply only for non-cracked concrete. For cracked concrete only the critical spacing and critical edge distance for concrete cone failure are decisive