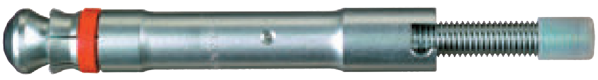
Mechanical anchoring systems.

Heavy duty anchors | Medium duty anchors

HDA design anchor

Anchor version		Benefits
	HDA-P HDA-PR HDA-PF Anchor for presetting	■ suitable for non-cracked and cracked concrete C 20/25 to C 50/60 ■ mechanical interlock (undercut) ■ low expansion force (thus small edge distance / spacing) ■ automatic undercutting (without special undercutting tool) ■ high loading capacity, performance of a headed stud ■ complete system (anchor, stop drill bit, setting tool, drill hammer) ■ setting mark on anchor for control (easy and safe) ■ completely removable ■ test reports: fire resistance, fatigue, shock, seismic
	HDA-T HDA-TR HDA-TF Anchor for through-fasting	

Concrete | Tensile zone | Small edge distance & spacing | Performance of a headed stud | Fire resistance | Fatigue | Shock | Seismic ICC | Nuclear | 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-99/0009 / 2013-03-25
ICC-ES report	ICC evaluation service	ESR 1546 / 2008-03-01
Shockproof fastenings in civil defence installations	Bundesamt für Zivilschutz, Bern	BZS D 04-221 / 2004-09-02
Nuclear power plants	DIBt, Berlin	Z-21.1-1696 / 2008-09-01
Dynamic loads	DIBt, Berlin	Z-21.1-1693 / 2007-05-25
Fire test report	IBMB, Braunschweig	UB 3039/8151-CM / 2001-01-31
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

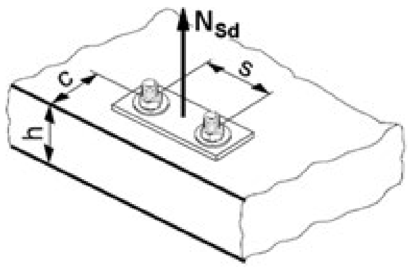
a) All data given in this section according ETA 99/0009 issue 2008-03-05.

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

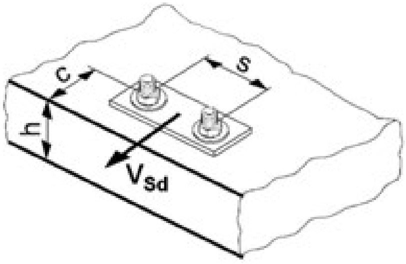
- **Design steel resistance (tension) $N_{Rd,s}$**

Anchor size			M10	M12	M16	M20
$N_{Rd,s}$	HDA-P(F), HDA-T(F)	[kN]	30.7	44.7	84.0	128.0
	HDA-PR, HDA-TR	[kN]	28.8	41.9	78.8	Not available

$N_{Rd} = \min\{ N_{Rd,c} , N_{Rd,s} \}$
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 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) $V_{Rd,s}$**

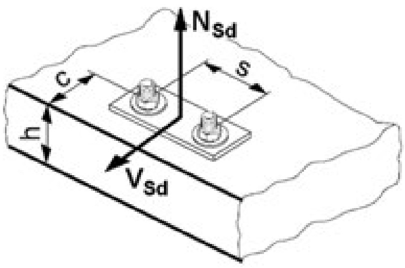
Anchor size			M10	M12	M16	M20
$V_{Rd,s}$	HDA-P, HDA-PF	[kN]	17.6	24.0	49.6	73.6
	HDA-PR	[kN]	17.3	25.6	47.4	Not available
	HDA-T, HDA-TF		43.3	53.3	93.3	136.7
	HDA-TR		53.4	65.4	114.3	Not available

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

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

Anchor size	M10	M12	M16	M20
$h = h_{min}$ [mm]	Refer to Setting detail			

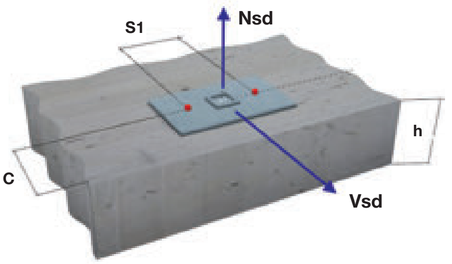
Basic loading data (for a single anchor) – no edge or spacing influence

Anchor size			M10	M12	M16	M20
Tensile $N_{Rd,s}$	HDA-P/T	[kN]	Steel faiure governs refer to steel resistance tables			
Shear $V_{Rd,s}$	HDA-P/T	[kN]				

Two Anchors

Table 1: One edge influence

h=hmin



ANCHOR M10	Edge C (mm)											
	80		120		150		200		250		350	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	43.2	19.1	55.4	29.3	65.5	33.8	65.5	41.1	65.5	48.4	65.5	62.7
150	48.6	21.9	62.3	32.5	73.7	36.8	73.7	44.0	73.7	51.2	73.7	65.5
200	54.0	24.7	69.3	35.7	81.9	39.9	81.9	47.0	81.9	54.0	81.9	68.2
250	59.4	27.0	76.2	38.8	90.0	42.9	90.0	49.9	90.0	56.9	90.0	70.9
300	64.8	27.0	83.1	42.0	98.2	46.0	98.2	52.8	98.2	59.7	98.2	73.6

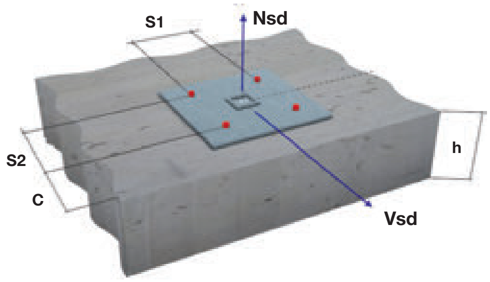
ANCHOR M12	Edge C (mm)											
	100		150		200		250		300		400	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	60.2	27.2	77.2	39.2	91.5	47.0	91.5	54.8	91.5	62.6	91.5	77.8
150	63.2	28.8	81.0	40.9	96.1	48.7	96.1	56.4	96.1	64.1	96.1	79.3
200	69.2	32.0	88.7	44.3	105.2	51.9	105.2	59.5	105.2	67.1	105.2	82.2
250	75.2	35.2	96.4	47.7	114.4	55.1	114.4	62.6	114.4	70.2	114.4	85.2
350	87.3	38.4	111.9	54.5	132.7	61.6	132.7	68.9	132.7	76.3	132.7	91.0

ANCHOR M16	Edge C (mm)											
	150		200		250		300		400		500	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
190	112.3	50.1	132.8	64.0	155.0	73.2	171.4	82.5	171.4	100.7	171.4	118.8
250	121.1	54.8	143.3	68.9	167.2	77.9	185.0	87.0	185.0	105.0	185.0	123.0
300	128.5	58.7	152.0	73.0	177.4	81.8	196.3	90.8	196.3	108.7	196.3	126.5
350	135.9	62.6	160.8	77.0	187.6	85.7	207.6	94.6	207.6	112.3	207.6	130.0
450	150.7	70.4	178.3	85.1	208.0	93.5	230.1	102.1	230.1	119.5	230.1	137.0

ANCHOR M20	Edge C (mm)											
	200		250		300		400		500		600	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
250	170.6	78.9	194.1	95.7	218.9	106.3	258.7	127.4	258.7	148.5	258.7	169.3
300	179.2	83.5	203.8	100.5	229.8	110.9	271.7	131.9	271.7	152.7	271.7	173.4
350	187.7	88.1	213.5	105.3	240.8	115.5	284.6	136.2	284.6	157.0	284.6	177.6
450	204.7	97.4	232.9	114.8	262.7	124.8	310.5	145.0	310.5	165.4	310.5	185.8
550	221.8	106.7	252.3	124.4	284.6	134.0	336.4	153.8	336.4	173.9	336.4	194.1

Four anchors

Table 2: One edge influence **h=hmin**



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 M10	Edge C (mm)											
	80		120		150		200		250		350	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	62.0	38.2	75.9	44.0	87.3	48.3	87.3	55.5	87.3	62.7	87.3	76.9
150	80.2	43.8	96.9	54.1	110.5	58.3	110.5	65.4	110.5	72.5	110.5	86.5
200	100.9	49.4	120.5	63.9	136.4	68.2	136.4	75.2	136.4	82.2	136.4	96.1
250	123.9	54.0	146.7	73.7	165.0	77.9	165.0	84.8	165.0	91.7	165.0	105.5
300	149.2	54.0	175.4	83.3	196.4	87.5	196.4	94.4	196.4	101.3	196.4	115.0

ANCHOR M12	Edge C (mm)											
	100		150		200		250		300		400	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	86.4	50.9	105.7	58.7	122.0	66.4	122.0	74.0	122.0	81.6	122.0	96.7
150	96.2	56.4	117.0	64.1	134.5	71.7	134.5	79.3	134.5	86.8	134.5	101.8
200	117.3	64.0	141.3	74.7	161.3	82.2	161.3	89.7	161.3	97.2	161.3	112.1
250	140.6	70.4	167.8	85.2	190.6	92.6	190.6	100.1	190.6	107.5	190.6	122.2
350	193.5	76.8	227.8	105.8	256.4	113.1	256.4	120.4	256.4	127.8	256.4	142.3

ANCHOR M16	Edge C (mm)											
	150		200		250		300		400		500	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
190	161.3	89.8	184.9	98.9	210.0	107.9	228.6	117.0	228.6	134.8	228.6	152.6
250	190.7	105.0	217.2	114.0	245.4	123.0	266.1	131.9	266.1	149.6	266.1	167.2
300	217.1	117.4	246.1	126.5	276.9	135.3	299.5	144.2	299.5	161.8	299.5	179.3
350	245.2	125.2	276.8	138.8	310.3	147.6	335.0	156.4	335.0	173.9	335.0	191.3
450	306.5	140.8	343.6	163.2	383.0	171.9	411.7	180.6	411.7	197.9	411.7	215.1

ANCHOR M20	Edge C (mm)											
	200		250		300		400		500		600	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
250	244.8	138.0	271.7	148.5	300.0	158.9	345.0	179.7	345.0	200.3	345.0	220.8
300	272.6	152.7	301.6	163.1	332.0	173.4	380.3	194.0	380.3	214.5	380.3	234.9
350	301.9	167.3	333.0	177.6	365.6	187.8	417.4	208.3	417.4	228.6	417.4	248.9
450	365.0	194.8	400.5	206.2	437.8	216.3	496.8	236.5	496.8	256.7	496.8	276.7
550	433.9	213.4	474.3	234.4	516.4	244.4	583.0	264.4	583.0	284.4	583.0	304.3

Materials

Mechanical properties of HDA

Anchor size			HDA-P(F) / HDA-T(F)				HDA-PR / HDA-TR		
			M10	M12	M16	M20	M10	M12	M16
Anchor bolt									
Nominal tensile strength	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Yield strength	f_{yk}	[N/mm²]	640	640	640	640	600	600	600
Stressed cross-section	A_s	[mm²]	58,0	84,3	157	245	58,0	84,3	157
Section modulus	Z	[mm³]	62,3	109,2	277,5	540,9	62,3	109,2	277,5
Characteristic bending resistance without sleeve	$M^0_{Rk,s}$	[Nm]	60	105	266	519	60	105	266
Anchor sleeve									
Nominal tensile strength	f_{uk}	[N/mm²]	850	850	700	550	850	850	700
Yield strength	f_{yk}	[N/mm²]	600	600	600	450	600	600	600

a) HDA M20: only a galvanized 5µm version is available

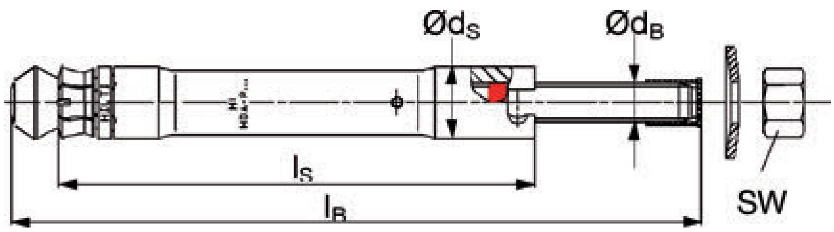
b) The recommended bending moment of the HDA anchor bolt may be calculated from $M_{rec} = M_{Rd,s} / \gamma_F = M_{Rk,s} / (\gamma_{Ms} \cdot \gamma_F) = (1{,}2 \cdot W_{el} \cdot f_{uk}) / (\gamma_{Ms} \cdot \gamma_F)$, where the partial safety factor for bolts of grade 8.8 is γ_{MS} = 1,25, for A4-80 equal to 1,33 and the partial safety factor for action may be taken as γ_F = 1,4. In case of HDA-T/TR/TF the bending capacity of the sleeve is neglected, only the capacity of the bolt is taken into account.

Material quality

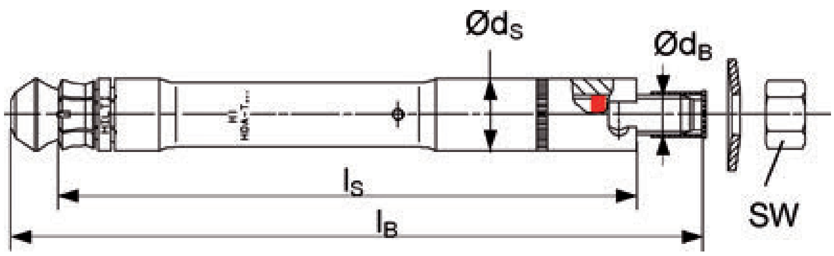
Part	Material
HDA-P / HDA-T (Carbon steel version)	
Sleeve: Bolt M10 - M16: Bolt M20:	Machined steel with brazed tungsten carbide tips, galvanised to min. 5 µm Cold formed steel, grade 8.8, galvanised to min. 5 µm Cone machined, rod grade 8.8, galvanised to min. 5 µm
HDA-PR / HDA-TR (Stainless steel version)	
Sleeve: Bolt M10 - M16:	Machined stainless steel with brazed tungsten carbide tips Cone/rod: machined stainless steel
HDA-PF / HDA-TF (Sherardized version)	
Sleeve: Bolt M10 - M16:	Machined steel with brazed tungsten carbide tips, shearadized Cold formed steel, grade 8.8, shearadized

Anchor dimensions

HDA-P / HDA-PR / HDA-PF



HDA-T / HDA-TR / HDA-TF



Dimensions of HDA

Anchor size			HDA-P / HDA-PR / HDA-PF / HDA-T / HDA-TR / HDA-TF						
			M10	M12		M16		M20	
			x100/20	x125/30	x125/50	x190/40	x190/60	x250/50	x250/100
Length code letter			I	L	N	R	S	V	X
Total length of bolt	l_B	[mm]	150	190	210	275	295	360	410
Diameter of bolt	d_B	[mm]	10	12		16		20	
Total length of sleeve:									
- HDA-P	l_s	[mm]	100	125	125	190	190	250	250
- HDA-T	l_s	[mm]	120	155	175	230	250	300	350
Max. diameter of sleeve	d_s	[mm]	19	21		29		35	
Washer diameter	d_w	[mm]	27,5	33,5		45,5		50	
Width across flats	S_w	[mm]	17	19		24		30	

Setting

Drilling

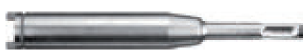
The stop drill is required for drilling in order to achieve the correct hole depth.

Anchor	Stop drill bit with TE-C (SDS plus) connection end	Stop drill bit with TE-Y (SDS max) connection end
HDA-P/ PF/ PR M10x100/20	TE-C-HDA-B 20*100	TE-Y-HDA-B 20*100
HDA-T/ TF/ TR M10x100/20	TE-C-HDA-B 20*120	TE-Y-HDA-B 20*120
HDA-P/ PF/ PR M12*125/30	TE-C HDA-B 22*125	TE-Y HDA-B 22*125
HDA-P/ PF/ PR M12*125/50		
HDA-T/ TF/ TR M12*125/30	TE-C HDA-B 22*155	TE-Y HDA-B 22*155
HDA-T/ TF/ TR M12*125/50	TE-C HDA-B 22*175	TE-Y HDA-B 22*175
HDA-P/ PF/ PR M16 *190/40 HDA-P/ PF/ PR M16 *190/60		TE-Y HDA-B 30*190
HDA-T/ TF/ TR M16*190/40		TE-Y HDA-B 30*230
HDA-T/ TF/ TR M16*190/60		TE-Y HDA-B 30*250
HDA-P M20 *250/50 HDA-P M20 *250/100		TE-Y HDA-B 37*250
HDA-T M20*250/50		TE-Y HDA-B 37*300
HDA-T M20*250/100		TE-Y HDA-B 37*350

Setting

Drilling

Setting tool



The setting system (tool and setting tool) is required for transferring the specific energy for the undercutting process.

Setting HDA carbon steel version

Anchor	TE 25 [a] TE 24 [a]	TE 35	TE 40 AVR TE 40	TE 50	TE 56 [b] TE 56-ATC [b]	TE 75 [b]	TE 76-ATC [b] TE 76 [b]	TE 70-ATC [b] TE 70 [b]	Setting tool	Technical data of the required drilling hammer	
										Single impact energy [J]	Speed under load [1/min]
HDA-P/T20-M10*100/20	■		■						TE-C-HDA-ST 20 M10	3.5 - 4.9	250 - 555
					■				TE-Y-HDA-ST 20 M10	6.5 - 7.5	480 - 500
HDA-P/T 22-M12*125/30 HDA-P/T 22-M12*125/50	■		■						TE-C-HDA-ST 22 M12	3,5 - 4.9	250 - 555
					■				TE-Y-HDA-ST 22 M12	6.5 - 7.5	480 - 500
HDA-P/T 30-M16*190/40 HDA-P/T 30-M16*190/60						■	■	■	TE-Y-HDA-ST 30 M16	8.0 - 11.0	250 - 360
HDA-P/T 37-M20*250/50 HDA-P/T 37-M20*250/100							■	■	TE-Y-HDA-ST 37 M20	8.3 - 11.0	280 - 360

Setting of HDA-R stainless steel

Anchor	TE 25 [a] TE 24 [a]	TE 35	TE 40 AVR TE 40	TE 50	TE 56 [b] TE 56-ATC [b]	TE 75 [b]	TE 76-ATC [b] TE 76 [b]	TE 70-ATC [b] TE 70 [b]	Setting tool	Technical data of the required drilling hammer	
										Single impact energy [J]	Speed under load [1/min]
HDA-PR/TR20-M10*100/20	■	■	■						TE-C-HDA-ST 20 M10	3.5 - 4.9	250 - 620
					■				TE-Y-HDA-ST 20 M10	6.5 - 7.5	480 - 500
HDA-PR/TR 22 M12*125/30 HDA-PR/TR 22-M12*125/50	■	■	■						TE-C-HDA-ST 22 M12	3.5 - 4.9	250 - 620
					■				TE-Y-HDA-ST 22 M12	6.5 - 7.5	480 - 500
HDA-PR/TR 30-M16*190/40 HDA-PR/TR 30-M16*190/60						■	■	■	TE-Y-HDA-ST 30 M16	8.0 - 11.0	250 - 360

Setting of HDA-F sheradised

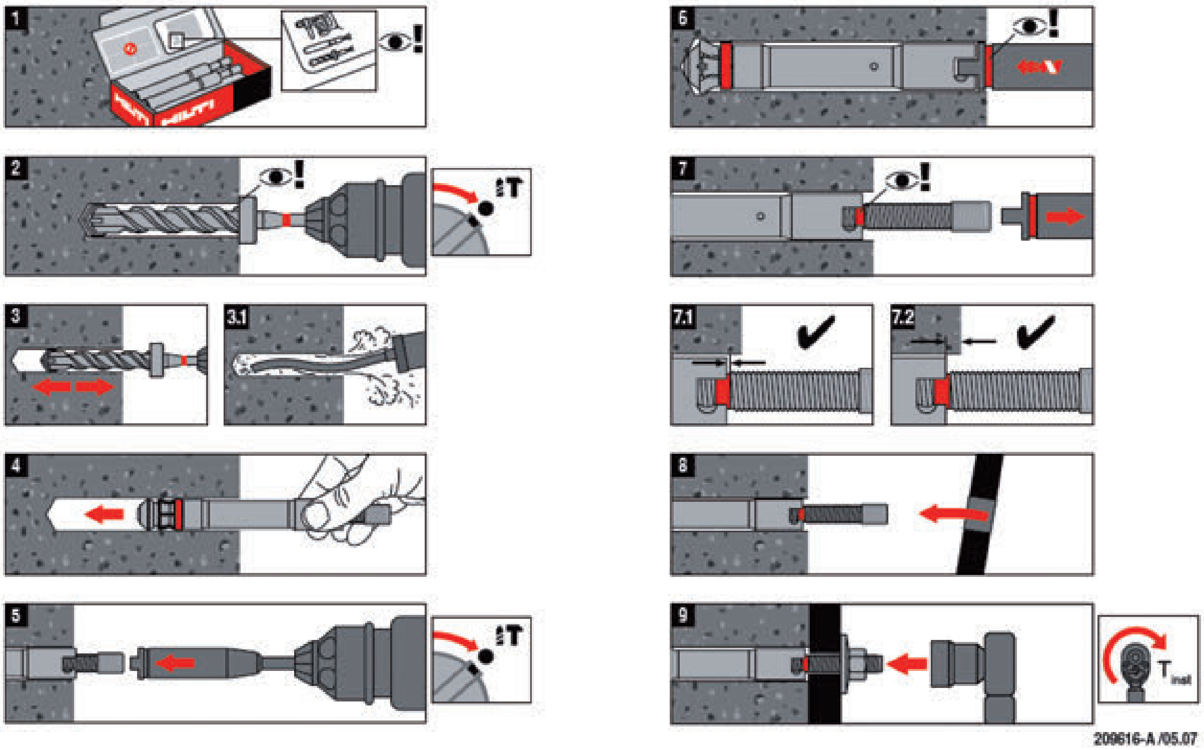
Anchor	TE 25 [a] TE 24 [a]	TE 35	TE 40 AVR TE 40	TE 50	TE 56 [b] TE 56-ATC [b]	TE 75 [b]	TE 76-ATC [b] TE 76 [b]	TE 70-ATC [b] TE 70 [b]	Setting tool	Technical data of the required drilling hammer	
										Single impact energy [J]	Speed under load [1/min]
HDA-PF/TF 20-M10*100/20		■							TE-C-HDA-ST 20 M10	3.5 - 4.9	250 - 620
HDA-PF/TF 22 M12*125/30 HDA-PF/TF 22-M12*125/50		■							TE-C-HDA-ST 22 M12	3.5 - 4.9	250 - 620
HDA-PF/TF 30-M16*190/40 HDA-PF/TF 30-M16*190/60						■	■	■	TE-Y-HDA-ST 30 M16	8.0 - 11.0	250 - 360

a) 1st gear

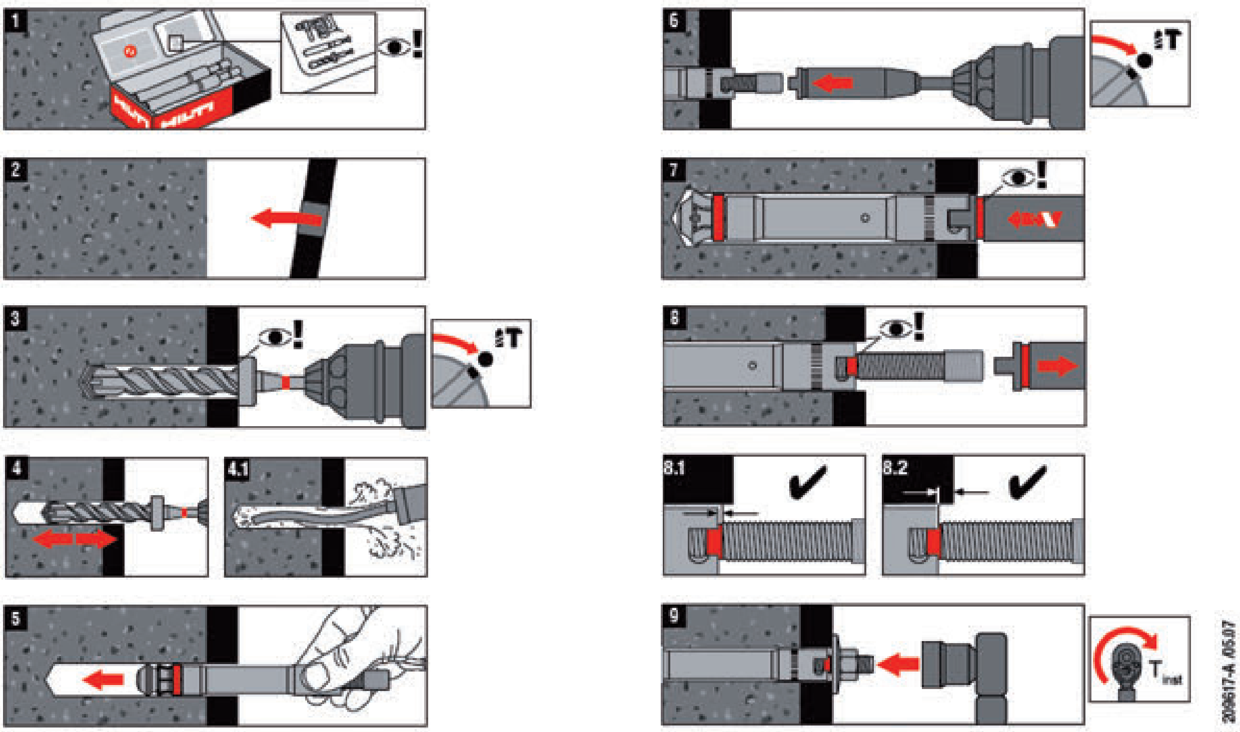
b) max. impact energy

Setting instructions

HDA-P, HDA-PR, HDA-PF

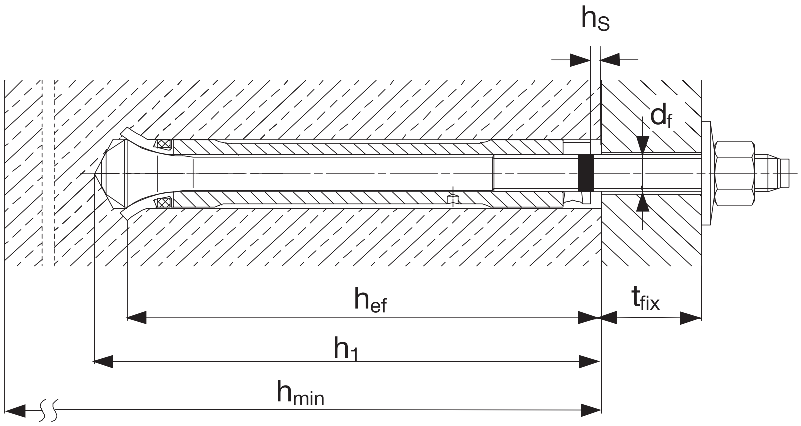


HDA-T, HDA-TR, HDA-TF

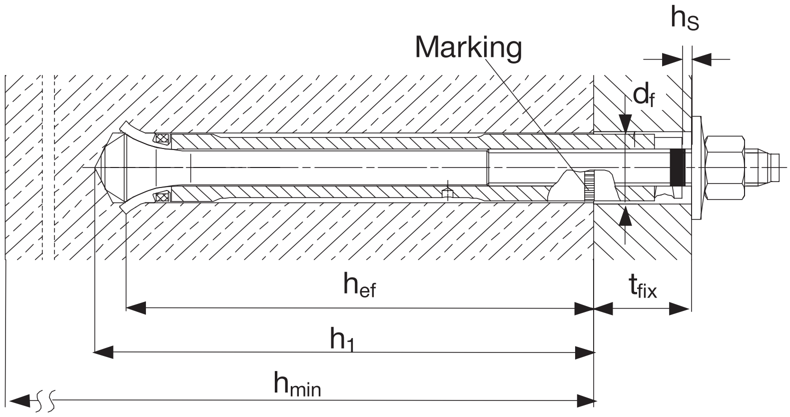


Setting details

HDA-P / HDA-PR / HDA-PF



HDA-T / HDA-TR / HDA-TF



Anchor size			HDA-P / HDA-PR / HDA-PF / HDA-T / HDA-TR / HDA-TF						
			M10	M12		M16		M20	
			x100/20	x125/30	x125/50	x190/40	x190/60	x250/50	x250/100
Head marking			I	L	N	R	S	V	X
Nominal diameter of drill bit	d_0	[mm]	20	22		30		37	
Cutting diameter of drill bit	$d_{cut,min}$	[mm]	20,10	22,10		30,10		37,15	
	$d_{cut,max}$	[mm]	20,55	22,55		30,55		37,70	
Depth of drill hole [a)]	h_1	[mm]	107	133		203		266	
Anchorage depth	h_{ef}	[mm]	100	125		190		250	
Sleeve recess	$h_{s,min}$	[mm]	2	2		2		2	
	$h_{s,max}$	[mm]	6	7		8		8	
Torque moment [b)]	T_{inst}	[Nm]	50	80		120		300	

For HDA-P/-PF/-PR

Clearance hole	d_f	[mm]	12	14		18		22	
Minimum base material thickness	h_{min}	[mm]	180	200		270		350	
Fixture thickness	$t_{fix,min}$	[mm]	0	0		0		0	
	$t_{fix,max}$	[mm]	20	30	50	40	60	50	100

For HDA-T/-TF/-TR

Clearance hole	d_f	[mm]	21	23		32		40	
Minimum base material thickness	h_{min}	[mm]	200-t_{fix}	230-t_{fix}	250-t_{fix}	310-t_{fix}	330-t_{fix}	400-t_{fix}	450-t_{fix}
Min. fixture thickness:									
- Tension load only!	$t_{fix,min}$	[mm]	10	10		15		20	50
- Shear load - **without** use of centering washer	$t_{fix,min}$ [b)]	[mm]	15	15		20		25	50
- Shear load - **with** use of centering washer	$t_{fix,min}$	[mm]	10	10		15		20	-
Max. fixture thickness	$t_{fix,max}$	[mm]	20	30	50	40	60	50	100

a) use specified stop drill bit

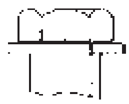
b) with use of centering washer a reduction of $t_{fix,min}$ is possible for shear loading, details see ETA-99/0009

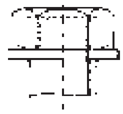
Setting parameters

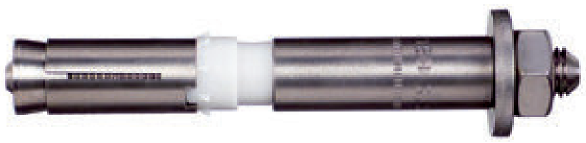
Anchor size			HDA-P / HDA-PR / HDA-PF / HDA-T / HDA-TR / HDA-TF						
			M10	M12		M16		M20	
			x100/20	x125/30	x125/50	x190/40	x190/60	x250/50	x250/100
Minimum spacing	s_{min}	[mm]	100	125		190		250	
Minimum edge distance	c_{min}	[mm]	80	100		150		200	

HSL-3 heavy duty anchor

Anchor version



HSL-3 Bolt version



HSL-3-B Safety cap version



HSL-G-R Stainless steel version

Benefits

- suitable for non-cracked and cracked concrete C 20/25 to C 50/60
- high loading capacity
- force-controlled expansion
- reliable pull-down of the part fastened
- no rotation in hole when tightening bolt
- stainless steel version (HSL-G-R) is available if required, subject to lead time. For technical data, please contact your local Hilti Field Engineer

Concrete | Tensile zone | Fire resistance | Shock | European Technical Approval | CE conformity | Hilti anchor design software | Fatigue | Seismic ICC

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	CSTB, Paris	ETA-02/0042 / 2013-01-10
ICC-ES report	ICC evaluation service	ESR 1545 / 2005-08-01
Shockproof fastenings in civil defence installations	Bundesamt für Bevölkerungsschutz, Bern	BZS D 08-601 / 2008-06-30
Fire test report	IBMB, Braunschweig	UB 3041/1663-CM / 2004-03-22
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section according ETA-02/0042, issue 2008-01-10.

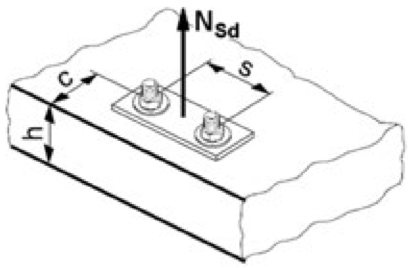
Design process for typical anchors layout in non cracked concrete

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

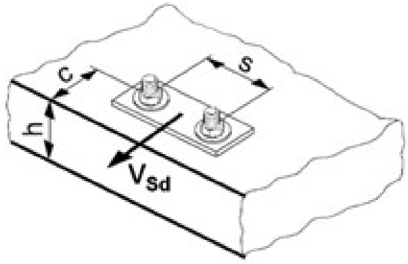
- **Design steel resistance (tension) $N_{Rd,s}$**

Anchor size			M8	M10	M12	M16	M20	M24
$N_{Rd,s}$	HSL-3, HSL-3B	[kN]	19.5	30.9	44.9	83.7	130.7	188.3

$N_{Rd} = \min \{ N_{Rd,c} , N_{Rd,s} \}$
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 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) $V_{Rd,s}$**

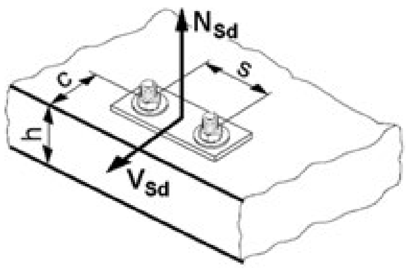
Anchor size			M8	M10	M12	M16	M20	M24
$V_{Rd,s}$	HSL-3, HSL-3B	[kN]	24.9	39.4	57.4	80.9	113.5	141.9

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

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

Anchor size	M8	M10	M12	M16	M20	M24
h = h_{min} [mm]	120	140	160	200	250	300

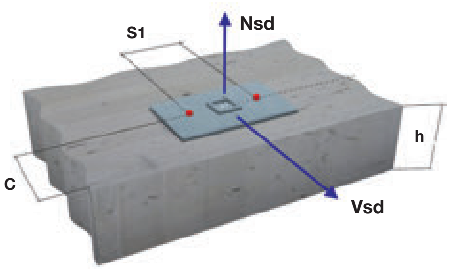
Basic loading data (for a single anchor) – no edge or spacing influence

Anchor size			M8	M10	M12	M16	M20	M24
Tensile $N^*_{Rd,c}$	HSL-3, HSL-3-B	[kN]	19.7	25.0	30.4	42.6	59.6	78.2
Shear $V_{Rd,s}$	HSL-3, HSL-3-B	[kN]	Steel governed refer $V_{Rd,s}$ table					

Steel failure

Two anchors

Table 1: One edge influence



ANCHOR M8	Edge C (mm)													
	60		80		100		125		150		200		250	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
60	-	-	-	-	22.5	17.3	25.0	20.2	26.4	23.1	26.4	28.9	26.4	34.5
80	-	-	20.6	15.9	24.0	18.2	26.7	21.1	28.6	24.0	28.6	29.7	28.6	35.4
100	18.6	12.7	21.9	16.9	25.6	19.2	28.4	22.0	30.8	24.9	30.8	30.6	30.8	36.2
125	20.0	13.8	23.6	18.1	27.5	20.4	30.6	23.2	33.6	26.0	33.6	31.7	33.6	37.3
150	21.4	14.9	25.2	19.4	29.4	21.6	32.7	24.4	36.3	27.2	36.3	32.8	36.3	38.4
200	24.2	16.3	28.6	21.8	33.3	24.0	37.0	26.7	39.6	29.4	39.6	35.0	39.6	40.5
250	25.8	16.3	30.5	23.8	35.6	26.3	39.6	29.0	39.6	31.7	39.6	37.1	39.6	42.6

ANCHOR M10	Edge C (mm)													
	70		100		125		150		175		200		250	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
70	-	-	25.3	20.3	29.6	23.5	31.5	26.7	33.3	29.9	33.3	33.0	33.3	39.3
100	-	-	27.5	21.9	32.2	25.1	34.2	28.2	36.9	31.4	36.9	34.5	36.9	40.8
125	-	-	29.3	23.3	34.4	26.4	36.5	29.5	39.8	32.6	39.8	35.8	39.8	42.0
150	-	-	31.2	24.6	36.6	27.7	38.8	30.8	42.8	33.9	42.8	37.0	42.8	43.2
175	26.7	19.5	33.0	26.0	38.7	29.0	41.2	32.1	45.8	35.2	45.8	38.2	45.8	44.4
200	28.2	20.8	34.9	27.4	40.9	30.3	43.5	33.4	48.7	36.4	48.7	39.5	48.7	45.6
250	31.2	21.3	38.6	30.1	45.3	33.0	48.1	35.9	49.9	38.9	49.9	41.9	49.9	48.0

ANCHOR M12	Edge C (mm)													
	80		125		150		175		200		250		300	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
80	-	-	-	-	-	-	38.6	33.9	40.7	37.3	40.7	44.2	40.7	50.9
125	-	-	-	-	43.2	33.0	43.2	36.4	46.4	39.8	46.4	46.6	46.4	53.3
150	-	-	39.9	31.1	45.8	34.4	45.8	37.8	49.6	41.2	49.6	47.9	49.6	54.6
175	-	-	42.1	32.6	48.3	35.9	48.3	39.2	52.7	42.5	52.7	49.2	52.7	55.9
200	-	-	44.3	34.0	50.8	37.3	50.8	40.6	55.9	43.9	55.9	50.5	55.9	57.2
250	36.9	26.8	48.7	37.0	55.9	40.2	55.9	43.4	61.0	46.7	61.0	53.2	61.0	59.8
300	40.2	26.8	53.1	39.9	61.0	43.0	61.0	46.2	61.0	49.4	61.0	55.9	61.0	62.3

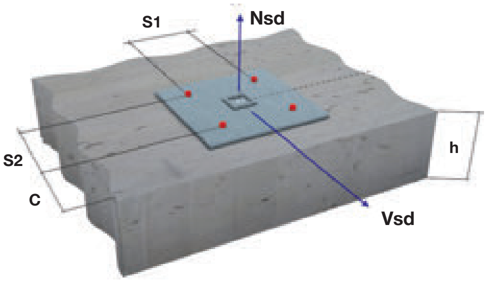
ANCHOR M16	Edge C (mm)													
	100		150		175		200		250		300		350	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	-	-	-	-	-	-	-	-	56.8	54.0	56.8	61.8	56.8	69.6
150	-	-	-	-	-	-	59.4	49.5	63.9	57.2	63.9	64.9	63.9	72.6
175	-	-	-	-	-	-	62.2	51.2	67.5	58.8	67.5	66.5	67.5	74.1
200	-	-	54.5	45.2	61.0	49.0	65.0	52.8	71.0	60.4	71.0	68.0	71.0	75.6
250	46.3	36.1	59.2	48.7	66.3	52.4	70.7	56.1	78.1	63.6	78.1	71.1	78.1	78.6
300	49.9	39.4	63.9	52.2	71.5	55.7	76.3	59.4	85.2	66.8	85.2	74.2	85.2	81.6
350	53.6	39.4	68.6	55.6	76.8	59.1	81.9	62.7	85.2	69.9	85.2	77.3	85.2	84.7

ANCHOR M20	Edge C (mm)													
	150		200		250		300		350		400		450	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	-	-	-	-	-	-	79.4	74.8	79.4	83.6	79.4	92.4	79.4	101.0
150	-	-	-	-	-	-	83.4	76.6	83.4	85.4	83.4	94.1	83.4	102.8
200	-	-	-	-	84.4	71.6	91.3	80.3	91.3	88.9	91.3	97.6	91.3	106.2
250	-	-	78.9	66.8	90.6	75.3	99.2	83.9	99.2	92.5	99.2	101.1	99.2	109.6
300	69.8	59.4	84.3	70.7	96.8	79.1	107.2	87.6	107.2	96.0	107.2	104.6	107.2	113.0
350	74.3	63.3	89.7	74.6	103.0	82.8	115.1	91.2	115.1	99.6	115.1	108.0	115.1	116.5
400	78.7	67.3	95.1	78.6	109.2	86.6	119.1	94.8	119.1	103.2	119.1	111.5	119.1	119.9

ANCHOR M24	Edge C (mm)													
	150		200		250		300		350		400		450	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
150	-	-	-	-	-	-	98.9	88.2	104.4	98.0	104.4	107.8	104.4	117.5
200	-	-	-	-	95.6	82.7	105.7	92.4	113.0	102.1	113.0	111.8	113.0	121.4
250	-	-	87.2	77.5	101.8	87.0	112.6	96.6	121.7	106.2	121.7	115.8	121.7	125.3
300	78.2	63.4	92.6	82.1	108.0	91.4	119.5	100.8	130.4	110.3	130.4	119.8	130.4	129.2
350	82.7	67.6	97.9	86.6	114.2	95.7	126.3	105.0	139.1	114.4	139.1	123.7	139.1	133.1
400	87.2	71.8	103.2	91.2	120.4	100.1	133.2	109.2	147.8	118.4	147.8	127.7	147.8	137.0
450	91.7	76.0	108.5	95.8	126.6	104.4	140.0	113.4	156.5	122.5	156.5	131.7	156.5	141.0

Four anchors

Table 2: One edge influence



ANCHOR M8	Edge C (mm)													
	60		80		100		125		150		200		250	
spacing s1=s2 (mm)	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$
60	-	-	-	-	28.7	24.3	31.5	27.1	35.2	30.0	35.2	35.7	35.2	41.3
80	-	-	29.0	25.2	32.9	27.4	36.0	30.3	41.3	33.1	41.3	38.8	41.3	44.4
100	29.1	25.4	33.1	28.3	37.4	30.6	40.8	33.4	47.9	36.3	47.9	41.9	47.9	47.4
125	34.2	27.6	38.7	32.3	43.4	34.5	47.2	37.3	56.9	40.1	56.9	45.7	56.9	51.2
150	39.6	29.8	44.6	36.1	49.9	38.4	54.1	41.2	66.5	43.9	66.5	49.5	66.5	55.0
200	51.7	32.6	57.8	43.6	64.2	46.0	69.2	48.8	79.2	51.5	79.2	57.0	79.2	62.5
250	59.7	32.6	66.5	47.6	73.6	52.6	79.2	56.3	79.2	59.0	79.2	64.5	79.2	69.9

ANCHOR M10	Edge C (mm)													
	70		100		125		150		175		200		250	
spacing s1=s2 (mm)	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$
70	-	-	32.8	29.3	37.6	32.4	39.6	35.6	44.4	38.7	44.4	41.8	44.4	48.0
100	-	-	39.2	34.5	44.6	37.7	46.9	40.8	54.4	43.9	54.4	46.9	54.4	53.1
125	-	-	44.9	38.9	50.9	42.0	53.4	45.0	63.5	48.1	63.5	51.2	63.5	57.3
150	-	-	51.1	43.2	57.6	46.2	60.4	49.3	73.3	52.3	73.3	55.4	73.3	61.5
175	49.5	39.0	57.6	47.4	64.8	50.5	67.8	53.5	83.9	56.5	83.9	59.6	83.9	65.6
200	55.8	41.6	64.6	51.6	72.4	54.7	75.6	57.7	95.1	60.7	95.1	63.7	95.1	69.7
250	69.3	42.6	79.6	60.0	88.8	63.0	92.6	66.0	99.8	69.0	99.8	72.0	99.8	78.0

ANCHOR M12	Edge C (mm)													
	80		125		150		175		200		250		300	
spacing s1=s2 (mm)	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$	tension $N^*_{Rd,c}$	shear $V^*_{Rrd,c}$
80	-	-	-	-	-	-	48.9	44.8	54.2	48.2	54.2	55.0	54.2	61.6
125	-	-	-	-	61.2	49.9	61.2	53.3	70.5	56.6	70.5	63.2	70.5	69.8
150	-	-	61.6	51.2	68.6	54.6	68.6	57.9	80.5	61.2	80.5	67.8	80.5	74.4
175	-	-	68.8	55.9	76.4	59.2	76.4	62.5	91.2	65.8	91.2	72.3	91.2	78.9
200	-	-	76.4	60.5	84.7	63.7	84.7	67.0	102.5	70.3	102.5	76.8	102.5	83.3
250	76.9	53.6	92.9	69.6	102.5	72.8	102.5	76.1	121.9	79.3	121.9	85.8	121.9	92.2
300	92.6	53.6	111.0	78.6	121.9	81.8	121.9	85.0	121.9	88.2	121.9	94.7	121.9	101.1

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)													
	100		150		175		200		250		300		350	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
100	-	-	-	-	-	-	-	-	75.8	69.6	75.8	77.2	75.8	84.8
150	-	-	-	-	-	-	82.9	72.6	95.9	80.2	95.9	87.7	95.9	95.3
175	-	-	-	-	-	-	90.9	77.9	106.8	85.4	106.8	93.0	106.8	100.4
200	-	-	86.6	75.6	94.4	79.4	99.3	83.1	118.3	90.7	118.3	98.1	118.3	105.6
250	86.1	72.2	102.7	86.1	111.6	89.9	117.1	93.6	143.2	101.0	143.2	108.4	143.2	115.8
300	101.6	78.8	120.3	96.5	130.3	100.2	136.4	103.9	170.4	111.3	170.4	118.7	170.4	126.0
350	118.3	78.8	139.2	106.8	150.3	110.5	157.2	114.1	170.4	121.5	170.4	128.8	170.4	136.1

ANCHOR M20	Edge C (mm)													
	150		200		250		300		350		400		450	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
125	-	-	-	-	-	-	105.9	96.7	105.9	105.4	105.9	114.0	105.9	122.6
150	-	-	-	-	-	-	116.7	102.8	116.7	111.4	116.7	119.9	116.7	128.5
200	-	-	-	-	119.5	106.2	140.0	114.6	140.0	123.3	140.0	131.8	140.0	140.2
250	-	-	123.7	109.6	137.7	118.1	165.4	126.6	165.4	135.1	165.4	143.5	165.4	151.9
300	123.4	113.0	141.7	121.5	157.2	129.9	192.9	138.4	192.9	146.7	192.9	155.1	192.9	163.4
350	140.9	124.9	161.0	133.3	178.0	141.6	222.5	150.0	222.5	158.3	222.5	166.6	222.5	174.9
400	159.4	134.6	181.4	144.9	200.1	153.3	238.1	161.6	238.1	169.8	238.1	178.1	238.1	186.4

ANCHOR M24	Edge C (mm)													
	150		200		250		300		350		400		450	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
150	-	-	-	-	-	-	124.9	117.5	139.1	127.1	139.1	136.7	139.1	146.2
200	-	-	-	-	131.3	121.4	142.8	131.0	163.3	140.5	163.3	150.0	163.3	159.4
250	-	-	132.2	125.3	149.3	134.8	162.0	144.3	189.4	153.7	189.4	163.1	189.4	172.5
300	132.1	126.8	149.8	138.7	168.5	148.1	182.3	157.5	217.4	166.8	217.4	176.2	217.4	185.5
350	149.2	135.2	168.5	151.9	188.9	161.2	203.9	170.6	247.3	179.8	247.3	189.1	247.3	198.4
400	167.4	143.6	188.3	165.0	210.4	174.3	226.6	183.5	279.2	192.8	279.2	202.0	279.2	211.2
450	186.5	152.0	209.1	178.0	233.1	187.2	250.6	196.4	313.0	205.6	313.0	214.7	313.0	223.4

Materials

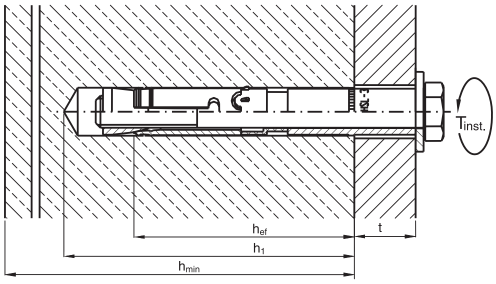
Mechanical properties of HSL-3, HSL-3-B

Anchor size			M8	M10	M12	M16	M20	M24
Nominal tensile strength	f_{uk}	[N/mm²]	800	800	800	800	830	830
Yield strength	f_{yk}	[N/mm²]	640	640	640	640	640	640
Stressed cross-section	A_s	[mm²]	36.6	58.0	84.3	157	245	353
Section modulus	Z	[mm³]	31.3	62.5	109.4	277.1	540.6	935.4
Design bending resistance without sleeve	$M_{Rd,s}$	[Nm]	24.0	48.0	84.0	212.8	415.2	718.4

Material quality

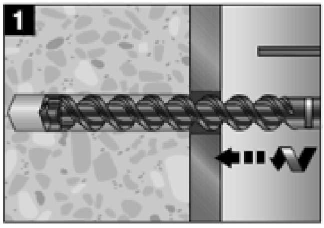
Part	Material
Bolt, threaded rod	steel grade 8.8 according ISO 898-1, galvanised to min. 5 µm

Setting details

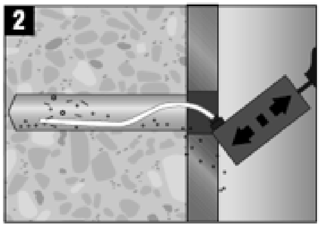


Anchor version HSL-3			M8/20	M10/20	M10/40	M12/25	M12/50	M16/25	M16/50	M20/30	M20/60	M24/30	M24/60
Drill bit diameter	d_0	[mm]	12	15		18		24		28		32	
Hole depth	h_1	[mm]	80	90		105		125		155		180	
Effective anchorage depth	h_{ef}	[mm]	60	70		80		100		125		150	
Max. fixture thickness	t_{fix}	[mm]	20	20	40	25	50	25	50	30	60	30	60
Anchor length	l	[mm]	98	110	130	131	156	153	178	183	213	205	235
Head height + washer	h_n	[mm]	7.5	10		11		14		17		19	
Tightening torque	T_{inst}	[Nm]	25	50		80		120		200		250	
Width across flats	S_w [mm]	HSL-3	13	17		19		24		30		36	
		HSL-3-B	-	-		24		30		36		41	
Clearance hole	d_h	[mm]	14	17		20		26		31		35	
Washer diameter	d_w	[mm]	20	25		30		40		45		50	
Min. base material thickness	h_{min}	[mm]	120	140		160		200		250		300	
Minimum spacing	s_{min}	[mm]	60	70		80		100		125		150	
	for c ≥	[mm]	100	100		160		240		300		300	
Minimum edge distance	c_{min}	[mm]	60	70		80		100		150		150	
	for s ≥	[mm]	100	160		240		240		300		300	

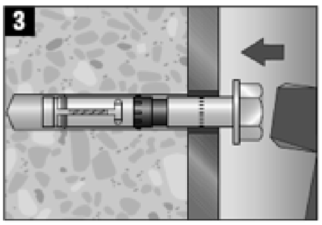
Setting instructions



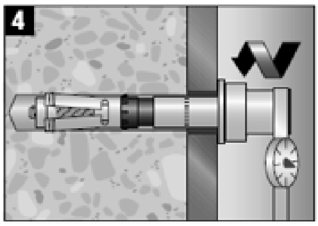
Drill hole



Blow out dust and fragments



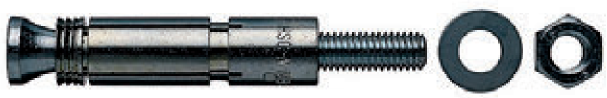
Install anchor



Apply tightening torque
(for HSL-3-B: no torque wrench
is needed)

HSC-A safety anchor

Anchor version



Bolt version

HSC-A Carbon Steel version

HSC-AR Stainless steel version

Benefits

- 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

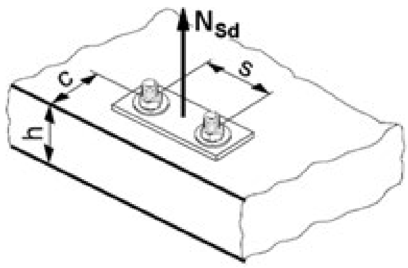
Design process for typical anchors layout in non cracked concrete

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) $N_{Rd,s}$**

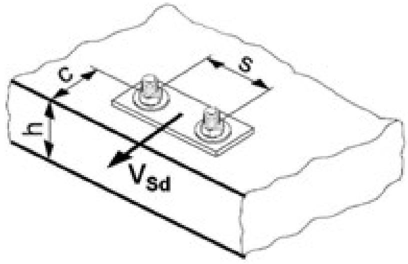
Anchor size			M8x40	M10x40	M12x60
$N_{Rd,s}$	HSC-A	[kN]	19.5	30.9	44.9
	HSC-AR	[kN]	13.7	21.7	31.6

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

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

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

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

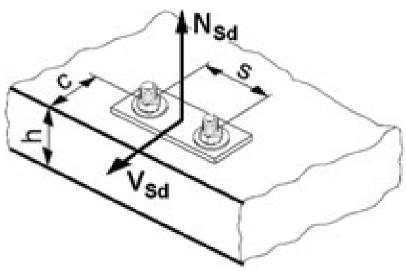
STEP 3: COMBINED TENSION AND SHEAR LOADING

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

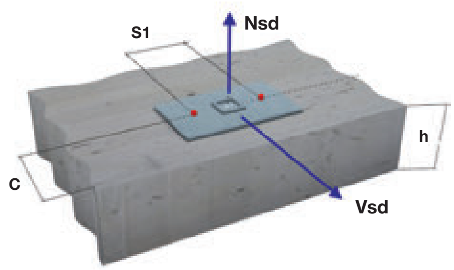
Basic loading data (for a single anchor) – no edge or spacing influence

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}



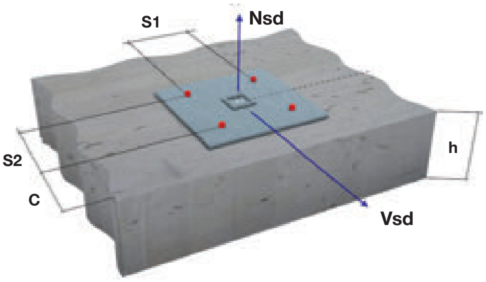
ANCHOR M8	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	10.8	6.0	14.4	9.4	14.4	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

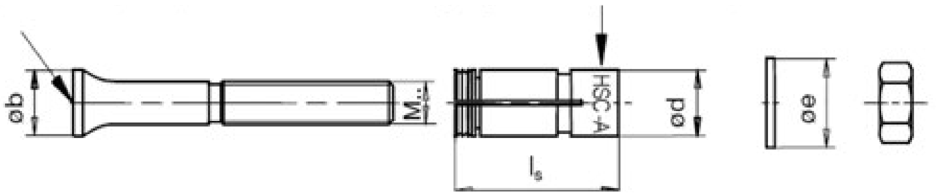
Anchor dimensions

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)

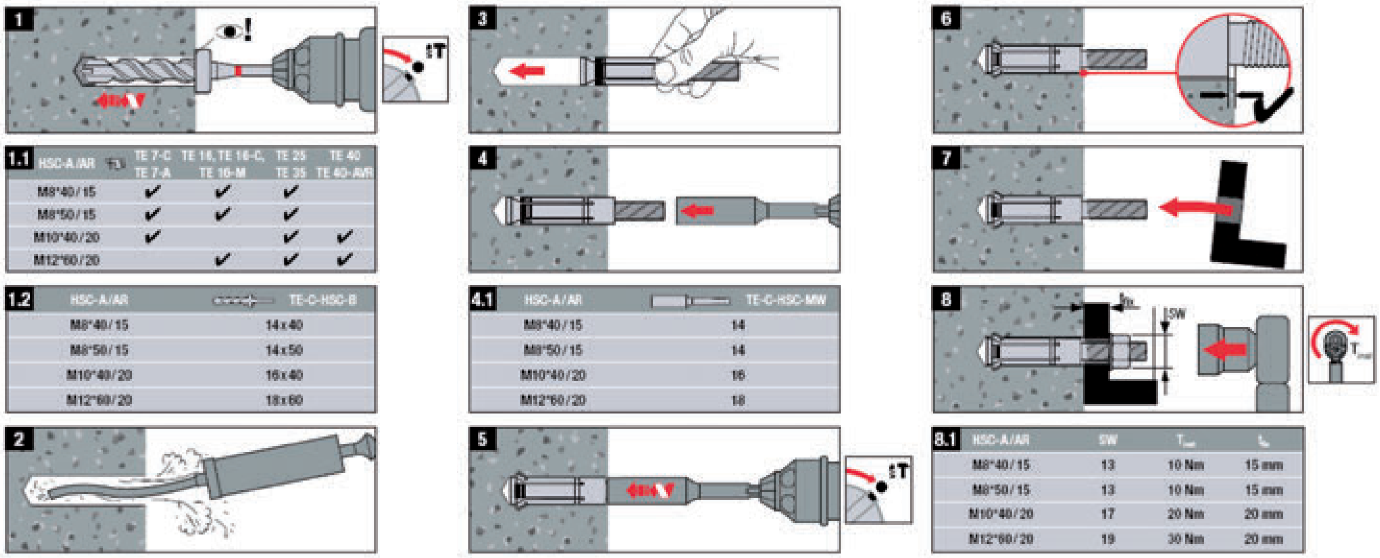


Setting

Installation equipment

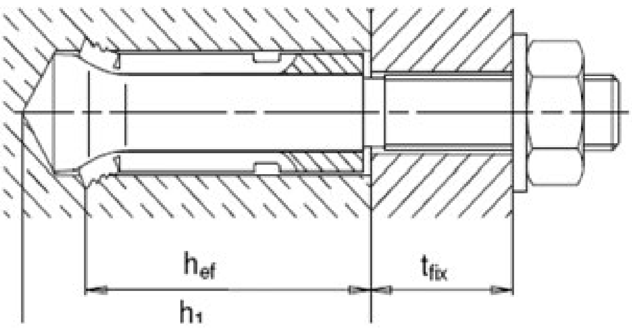
Anchor size		HSC-A/AR M8x40	HSC-A/AR M10x40	HSC-A/AR M12x60
Rotary hammer for setting		TE 7-C; TE 7-A; TE 16; TE 16-C;TE 16-M; TE 25; TE 35	TE 7-C; TE 7-A; TE 25; TE 35	TE 16; TE 16-C; TE 16-M; TE 25; TE 35; TE 40; TE 40-AVR
Stop drill bit	TE-C-HSC-B	14x40	16x40	16x60
Setting Tool	TE-C-HSC-MW	14	16	18

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

HSC-I safety anchor

Anchor version	Benefits
 Internal threaded version: HSC-I carbon steel internal version HSC-IR Stainless steel version (A4)	■ 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 ■ internal threaded ■ 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

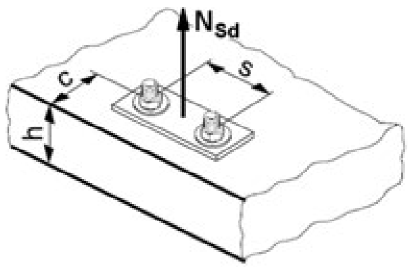
Design process for typical anchors layout in non cracked concrete

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

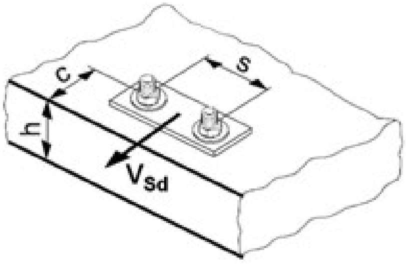
- **Design steel resistance (tension) $N_{Rd,s}$**

Anchor size			M8x40	M10x50	M12x60
$N_{Rd,s}$	HSC-I	[kN]	16.3	20.2	24.3
	HSC-IR	[kN]	11.4	14.2	17.1

$N_{Rd} = \min\{ N_{Rd,c}, N_{Rd,s} \}$
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 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	M10x50	M12x60
$V_{Rd,s}$	HSC-I	[kN]	9.8	12.2	14.6
	HSC-IR	[kN]	6.9	8.5	10.3

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

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

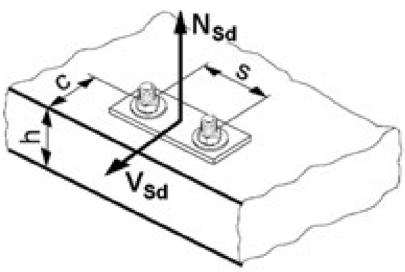
STEP 3: COMBINED TENSION AND SHEAR LOADING

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

Anchor size	M8x40	M10x50	M12x60
$h = h_{min}$ [mm]	100	110	130

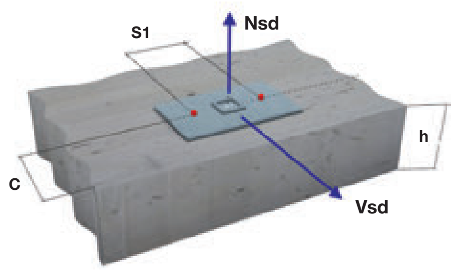
Basic loading data (for a single anchor) – no edge or spacing influence

Anchor size			**M8 x 40**	**M10 x 50**	**M12 x 60**
Tensile $N^*_{rd,c}$	HSC-I	[kN]	10.7	15.1	19.8
Shear $V_{Rd,s}$	HSC-I	[kN]	Steel governed refer $V_{Rd,s}$ table		

Two Anchors

Table 1: One edge influence

h=h$_{min}$



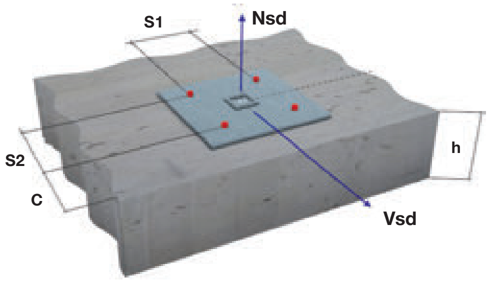
ANCHOR M8	Edge C (mm)									
	40		60		100		120		150	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
40	10.8	6.1	14.4	9.6	14.4	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 M10	Edge C (mm)									
	50		75		100		150		200	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
50	14.5	8.8	18.9	13.5	20.1	16.4	20.1	22.1	20.1	27.7
75	16.1	9.9	21.0	14.7	22.6	17.6	22.6	23.2	22.6	28.7
100	17.7	11.0	23.2	16.0	25.1	18.7	25.1	24.3	25.1	29.8
150	21.0	13.2	27.5	18.4	30.1	21.1	30.1	26.5	30.1	31.9
200	22.3	13.2	29.1	20.9	30.1	23.4	30.1	28.7	30.1	34.0

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	11.8	26.4	18.0	26.4	21.7	26.4	29.2	26.4	37.7
90	22.3	13.2	29.7	19.6	29.7	23.3	29.7	30.7	29.7	39.1
120	24.8	14.7	33.0	21.2	33.0	24.8	33.0	32.1	33.0	40.5
180	29.7	17.7	39.6	24.5	39.6	27.9	39.6	35.0	39.6	43.3
250	29.7	17.7	39.6	28.3	39.6	31.6	39.6	38.4	39.6	46.6

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	12.2	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 M10	Edge C (mm)									
	50		75		100		150		200	
spacing	tension	shear	tension	shear	tension	shear	tension	shear	tension	shear
s1=s2 (mm)	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$	$N^*_{Rd,c}$	$V^*_{Rrd,c}$
50	19.8	16.4	24.8	19.3	26.8	22.1	26.8	27.7	26.8	33.2
75	25.0	19.8	30.9	23.2	33.3	26.0	33.9	31.5	33.9	36.9
100	30.9	22.0	37.6	27.0	40.5	29.8	41.8	35.2	41.8	40.6
150	44.4	26.4	53.1	34.6	56.9	37.3	60.3	42.7	60.3	48.0
200	49.7	26.4	60.1	41.8	60.3	44.7	60.3	50.0	60.3	55.3

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	21.7	35.2	25.5	35.2	29.2	35.2	36.5	35.2	45.0
90	35.7	26.6	44.5	30.6	44.5	34.3	44.5	41.6	44.5	49.9
120	44.5	29.4	55.0	35.7	55.0	39.3	55.0	46.5	55.0	54.8
180	65.3	35.4	79.2	45.7	79.2	49.2	79.2	56.3	79.2	64.5
250	65.3	35.4	79.2	56.6	79.2	60.6	79.2	67.5	79.2	75.6

Materials

Mechanical properties

Anchor size			HSC	M8x40	M10x50	M12x60
Nominal tensile strength	f_{uk}	[N/mm²]	-I	800	800	800
			-IR	600	700	700
Yield strength	f_{yk}	[N/mm²]	-I	640	640	640
			-IR	355	350	340
Stressed cross-section for internal threaded version	$A_{s,I}$	[mm²]	-I,IR	28.3	34.6	40.8
Stressed cross-section for bolt version	$A_{s,A}$	[mm²]	-I,IR	36.6	58.0	84.3
Section modulus	Z	[mm³]	-I,IR	31.2	62.3	109.2
Design bending resistance without sleeve	$M_{Rd,s}$	[Nm]	-I	24	48	84
			-IR	16.7	33.3	59.0

Material quality

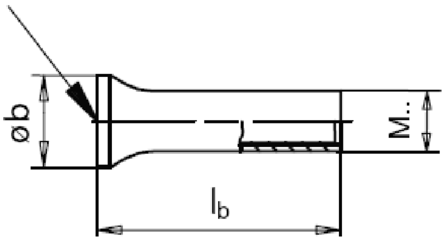
	Part	Material
HSC-I	Cone bolt with , with internal or external thread	steel grade 8.8 according ISO 898-1, galvanised to min. 5 µm
	Expansion sleeve and washer	Galvanised steel
	Hexagon nut	Grade 8 according to ISO 898-2
HSC-IR	Cone bolt with , with internal or external thread	steel grade 1.4401, 1.4571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

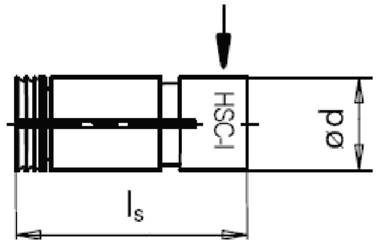
Dimensions of HSC-I and HSC-IR

Anchor version	Thread size	b (mm)	l_s (mm)	d (mm)	l_b (mm)
HSC-I M8x40	M8	15.5	40.8	15.5	43.8
HSC-I M10x50	M10	17.5	50.8	17.5	54.8
HSC-I M12x60	M12	19.5	60.8	19.5	64.8

marking HILTI 8.8 (or A4)



marking e.g. HSC-I M6 x 40 (or HSC-IR M6 x 40 A4)

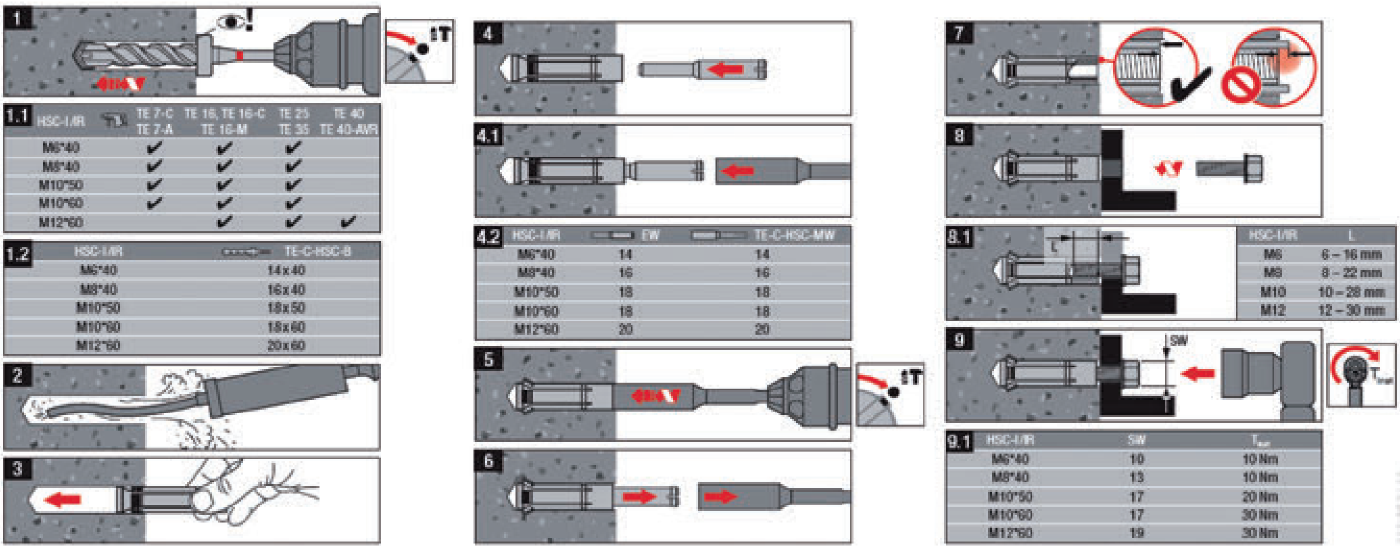


Setting

Installation equipment

Anchor size		HSC-I/IR M8x40	HSC-I/IR M10x50	HSC-I/IR M12x60
Rotary hammer for setting		TE 7-C; TE 7-A; TE 16; TE 16-C; TE 16-M; 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-CHSC-B	16x40	18x50	20x60
Setting Tool	TE-C HSC-MW	16	18	20
Insert Tool	TE-C HSC-EW	16	18	20

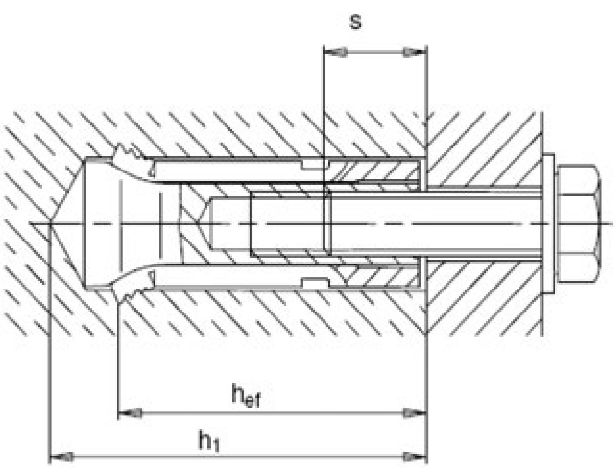
Setting instruction



For HSC-I: fastening carbon steel screw or threaded rod. Minimum strength class 8.8 according to ESO 8898-1
For HSC-IR: fastening stainless steel screw or threaded rod: minimum strength class A4-70 according to EN ISO 3506

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

Anchor version			M8x40	M10x50	M12x60
Nominal diameter of drill bit	d_0	[mm]	16	18	20
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	16.5	18.5	20.5
Depth of drill hole	$h_1 \geq$	[mm]	46	56	68
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14
Effective anchorage depth	h_{ef}	[mm]	40	50	60
Screwing depth	min s	[mm]	8	10	12
	max s	[mm]	22	28	30
Width across	SW	[mm]	13	17	19
Installation torque	T_{inst}	[Nm]	10	20	30

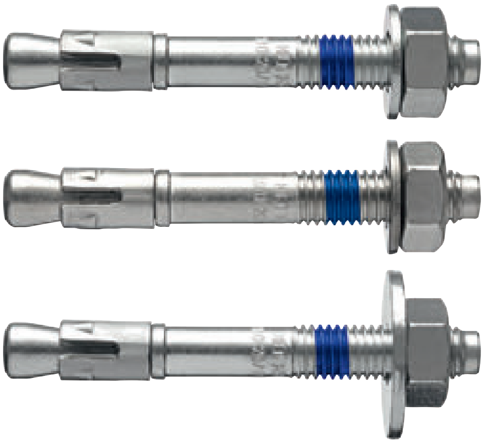
Base material thickness, anchor spacing and edge distance

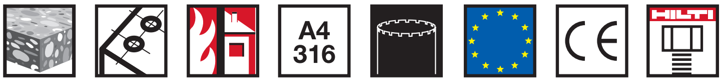
Anchor version			M8x40	M10x50	M12x60
Minimum base material thickness	h_{min}	[mm]	100	110	130
Minimum spacing	s_{min}	[mm]	40	50	60
Minimum edge distance	c_{min}	[mm]	40	50	60

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

HSA stud anchor

Anchor version		Benefits
	HSA Carbon steel HSA-F Carbon steel hot-dipped galvanised with DIN 125 washer HSA-R Stainless steel A4 HSA-BW Carbon steel with DIN 9021 washer	■ small edge distance and spacing ■ three different embedment depth for each anchor size ■ approved for diamond drilled holes ■ simple and quick machine setting with torque bar for torque control



Concrete | Small edge distance and spacing | Fire resistance | Corrosion resistance | Diamond drilled holes | European Technical Approval | CE conformity | PROFIS anchor design software

Approvals / certificates

3215/229/12 / 2012-08-09	Authority / Laboratory	No. / date of issue
European technical approval a)	DIBt, Berlin	ETA-11/0374 / 2012-07-19
Fire test report	IBMB, Braunschweig	3215/229/12 / 2012-08-09

a) All data given in this section according ETA-11/0374, issue 2012-07-19.

Design process for typical anchor layouts in non cracked concrete

Background of the design method:

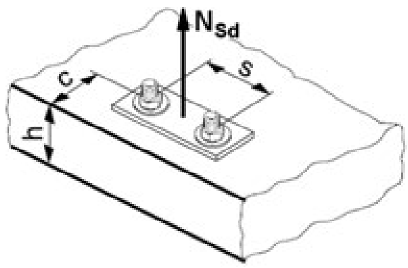
Values of the design resistances are obtained from PROFIS 2.4.2 in compliance with ETAG No.001 Annex C Design Method.

Design Process:

STEP 1: TENSION LOADING

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

- **Concrete cone or concrete splitting resistance, or pullout, 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) $N_{Rd,s}$**

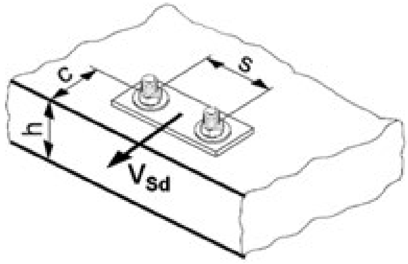
Anchor size			M6	M8	M10	M12	M16	M20
$N_{Rd,s}$	HSA	[kN]	6.4	11.8	20.0	29.6	59.0	88.5
	HSA-R	[kN]	8.7	13.1	25.0	31.9	62.6	68.5

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

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 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

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

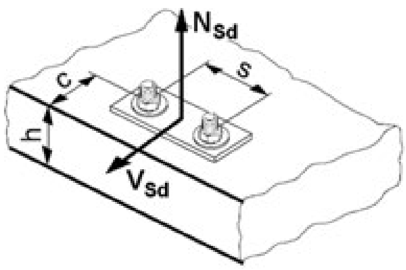
Anchor size			M6	M8	M10	M12	M16	M20
$V_{Rd,s}$	HSA	[kN]	5.2	8.5	15.1	23.6	40.8	68.6
	HSA-R	[kN]	5.8	9.8	18.1	23.4	45.2	73.5

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

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
- minimum base material thickness, as specified in the table below
- effective anchorage depth (h_{eff}) does not equal to nominal anchorage (h_{nom}) and borehole depths (h_1) in case of stud anchors. Please see Setting Details Table on pages 295-296
- for more complex design we recommend to use our free design software, Hilti PROFIS Anchor
- design for hot-dipped galvanised version (HSA-F): please use PROFIS Anchor Software

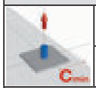
Single anchor – no edge effect

Anchor size		**M6**		**M8**		**M10**		
Effective anchorage depth	h_{ef} [mm]	40	60	40	70	40	50	80
Min. base material thickness	h_{min} [mm]	100	120	100	120	100	120	160
Tensile N_{Rd}								
HSA	[kN]	6.3	7.6	10.8	13.5	10.8	15.1	21.2
HSA-R	[kN]	6.3	7.6	10.8	13.5	10.8	15.1	21.1
Shear V_{Rd} (without lever arm)								
HSA	[kN]	Steel failure governs refer $V_{Rd,s}$ table		Steel failure governs refer $V_{Rd,s}$ table		Steel failure governs refer $V_{Rd,s}$ table		
HSA-R	[kN]							

Anchor size		**M12**			**M16**			**M20**		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Min. base material thickness	h_{min} [mm]	100	140	180	140	160	180	160	220	220
Tensile N_{Rd}										
HSA	[kN]	15.1	22.3	29.5	22.3	30.5	42.2	27.7	42.6	52.5
HSA-R	[kN]	15.1	22.3	29.5	22.3	30.5	42.2	27.7	42.6	52.5
Shear V_{Rd} (without lever arm)										
HSA	[kN]	Steel failure governs refer $V_{Rd,s}$ table			Steel failure governs refer $V_{Rd,s}$ table			55.3	Steel failure governs refer $V_{Rd,s}$ table	
HSA-R	[kN]							55.3		

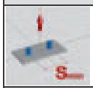
For the shear V_{Rd} values, where steel is not governing this is due to concrete pry-out failure. These values are multiplied by f_b to obtain the pry-out capacity. Ensure that you take the lower value of the shear steel capacity and pry-out capacity.

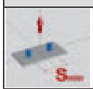
Single anchor, min. edge distance (c = c_min)

Anchor size		M6		M8		M10		
Effective anchorage depth	h_{ef} [mm]	40	60	40	70	40	50	80
Min. base material thickness	h_{min} [mm]	100	120	100	120	100	120	160
Min. edge distance	c_{min} [mm]	35	35	35	35	50	40	40
Tensile N_{Rd}								
 HSA	[kN]	4.4	5.0	6.1	7.3	7.1	8.5	10.5
HSA-R	[kN]	4.4	5.0	6.1	7.3	7.1	8.5	10.5
Shear V_{Rd} (without lever arm)								
 HSA	[kN]	3.3	3.5	3.4	3.9	5.7	4.5	4.9
HSA-R	[kN]	3.3	3.5	3.4	3.9	5.7	4.5	4.9

Anchor size		M12			M16			M20		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Min. base material thickness	h_{min} [mm]	100	140	180	140	160	180	160	220	220
Min. edge distance	c_{min} [mm]	70	65	55	80	75	70	130	120	120
Tensile N_{Rd}										
 HSA	[kN]	11.6	14.5	16.1	17.2	20.1	23.4	27.7	31.4	37.0
HSA-R	[kN]	11.6	14.5	16.1	17.2	20.1	23.4	27.7	31.4	37.0
Shear V_{Rd} (without lever arm)										
 HSA	[kN]	9.4	9.2	8.1	12.6	12.1	12.2	23.0	24.1	24.9
HSA-R	[kN]	9.4	9.2	8.1	12.6	12.1	12.2	23.0	24.1	24.9

Double anchor, no edge effects, min. spacing (s = s_min) (load values are valid for two anchors)

Anchor size		**M6**		**M8**		**M10**		
Effective anchorage depth	h_{ef} [mm]	40	60	40	70	40	50	80
Min. base material thickness	h_{min} [mm]	100	120	100	120	100	120	160
Minimum spacing	s_{min} [mm]	35	35	35	35	50	50	50
Tensile N_{Rd}								
 HSA	[kN]	12.6	15.2	13.9	15.8	15.2	20.0	36.8
HSA-R	[kN]	12.6	15.2	13.9	15.8	15.2	20.0	36.8
Shear V_{Rd} (without lever arm)								
 HSA	[kN]	Steel failure governs refer $V_{Rd,s}$ table		Steel failure governs refer $V_{Rd,s}$ table		36.6	Steel failure governs refer $V_{Rd,s}$ table	
HSA-R	[kN]					36.6		

Anchor size		**M12**			**M16**			**M20**		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Min. base material thickness	h_{min} [mm]	100	140	180	140	160	180	160	220	220
Minimum spacing	s_{min} [mm]	70	70	70	90	90	90	195	175	175
Tensile N_{Rd}										
 HSA	[kN]	22.0	30.4	36.2	32.6	41.8	52.2	51.6	67.4	75.4
HSA-R	[kN]	22.0	30.4	36.2	32.6	41.8	52.2	51.6	67.4	75.4
Shear V_{Rd} (without lever arm)										
 HSA	[kN]	44.2	Steel failure governs refer $V_{Rd,s}$ table		94.6	Steel failure governs refer $V_{Rd,s}$ table		103.2	Steel failure governs refer $V_{Rd,s}$ table	
HSA-R	[kN]	44.2			94.6			103.2		

For the shear V_{Rd} values, where steel is not governing this is due to concrete pry-out failure. These values are multiplied by f_b to obtain the pry-out capacity. Ensure that you take the lower value of the shear steel capacity and pry-out capacity.

Materials

Mechanical properties

Anchor size			M6	M8	M10	M12	M16	M20
Nominal tensile strength f_{uk}	HSA HSA-F / -BW	[N/mm²]	650	580	650	700	650	700
	HSA-R	[N/mm²]	650	560	650	580	600	625
Yield strength f_{yk}	HSA HSA-F / -BW	[N/mm²]	520	464	520	560	520	560
	HSA-R	[N/mm²]	520	448	520	464	480	500
Stressed cross-section A_s	HSA HSA-F / -BW HSA-R	[mm²]	20.1	36.6	58.0	84.3	157.0	245.0
Moment of resistance	HSA HSA-F / -BW HSA-R	[mm³]	12.7	31.2	62.3	109.2	277.5	540.9
Design bending resistance $M^0_{Rd,s}$	HSA HSA-F / -BW	[Nm]	9.9	21.7	48.6	91.7	216.4	454.4
	HSA-R	[Nm]	9.9	21.0	48.6	76.0	199.8	405.7

Material quality

Type	Part	Material	Coating
HSA **HSA-BW** Carbon Steel	Bolt	Carbon-steel	Galvanised (≥5 µm)
	Sleeve	Carbon-steel	
	Washer	HSA :carbon steel, according Table 4 HSA-BW: carbon steel, according Table	
	Hexagon nut	Steel, strength class 8, EN 20898-2	
HSA-F Carbon Steel	All parts	Carbon-steel	Hot-dipped galvanised (45 µm)
HSA-R Stainless Steel Grade A4	Bolt	Stainless steel grade A4, 1.4401 or 1.4362	M6 - M20 coated
	Sleeve	Stainless steel A2, 1.4301 or 1.4404	-
	Washer	Stainless steel grade A4	-
	Hexagon nut	Stainless steel grade A4	M6 - M20 coated

Effective and nominal anchorage depth

Anchor size		M6			M8			M10		
Effective anchorage depth	h_{ef} [mm]	30	40	60	30	40	70	40	50	80
Nominal anchorage depth	h_{nom} [mm]	37	47	67	39	49	79	50	60	90

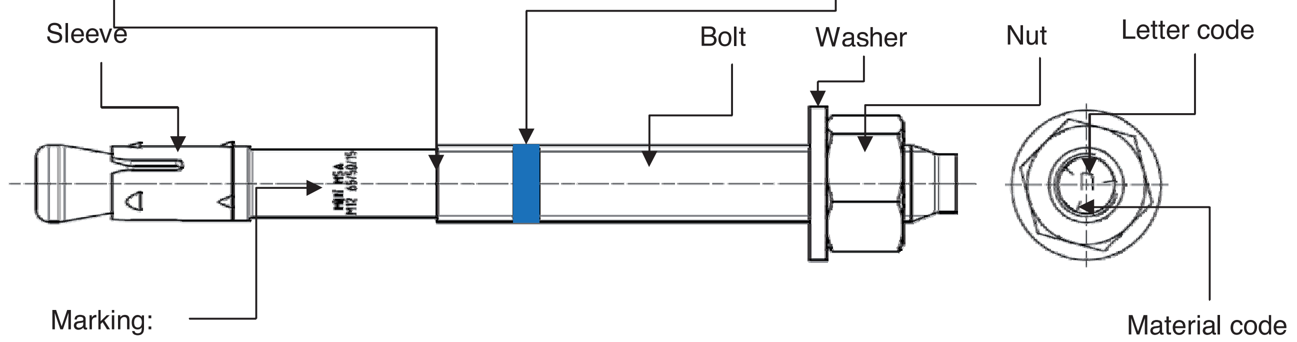
Anchor size		M12			M16			M20		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Nominal anchorage depth	h_{nom} [mm]	64	79	114	77	92	132	90	115	130

Anchor dimensions and coding

Product marking and identification of anchor

Beginning of thread: setting depth indicator for $h_{nom,1}$
$h_{nom,1}$ is reached when non-threaded part of the bolt is completely below the concrete surface

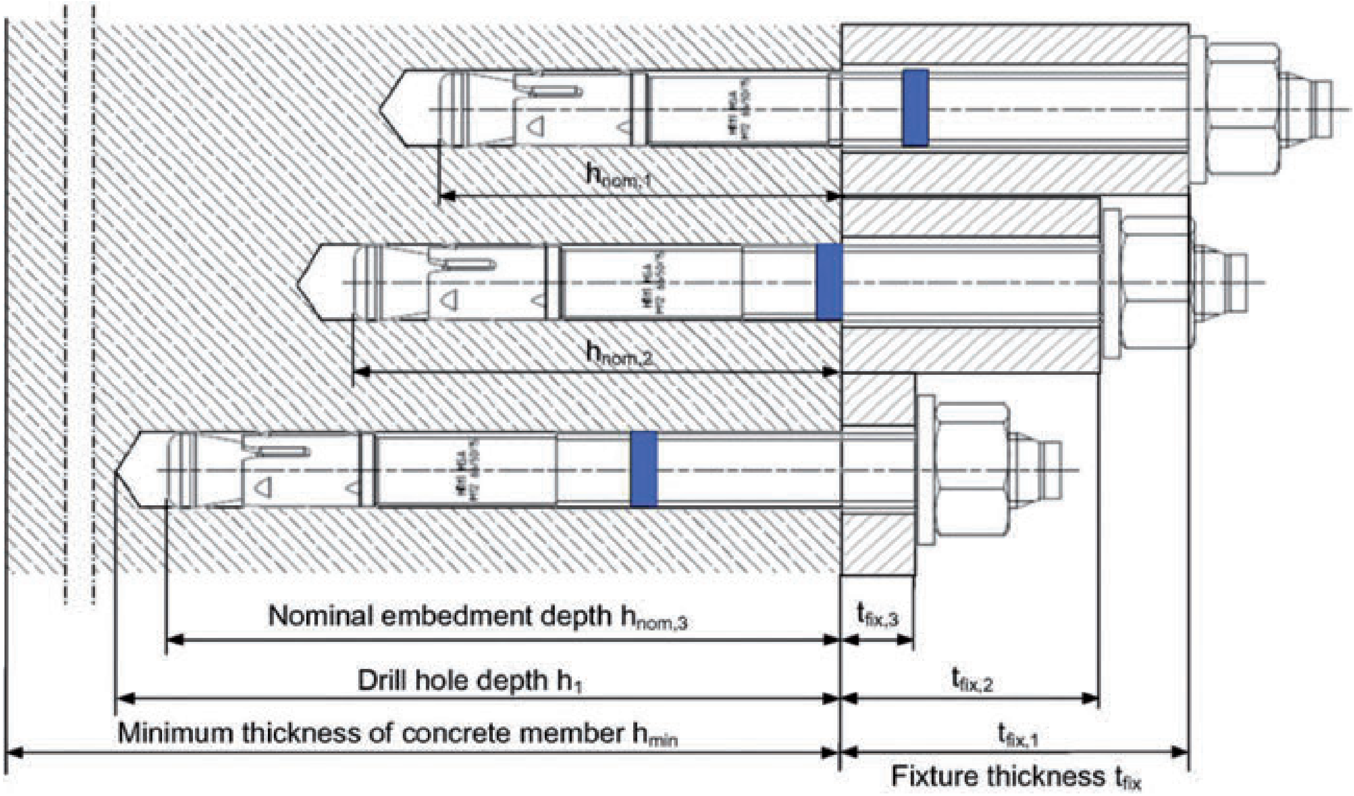
Blue ring: setting depth indicator for $h_{nom,2}$
$h_{nom,2}$ is reached when the blue ring is completely below the concrete surface



e.g.
Hilti HSA … Brand and Anchor type
M12 65/50/15 … Anchor Size and the max. $t_{fix,1}$/ $t_{fix,2}$/ $t_{fix,3}$ for the corresponding $h_{nom,1}$/ $h_{nom,2}$/ $h_{nom,3}$

Setting details

One anchor length for different fixture thickness t_{fix} and the corresponding setting positions



Setting

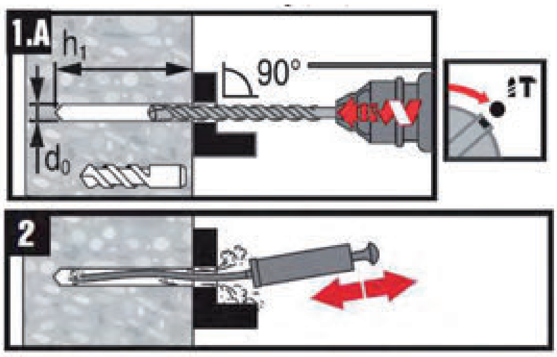
Installation equipment

Anchor size	M6	M8	M10	M12	M16	M20
Rotary hammer	TE 2 – TE 30					TE 40 – 70
Other tools	hammer, torque wrench, blow out pump					

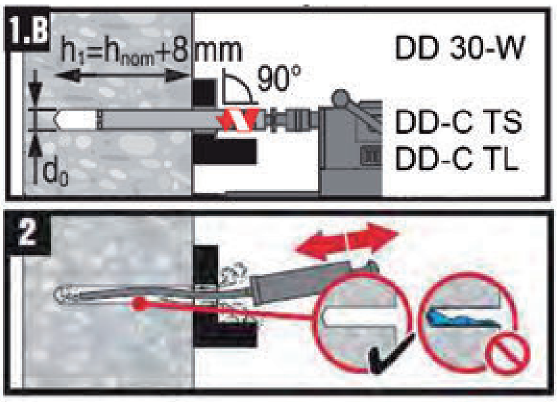
Setting instructions

Drill and clean borehole

Standard drilling method
M6 – M20: Hammer drilling (HD)

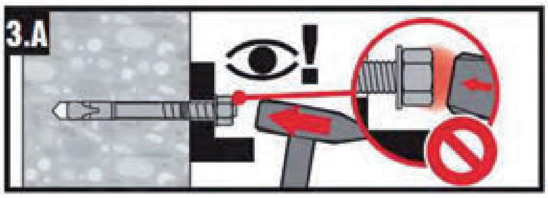


Alternative drilling method
M12 – M20: Diamond drilling (DD)

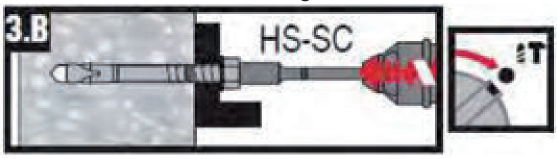


Install anchor with hammer or machine setting tool

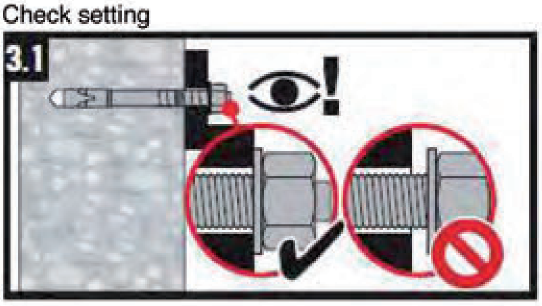
Standard setting method
M6 – M20: Hammer setting



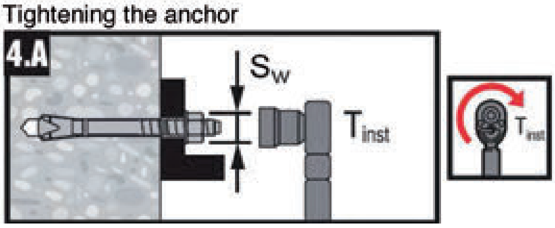
Alternative setting method
M8 – M16: Machnine setting



Check setting



Tightening the anchor



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

Setting details

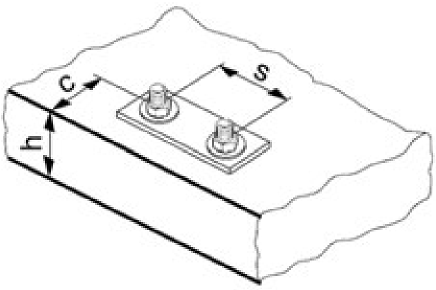
Anchor size			M6			M8			M10		
Nominal anchorage depth	h_{nom}	[mm]	37	47	67	39	49	79	50	60	90
Minimum base material thickness	h_{min}	[mm]	100	100	120	100	100	120	100	120	160
Minimum spacing	s_{min}	[mm]	35	35	35	35	35	35	50	50	50
Minimum edge distance	c_{min}	[mm]	35	35	35	40	35	35	50	40	40
Nominal diameter of drill bit	d_o	[mm]	6			8			10		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6.4			8.45			10.45		
Depth of drill hole	$h_1 \geq$	[mm]	42	52	72	44	54	84	55	65	95
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7			9			12		
Torque moment	T_{inat}	[Nm]	5			15			25		
Width across	SW	[mm]	10			13			17		

Anchor size			M12			M16			M20		
Nominal anchorage depth	h_{nom}	[mm]	64	79	114	77	92	132	90	115	130
Minimum base material thickness	h_{min}	[mm]	100	140	180	140	160	180	160	220	220
Minimum spacing	s_{min}	[mm]	70	70	70	90	90	90	195	175	175
Minimum edge distance	c_{min}	[mm]	70	65	55	80	75	70	130	120	120
Nominal diameter of drill bit	d_o	[mm]	12			16			20		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	12.5			16.5			20.55		
Depth of drill hole	$h_1 \geq$	[mm]	72	87	122	85	100	140	98	123	138
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14			18			22		
Torque moment	T_{inat}	[Nm]	50			80			200		
Width across	SW	[mm]	19			24			30		

Setting details

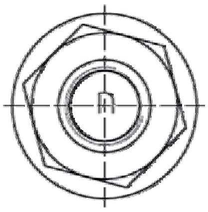
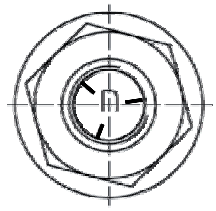
Anchor size			M6			M8			M10		
Nominal anchorage depth	h_{nom}	[mm]	37	47	67	39	49	79	50	60	90
Effective anchorage depth	h_{ef}	[mm]	30	40	60	30	40	70	40	50	80
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	100	120	130	130	180	200	190	210	290
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	50	60	65	65	90	100	95	105	145
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	90	120	180	90	120	210	120	150	240
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	45	60	90	45	60	105	60	75	120

Anchor size			M12			M16			M20		
Nominal anchorage depth	h_{nom}	[mm]	64	79	114	77	92	132	90	115	130
Effective anchorage depth	h_{ef}	[mm]	50	65	100	65	80	120	75	100	115
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	200	250	310	230	280	380	260	370	400
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	100	125	155	115	140	190	130	185	200
Critical spacing for concrete cone failure	$s_{cr,N}$	[mm]	150	195	300	195	240	360	225	300	345
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	75	97.5	150	97.5	120	180	112.5	150	172.5



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

Material code for identification of different materials

Type	HSA / HSA-BW (carbon steel)	HSA-R (stainless steel grade A4)
Material Code	 Letter code without mark	 Letter code with three marks

Letter code for anchor length and maximum thickness of the fixture t_{fix}

Type	HSA, HSA-BW, HSA-R					
Size	**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
h_{nom} [mm]	37 / 47 / 67	39 / 49 / 79	50 / 60 / 90	64 / 79 / 114	77 / 92 / 132	90 / 115 / 130
t_{fix} / Letter	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$	$t_{fix,1}/t_{fix,2}/t_{fix,3}$
z	**5/-/-**	**5/-/-**	**5/-/-**	**5/ -/-**	**5/-/-**	5/-/-
y	10/-/-	10/-/-	10/-/-	10/-/-	10/-/-	**10/-/-**
x	15/5/-	15/5/-	15/5/-	15/-/-	15/-/-	15/-/-
w	**20/10/-**	**20/10/-**	**20/10/-**	**20/5/-**	**20/5/-**	20/-/-
v	25/15/-	25/15/-	25/15	25/10/-	25/10/-	25/-/-
u	30/20/-	30/20/-	30/20/-	30/15/-	30/15/-	30/5/-
t	35/25/5	**35/25/-**	**35/25/-**	**35/20/-**	35/20/-	35/10/-
s	**40/30/10**	40/30/-	40/30/-	40/25/-	**40/25/-**	40/15/-
r	45/35/15	45/35/5	45/35/5	45/30/-	45/30/-	45/20/5
q	50/40/20	50/40/10	**50/40/10**	50/35/-	50/35/-	50/25/10
p	**55/45/25**	**55/45/15**	55/45/15	55/40/5	55/40/-	**55/30/15**
o	60/50/30	60/50/20	60/50/20	60/45/10	60/45/5	60/35/20
n	65/55/35	65/55/25	65/55/25	**65/50/15**	65/50/10	65/40/25
m	70/60/40	70/60/30	**70/60/30**	70/55/20	70/55/15	70/45/30
l	75/65/45	75/65/35	75/65/35	75/60/25	75/60/20	75/50/35
k	80/70/50	**80/70/40**	80/70/40	80/65/30	80/65/25	80/55/40
j	85/75/55	85/75/45	85/75/45	85/70/35	**85/70/30**	85/60/45
i	90/80/60	90/80/50	**90/80/50**	90/75/40	90/75/35	90/65/50
h	95/85/65	95/85/55	95/85/55	**95/80/45**	95/80/40	95/70/55
g	100/90/70	100/90/60	100/90/60	100/85/50	100/85/45	100/75/60
f	105/95/75	105/95/65	**105/95/65**	105/90/55	105/90/50	105/80/65
e	110/100/80	110/100/70	110/100/70	110/95/60	110/95/55	110/85/70
d	115/105/85	115/105/75	115/105/75	115/100/65	115/100/60	115/90/75
c	120/110/90	120/110/80	120/110/80	**125/110/75**	120/105/65	120/95/80
b	125/115/95	125/115/85	125/115/85	135/120/85	125/110/70	125/100/85
a	130/120/100	130/120/90	130/120/90	**145/130/95**	**135/120/80**	130/105/90

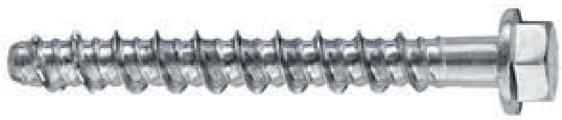
Anchor length in bolt type and grey shaded are standard items. For selection of other anchor length, check availability of the items.

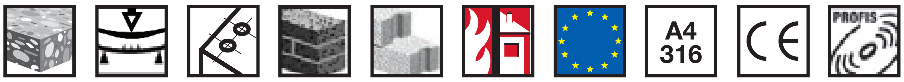
Product overview – HSA stud anchors

item	description	anchor length [mm]	drill bit [mm]	inst. torque [Nm]	clearance hole of fixture [mm]	drill depth 1 [mm]	drill depth 2 [mm]	drill depth 3 [mm]	min. concrete thickn. 1 [mm]	min. concrete thickn. 2 [mm]	min. concrete thickn. 3 [mm]
2036084	HSA M6 5/-/-	50	6	5	7	42	-	-	100	-	-
2036085	HSA M6 20/10/-	65	6	5	7	42	52	-	100	100	-
2036086	HSA M6 40/30/10	85	6	5	7	42	52	72	100	100	120
2036087	HSA M6 55/45/25	100	6	5	7	42	52	72	100	100	120
2004122	HSA M8 5/-/-	55	8	15	9	44	-	-	100	-	-
2004123	HSA M8 20/10/-	70	8	15	9	44	54	-	100	100	-
2004124	HSA M8 35/25/-	85	8	15	9	44	54	-	100	100	-
2004125	HSA M8 55/45/15	105	8	15	9	44	54	84	100	100	120
2004126	HSA M8 80/70/40	130	8	15	9	44	54	84	100	100	120
2004127	HSA M10 5/-/-	68	10	25	12	55	-	-	100	-	-
2004128	HSA M10 20/10/-	83	10	25	12	55	65	-	100	120	-
2004129	HSA M10 35/25/-	98	10	25	12	55	65	-	100	120	-
2004150	HSA M10 50/40/10	113	10	25	12	55	65	95	100	120	160
2004151	HSA M10 70/60/30	133	10	25	12	55	65	95	100	120	160
2004152	HSA M10 90/80/50	153	10	25	12	55	65	95	100	120	160
2004153	HSA M10 105/95/65	168	10	25	12	55	65	95	100	120	160
2004154	HSA M12 5/ -/-	85	12	50	14	72	-	-	100	-	-
2004155	HSA M12 20/5/-	100	12	50	14	72	87	-	100	140	-
2004156	HSA M12 35/20/-	115	12	50	14	72	87	-	100	140	-
2004157	HSA M12 65/50/15	145	12	50	14	72	87	122	100	140	180
2004158	HSA M12 95/80/45	175	12	50	14	72	87	122	100	140	180
2004159	HSA M12 125/110/75	205	12	50	14	72	87	122	100	140	180
2004160	HSA M12 145/130/95	225	12	50	14	72	87	122	100	140	180
2004161	HSA M16 5/-/-	102	16	80	18	85	-	-	140	-	-
2004162	HSA M16 20/5/-	117	16	80	18	85	100	-	140	160	-
2004163	HSA M16 40/25/-	137	16	80	18	85	100	-	140	160	-
2004164	HSA M16 85/70/30	182	16	80	18	85	100	140	140	160	180
2004165	HSA M16 135/120/80	232	16	80	18	85	100	140	140	160	180
2036088	HSA M20 10/-/-	125	20	200	22	98	-	-	160	-	-
2036089	HSA M20 55/30/-	170	20	200	22	98	123	-	160	220	-
2004223	HSA M8 5/-/- BW	55	8	15	9	44	-	-	100	-	-
2004224	HSA M8 20/10/- BW	70	8	15	9	44	54	-	100	100	-
2004225	HSA M10 5/-/- BW	68	10	25	12	55	-	-	100	-	-
2004226	HSA M10 20/10/- BW	83	10	25	12	55	65	-	100	120	-
2004227	HSA M12 5/ -/- BW	85	12	50	14	72	-	-	100	-	-
2004228	HSA M12 20/5/- BW	100	12	50	14	72	87	-	100	140	-
2004229	HSA M16 5/-/- BW	102	16	80	18	85	-	-	140	-	-
2004230	HSA M16 20/5/- BW	117	16	80	18	85	100	-	140	160	-
2004231	HSA M16 40/25/- BW	137	16	80	18	85	100	-	140	160	-
2036310	HSA-F M6 5/-/-	50	6	5	7	42	-	-	100	-	-
2036311	HSA-F M6 20/10/-	65	6	5	7	42	52	-	100	100	-
2004113	HSA-F M8 5/-/-	55	8	15	9	44	-	-	100	-	-
2004114	HSA-F M8 20/10/-	70	8	15	9	44	54	-	100	100	-
2004115	HSA-F M8 35/25/-	85	8	15	9	44	54	-	100	100	-

item	description	anchor length [mm]	drill bit [mm]	inst. torque [Nm]	clearance hole of fixture [mm]	drill depth 1 [mm]	drill depth 2 [mm]	drill depth 3 [mm]	min. concrete thickn. 1 [mm]	min. concrete thickn. 2 [mm]	min. concrete thickn. 3 [mm]
2004116	HSA-F M8 55/45/15	105	8	15	9	44	54	84	100	100	120
2004117	HSA-F M8 80/70/40	130	8	15	9	44	54	84	100	100	120
2004118	HSA-F M10 5/-/-	68	10	25	12	55	-	-	100	-	-
2004119	HSA-F M10 20/10/-	83	10	25	12	55	65	-	100	120	-
2004170	HSA-F M10 35/25/-	98	10	25	12	55	65	-	100	120	-
2004171	HSA-F M10 50/40/10	113	10	25	12	55	65	95	100	120	160
2004172	HSA-F M12 5/ -/-	85	12	50	14	72	-	-	100	-	-
2004173	HSA-F M12 20/5/-	100	12	50	14	72	87	-	100	140	-
2004174	HSA-F M12 35/20/-	115	12	50	14	72	87	-	100	140	-
2004175	HSA-F M12 65/50/15	145	12	50	14	72	87	122	100	140	180
2004176	HSA-F M12 145/130/95	225	12	50	14	72	87	122	100	140	180
2004177	HSA-F M16 5/-/-	102	16	80	18	85	-	-	140	-	-
2004178	HSA-F M16 40/25/-	137	16	80	18	85	100	-	140	160	-
2004179	HSA-F M16 85/70/30	182	16	80	18	85	100	140	140	160	180
2036312	HSA-F M20 10/-/-	125	20	200	22	98	-	-	160	-	-
2036313	HSA-F M20 55/30/-	170	20	200	22	98	123	-	160	220	-
2036314	HSA-R M6 5/-/-	50	6	5	7	42	-	-	100	-	-
2036315	HSA-R M6 20/10/-	65	6	5	7	42	52	-	100	100	-
2036316	HSA-R M6 40/30/10	85	6	5	7	42	52	72	100	100	120
2004197	HSA-R M8 5/-/-	55	8	15	9	44	-	-	100	-	-
2004198	HSA-R M8 20/10/-	70	8	15	9	44	54	-	100	100	-
2004199	HSA-R M8 35/25/-	85	8	15	9	44	54	-	100	100	-
2004200	HSA-R M8 55/45/15	105	8	15	9	44	54	84	100	100	120
2004201	HSA-R M10 5/-/-	68	10	25	12	55	-	-	100	-	-
2004202	HSA-R M10 20/10/-	83	10	25	12	55	65	-	100	120	-
2004203	HSA-R M10 35/25/-	98	10	25	12	55	65	-	100	120	-
2004204	HSA-R M10 50/40/10	113	10	25	12	55	65	95	100	120	160
2004205	HSA-R M10 70/60/30	133	10	25	12	55	65	95	100	120	160
2004206	HSA-R M10 90/80/50	153	10	25	12	55	65	95	100	120	160
2004207	HSA-R M12 5/ -/-	85	12	50	14	72	-	-	100	-	-
2004208	HSA-R M12 20/5/-	100	12	50	14	72	87	-	100	140	-
2004209	HSA-R M12 35/20/-	115	12	50	14	72	87	-	100	140	-
2004210	HSA-R M12 65/50/15	145	12	50	14	72	87	122	100	140	180
2004211	HSA-R M12 95/80/45	175	12	50	14	72	87	122	100	140	180
2004212	HSA-R M12 125/110/75	205	12	50	14	72	87	122	100	140	180
2004213	HSA-R M12 145/130/95	225	12	50	14	72	87	122	100	140	180
2004214	HSA-R M16 5/-/-	102	16	80	18	85	-	-	140	-	-
2004215	HSA-R M16 20/5/-	117	16	80	18	85	100	-	140	160	-
2004216	HSA-R M16 40/25/-	137	16	80	18	85	100	-	140	160	-
2004217	HSA-R M16 85/70/30	182	16	80	18	85	100	140	140	160	180
2036317	HSA-R M20 10/-/-	125	20	200	22	98	-	-	160	-	-
2036318	HSA-R M20 55/30/-	170	20	200	22	98	123	-	160	220	-

HUS-HR screw anchor

Anchor version	Benefits
 HUS-HR Stainless steel Concrete Screw	■ Quick and easy setting ■ Low expansion forces in base materials ■ Through fastening ■ Removable ■ Forged-on washer and hexagon head with no protruding thread



Concrete | Tensile zone | Small edge distance & spacing | Solid brick | Autoclaved aerated concrete | Fire resistance | European Technical Approval | Corrosion resistance | CE conformity | Hilti anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-08/0307 / 2013-06-04
Fire test report	DIBt, Berlin	ETA-08/0307 / 2013-06-04
Fire test report ZTV – Tunnel (EBA)	MFPA, Leipzig	PB III / 08-354 / 2008-11-27

a) Data for HUS-HR with standard and reduced embedment depth is given in this section according ETA-08/0307 issue 2009-03-30.

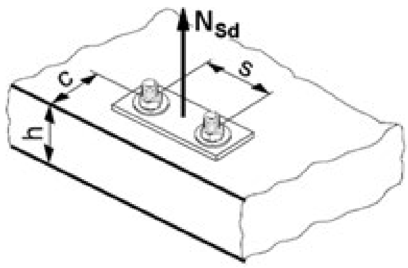
Design process for typical anchors layout in non cracked concrete

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**
  $N_{Rd} = f_B \cdot N^*_{Rd.c}$

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

f_B influence of concrete strength

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

a) extra reduced embedment depth b) reduced embedment depth

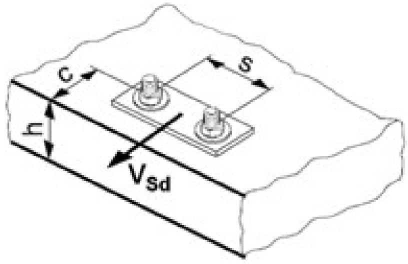
- **Design steel resistance (tension) $N_{Rd.s}$**

Anchor size		HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
$N_{Rd,s}$	[kN]	17.0	24.3	37.6	73.0

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

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

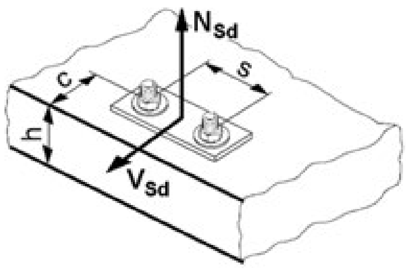
Anchor size			HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
Extra reduced embedment	$V_{Rd,s}$	[kN]	11.3	17.3	22.0	-
Reduced embedment	$V_{Rd,s}$	[kN]	-	17.3	22.0	36.7
Standard embedment	$V_{Rd,s}$	[kN]	11.3	17.3	22.0	36.7

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

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

Single anchor – no edge effects

		Non-cracked concrete				Cracked concrete			
Anchor size HUS-HR		**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment									
h_{nom}	[mm]	30	50	60	-	30	50	60	-
Min. base material thickness h_{min}	[mm]	80	100	120	-	80	100	120	-
Tension $N^*_{Rd,c}$	[kN]	-	6.3	8.4	-	-	3.5	5.2	-
Shear $V^*_{Rd,c}$	[kN]	-	20.0	26.5	-		14.2	18.8	-
Reduced embedment									
h_{nom}	[mm]	-	60	70	70	-	60	70	70
Min. base material thickness h_{min}	[mm]	-	100	120	140	-	100	120	140
Tension $N^*_{Rd,c}$	[kN]	-	8.4	11.2	13.3	-	4.2	6.3	8.4
Shear $V^*_{Rd,c}$	[kN]	-	Steel governs refer $V_{Rd,s}$ table		31.9	-	19.5	24.0	22.7
Standard embedment									
h_{nom}	[mm]	55	80	90	110	55	80	90	110
Min. base material thickness h_{min}	[mm]	100	120	140	160	100	120	140	160
Tension $N^*_{Rd,c}$	[kN]	5.4	11.2	17.6	28.3	3.0	8.4	11.2	17.6
Shear $V^*_{Rd,c}$	[kN]	Steel governs refer $V_{Rd,s}$ table				13.7	Steel governs refer $V_{Rd,s}$ table		

Single anchor, min. edge distance ($c = c_{min}$)

		Non-cracked concrete				Cracked concrete			
Anchor size HUS-HR		6	8	10	14	6	8	10	14
Extra reduced embedment									
h_{nom}	[mm]	30	50	60	-	30	50	60	-
Min. base material thickness h_{min}	[mm]	80	100	120	-	80	100	120	-
Min. edge distance $c=c_{min}$	[mm]	40	45	50	-	40	45	50	-
Tension $N^*_{Rd,c}$	[kN]	-	6.3	7.8	-	-	3.5	5.2	-
Shear $V^*_{Rd,c}$	[kN]	-	4.8	5.9	-	-	3.3	4.1	-
Reduced embedment									
h_{nom}	[mm]	-	60	70	70	-	60	70	70
Min. base material thickness h_{min}	[mm]	-	100	120	140	-	100	120	140
Min. edge distance $c=c_{min}$	[mm]	-	45	50	50	-	45	50	50
Tension $N^*_{Rd,c}$	[kN]	-	8.4	10.1	9.7	-	4.2	6.3	6.9
Shear $V^*_{Rd,c}$	[kN]	-	5.0	6.1	6.4	-	3.5	4.3	4.5
Standard embedment									
h_{nom}	[mm]	55	80	90	110	55	80	90	110
Min. base material thickness h_{min}	[mm]	100	120	140	160	100	120	140	160
Min. edge distance $c=c_{min}$	[mm]	40	50	50	60	40	50	50	60
Tension $N^*_{Rd,c}$	[kN]	5.4	11.2	13.1	17.4	3.0	8.4	9.3	12.4
Shear $V^*_{Rd,c}$	[kN]	4.0	6.0	6.4	9.0	2.8	4.3	4.5	6.3

Materials

Mechanical properties

Anchor size			HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
Nominal tensile strength	f_{uk}	[N/mm²]	1040	870	950	820
Stressed cross-section	A_s	[mm²]	23	39	55	125
Section modulus	Z	[mm³]	15.5	34.4	58.2	196.4
Design bending resistance	$M_{Rd,s}$	[Nm]	12.9	23.9	44.2	128.8

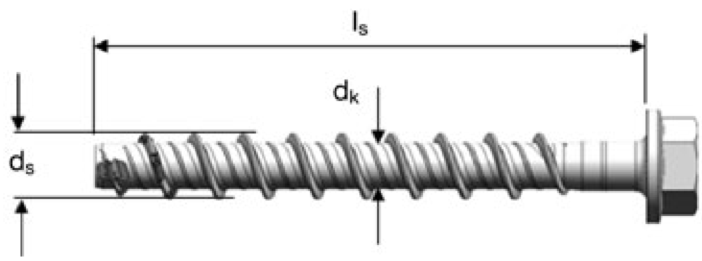
Material quality

Part	Material
Stainless steel hexagonal head concrete screw	Stainless steel (grade A4)

Anchor dimensions

Dimensions of HUS - HR

Anchor version	ls (mm)	ds (mm)	dk (mm)
HUS-HR 6 x 60	60	7.5	5.4
HUS-HR 8 x 85	85	10.1	7.1
HUS-HR 10 x 75, 105	75, 105	12.3	8.4
HUS-HR 14 x 120	120	16.5	12.6

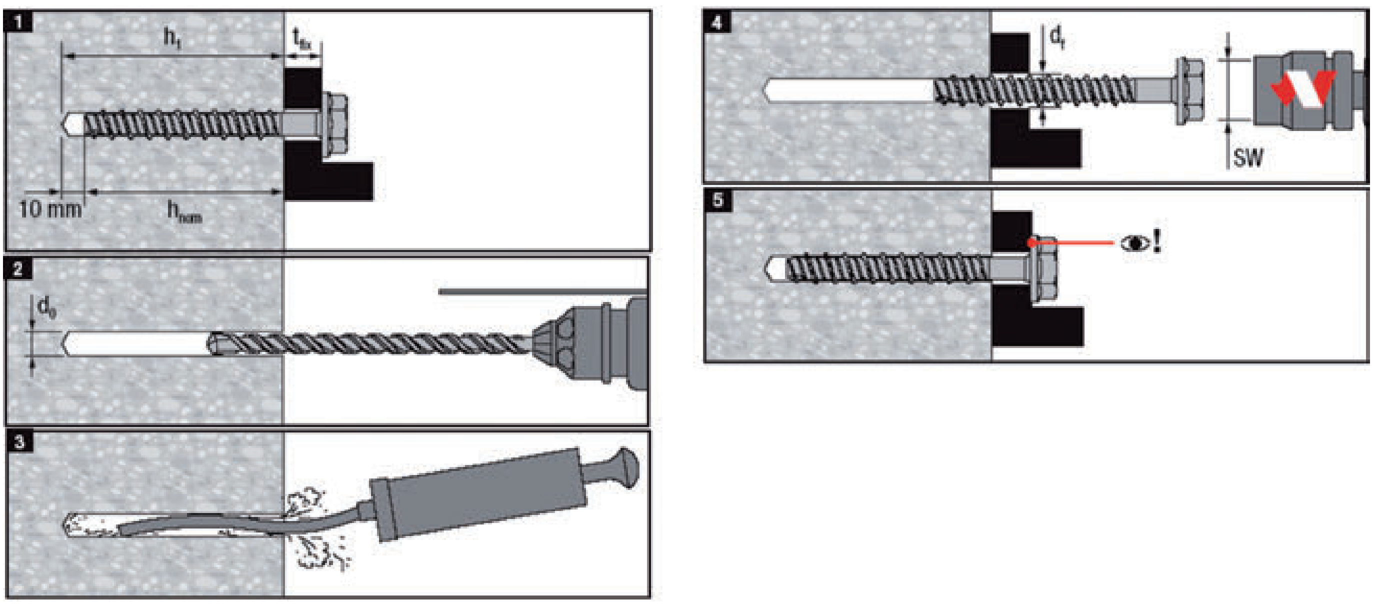


Setting

Recommended installation equipment

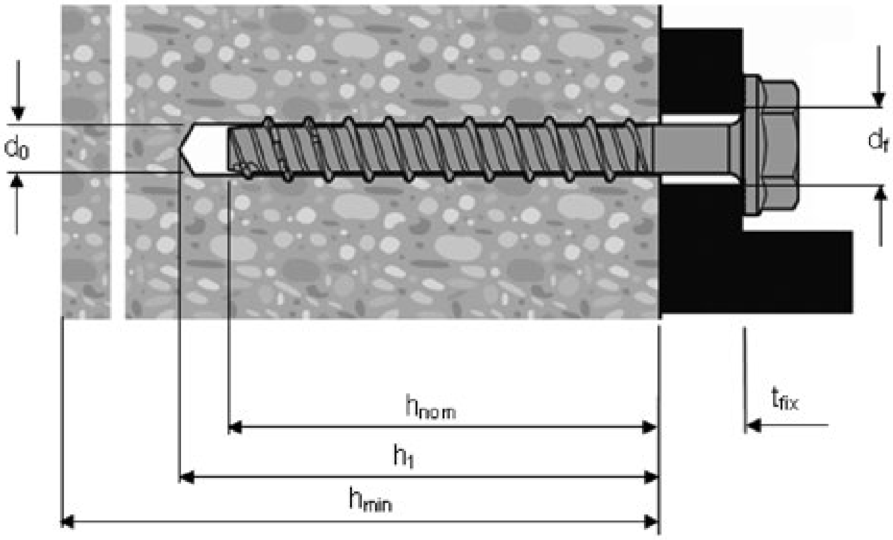
Anchor size	HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
Rotary hammer	Hilti TE 6	Hilti TE 6	Hilti TE 16	Hilti -TE 16
drill bit	TE-C3X 6/17	TE-C3X 8/17	TE-C3X 10/22	TE-C3X 14/22
Socket wrench insert	S-NSD 13 ½ (L)	S-NSD 13 ½ (L)	S-NSD 15 ½ (L)	S-NSD 21 ½
Impact screw driver	Hilti SIW 144 or 121 Hilti TKI 2500	Hilti SI 100		

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

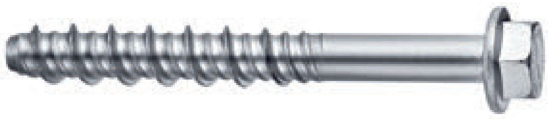
Anchor version	HUS-HR		6	8			10			14	
Nominal embedment depth	h_{nom}	[mm]	55	50[a]	60[b]	80	60[a]	70[b]	90	70[b]	110
Nominal diameter of drill bit	d_0	[mm]	6	8			10			14	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6.4	8.45			10.45			14.5	
Depth of drill hole	$h_1 \geq$	[mm]	65	60	70	90	70	80	100	80	120
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12			14			18	
Effective anchorage depth	h_{ef}	[mm]	45	38	47	64	46	54	71	52	86
Max. fastening thickness	T_{fix}										
Max. installation torque: Concrete	T_{inst}	[Nm]	-[c]	35	-[c]	-[c]	45	45	45	65	65
Max. installation torque: Solid m. Mz 12	T_{inst}	[Nm]	10	-[d]	16	16	-	20	20	-[d]	-[d]
Max. installation torque: Solid m. KS 12	T_{inst}	[Nm]	10	-[d]	16	16	-	20	20	-[d]	-[d]
Max. installation torque: Aerated conc.[c]	T_{inst}	[Nm]	4	-[d]	8	8	-	10	10	-[d]	-[d]

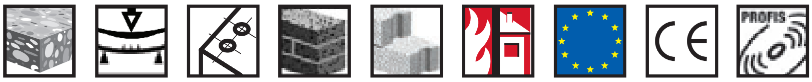
a) extra reduced embedment depth b) reduced embedment depth c) Hilti recommends machine setting only in concrete
d) Hilti does not recommend this setting process for this application

Base material thickness, anchor spacing and edge distance

Anchor size		HUS-HR 6		HUS-HR 8			HUS-HR 10			HUS-HR 14	
Nominal embedment depth	h_{nom} [mm]	30	55	50	60	80	60	70	90	70	110
Minimum base material thickness non-cracked concrete	h_{min} [mm]	100	100	100	100	120	120	120	140	140	160
Minimum spacing	s_{min} [mm]	40	40	45	45	50	50	50	50	50	60
Minimum edge distance	c_{min} [mm]	40	40	45	45	50	50	50	50	50	60

HUS-H screw anchor

Anchor version		Benefits
	HUS-H Carbon steel Concrete Screw	■ Quick and easy setting ■ Low expansion forces in base materials ■ Through fastening ■ Removable ■ Forged-on washer and hexagon head with no protruding thread



Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-08/0307 / 2013-06-04
Fire test report	IBMB, Brunswick	ETA-08/0307 / 2013-06-04
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) Data for HUS-H 8 and HUS-H 10 is given in this section according to ETA-08/0307 issue 2013-06-04.

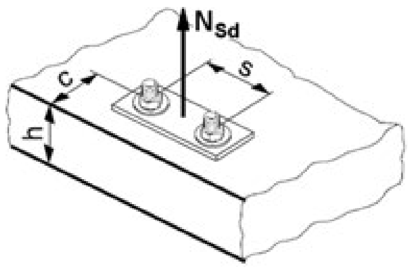
Design process for typical anchors layout in non cracked concrete

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**
  $N_{Rd} = f_B \cdot N^*_{Rd.c}$

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

f_B influence of concrete strength

Concrete Strengths f'c,cyl (MPa)	HUS-H	20	25	32	40	50
f_B	**8,10,14**	0.79	0.87	1.0	1.11	1.22
	10 [a,b]	0.82	0.89	1.0	1.09	1.17

a) extra reduced embedment depth b) reduced embedment depth

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

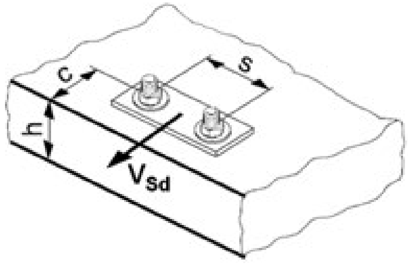
	ETA		HILTI
Anchor size	**HUS-H 8**	**HUS-H 10**	**HUS-H 14**
$N_{Rd,s}$ [kN]	26.5	39.6	67.5

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

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 tables

f_B influence of concrete strength

Concrete Strengths f'c,cyl (MPa)	HUS-H	20	25	32	40	50
f_B	**8,10,14**	0.79	0.87	1.0	1.11	1.22
	10 [a,b]	0.82	0.89	1.0	1.09	1.17

a) extra reduced embedment depth b) reduced embedment depth

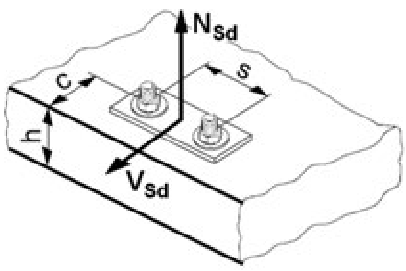
- **Design steel resistance (shear) $V_{Rrd,s}$**

		ETA		HILTI
Anchor size		**HUS-H 8**	**HUS-H 10**	**HUS-H 14**
$V_{Rd,s}$	[kN]	10.6	15.7	36.7

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

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

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

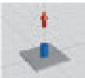
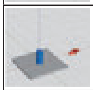
Precalculated table values – design resistance values

General:

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

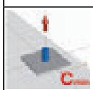
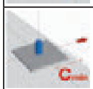
- correct setting (See setting instruction)
- non-cracked concrete – $f_{c,cyl}$ = 32 MPa
- minimum base material thickness, as specified in the table below

Single anchor – no edge effects

	8			10			14		
h_{nom}	50[a)]	60[b)]	75	60[a)]	70[b)]	85	70[a)]	90[b)]	110
Min. base material thickness	100	110	120	130	130	130	130	170	210
 Tension $N^*_{Rd,c}$	5.9	8.4	11.2	8.1	8.1	12.0	12.5	19.4	30.3
 Shear $V^*_{Rd,c}$	9.2	Steel governs refer $V_{Rd,s}$ table		12.4	Steel governs refer $V_{Rd,s}$ table		30.1	Steel governs refer $V_{Rd,s}$ table	

a) extra reduced embedment depth b) reduced embedment depth

Single anchor, min. edge distance ($c = c_{min}$)

	8			10			14		
h_{nom}	50[a)]	60[b)]	75	60[a)]	70[b)]	85	70[a)]	90[b)]	110
Min. base material thickness	100	110	120	130	130	130	130	170	210
Min. edge distance c_{min}	55	55	55	65	65	65	60	60	60
 Tension $N^*_{Rd,c}$	5.9	8.4	11.2	7.6	8.1	12.0	10.6	13.6	18.2
 Shear $V^*_{Rd,c}$	6.2	6.5	6.7	8.3	8.6	8.9	8.0	8.4	9.1

a) extra reduced embedment depth b) reduced embedment depth

Materials

Mechanical properties

Anchor size			HUS-H 8	HUS-H 10	HUS-H 14
Nominal tensile strength	f_{uk}	[N/mm²]	950	1000	770
Yield strength	f_{yk}	[N/mm²]	855	900	700
Stressed cross-section	A_s	[mm²]	39.0	55.4	143.1
Section modulus	Z	[mm³]	34.4	58.2	191.7
Design bending resistance	$M_{Rd,s}$	[Nm]	26.1	46.5	118

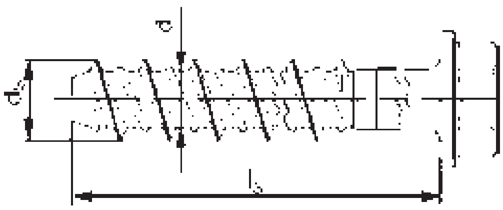
Material quality

Part	Material
Carbon steel hexagonal head concrete screw	steel according DIN EN 10263-4, 1.5523, galvanised to min. 5 µm

Anchor dimensions

Dimensions of HUS - H

Anchor version	l_s (mm)	d_s (mm)	d (mm)
HUS-H 8 x 55/65/80/90	55/65/80/90	10.1	7.1
HUS-H 10 x 65/75/90/100	65/75/90/100	12.2	8.4
HUS-H 14 x 80/115/160	80/115/160	16.5	12.6

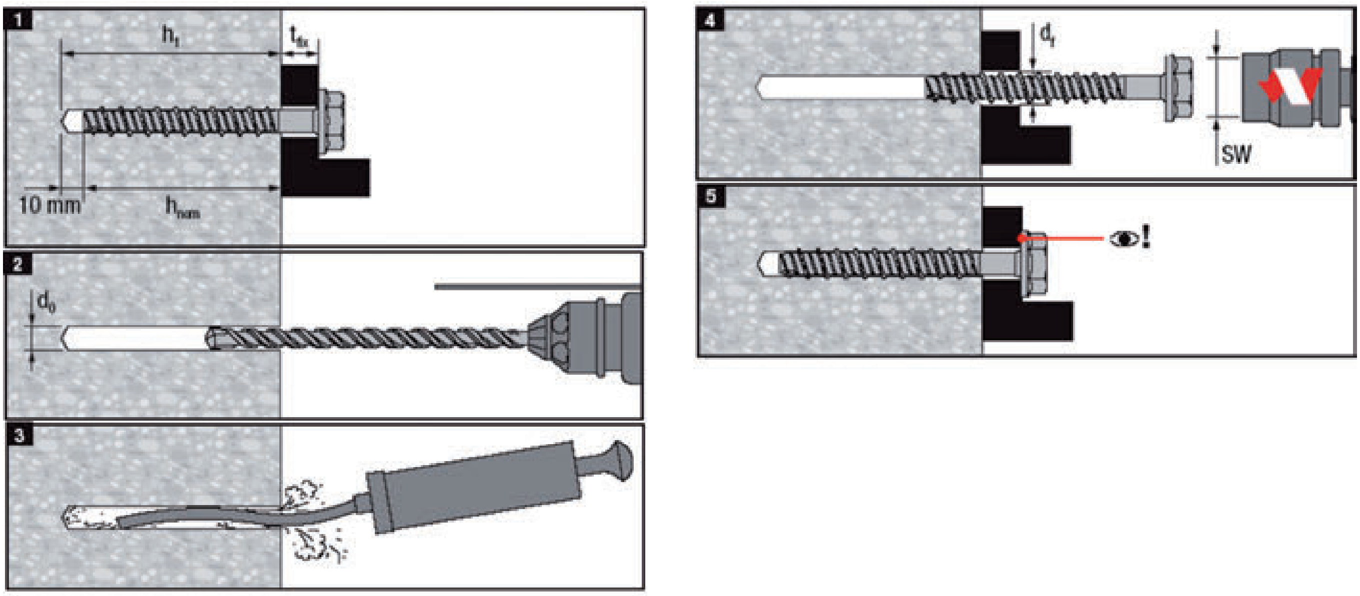


Setting

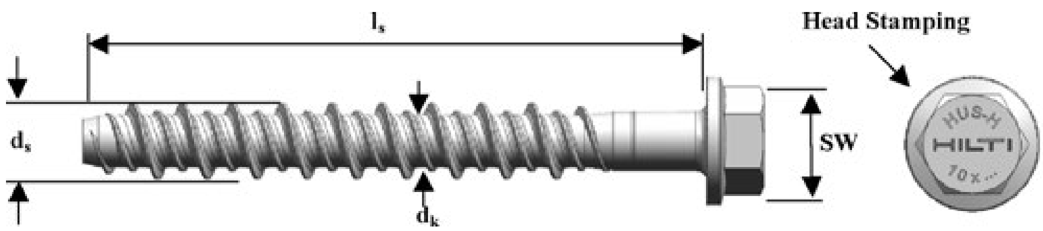
Recommended installation equipment

Anchor size	HUS-H 8	HUS-H 10	HUS-H 14
Rotary hammer	TE 6 ... TE 16		
Drill bit	TE-C3X 8/17	TE-C3X 10/22	TE-C3X 14/22
Socket wrench insert	S-NSD 13 ½ (L)	S-NSD 15 ½ (L)	S-NSD 21 ½
Impact screw driver	SI 100	SI 100	SI 100

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

Anchor version	HUS-H		8			10			14		
Nominal embedment depth	h_{nom}	[mm]	50[a)]	60[b)]	75	60[a)]	70[b)]	85	70[a)]	90[b)]	110
Nominal diameter of drill bit	d_0	[mm]	8			10			14		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8.45			10.45			14.5		
Depth of drill hole	$h_1 \geq$	[mm]	60	70	85	70	80	95	80	100	120
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	12			14			18		
Effective anchorage depth	h_{ef}	[mm]	36	47	60	44	54	67	50	67	90
Max. fastening thickness	T_{fix}		l_s - h_{nom}								
Max. installation torque – Concrete	T_{inst}	[Nm]	35		45	45		55	65		
Max. installation torque – Solid m. Mz 12	T_{inst}	[Nm]	-	6	-	-	10	-	-		
Max. installation torque – Solid m. KS 12	T_{inst}	[Nm]	-	16	-	-	16	-	-		
Max. installation torque – Aerated conc.[c)]	T_{inst}	[Nm]	-	10	-	-	10	-	-		

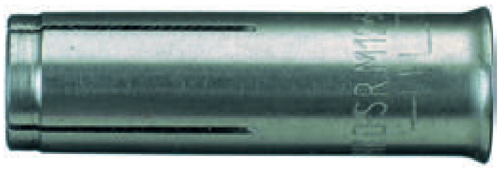
a) extra reduced embedment depth b) reduced embedment depth
c) Installation torque for manual setting only. Machine setting not required

Base material thickness, anchor spacing and edge distance

Anchor size		HUS-H 8			HUS-H 10			HUS-H 14		
Nominal embedment depth	h_{nom} [mm]	50	60	75	60	70	85	70	90	110
Minimum base material thickness non-cracked concrete	h_{min} [mm]	100	110	120	110	130	130	130	170	210
Minimum spacing non-cracked concrete	s_{min} [mm]	55	55	55	65	65	65	80	80	80
Minimum edge distance non-cracked concrete	c_{min} [mm]	55	55	55	65	65	65	60	60	60
Minimum base material thickness cracked concrete	h_{min} [mm]	100	110	120	110	110	130	-	170	-
Minimum spacing cracked concrete	s_{min} [mm]	55	40	40	65	50	50	-	80	-
Minimum edge distance cracked concrete	c_{min} [mm]	55	50	50	65	50	50	-	60	-

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

HKD push-in anchor – Single anchor application

Anchor version		Benefits
	HKD Carbon steel with lip	■ simple and well proven ■ approved, tested and confirmed by everyday jobsite experience ■ reliable setting thanks to simple visual check ■ versatile ■ for medium-duty fastening with bolts or threaded rods ■ available in various materials and sizes for maximized coverage of possible applications
	HKD-S(R) stainless steel with lip	

Concrete | 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-02/0032 / 2012-10-18

a) Anchors with anchorage depth hef = 25mm are not coverd by ETA

Design process for typical anchor layouts in non cracked concrete

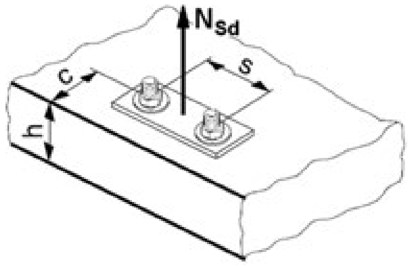
Background of the design method:

Values of the design resistances are obtained from PROFIS 2.4.3 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) $N_{Rd,s}$**

		Hilti technical data				according ETA-02/0032, issue 2012-10-18					
Anchor size		M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
$N_{Rd,s}$	HKD [kN]	6.7	10.3	12.6	23.6	11.4	13.3	14.7	24.4	45.0	65.3
	HKD-SR [kN]	6.9	-	-	-	9.2	-	11.5	20.4	35.1	55.7

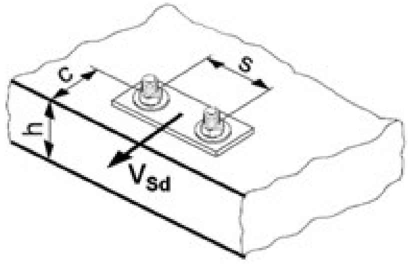
The design steel resistance of applied bolt needs to be checked separately!
Anchors with anchorage depth hef = 25mm are not covered by ETA approval

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

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

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

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

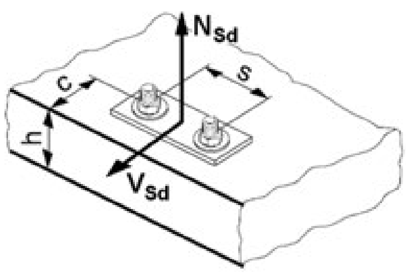
		Hilti technical data				according ETA-02/0032, issue 2012-10-18					
Anchor size		M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
$V_{Rd,s}$	HKD [kN]	4.0	6.2	7.5	14.1	6.9	8.0	8.8	14.6	27.0	39.6
	HKD-SR [kN]	4.1	-	-	-	5.5	-	6.9	12.3	21.1	33.6

The design steel resistance of applied bolt needs to be checked separately!
Anchors with anchorage depth hef = 25mm are not covered by ETA approval

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

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

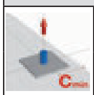
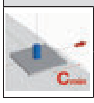
General:

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
- the design steel resistance of applied bolt needs to be checked separately

Anchor size	
h = h_{min} [mm]	Refer to table below

Single anchor for edge distance c ≥ c_{min} (including no close edge)

	Hilti Technical Data		according ETA-02/0032, issue 2012-10-18					
Anchor size	**M6x25***	**M8x25* M10x25* M12x25***	**M8x30***	**M10x30***	**M10x40**	**M12x50**	**M16x65**	**M20x80**
Min Base thickness h_{min}	100	100	100	100	100	100	130	160
Min. edge distance c_{min}	100	100	105	105	140	175	230	280
Tensile N_{Rd}								
 HKD [kN]	5.3	5.3	6.9	6.9	10.8	15.1	22.3	30.5
HKD-SR [kN]	3.8	-	5.8	-	9.0	12.5	22.3	30.5
Shear V_{Rd} (without lever arm)								
 HKD [kN]	Steel	5.3	Steel failure governs refer $V_{Rd,s}$ table					
HKD-SR [kN]	3.8	-						

*For application with statically indeterminate structural components only.
For the shear V_{Rd} values, where steel is not governing this is due to concrete pry-out failure. These values are multiplied by f_b to obtain the pry-out capacity. Ensure that you take the lower value of the shear steel capacity and pry-out capacity.

Materials

Mechanical properties of HKD and HKD-SR

Anchor size				M6	M8	M10	M12	M16	M20
Nominal tensile strength	f_{uk}	HKD	[N/mm²]	570	570	570	570	640	590
		HKD-SR	[N/mm²]	540	540	540	540	540	540
Yield strength	f_{yk}	HKD	[N/mm²]	460	460	460	480	510	470
		HKD-SR	[N/mm²]	355	355	355	355	355	355
Stressed cross-section	A_s	HKD	[mm²]	20.7	26.7	32.7	60.1	105	167
		HKD-SR	[mm²]	20.9	26.1	28.8	58.7	102.8	163

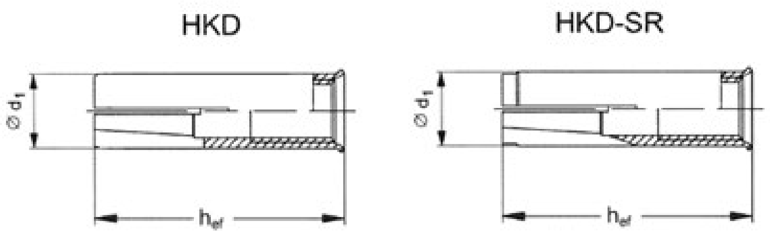
Material quality

Part		Material
Anchor Body	HKD	Steel Fe/Zn5 galvanised to min. 5 µm
	HKD-SR	Stainless steel, 1.4401, 1.4404, 1.4571
Tapered expansion plug	HKD	Steel material
	HKD-SR	Stainless steel, 1.4401, 1.4404, 1.4571

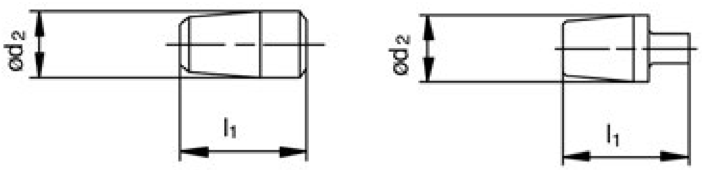
Anchor dimensions

Anchor size Anchor version: HKD, HKD-SR			M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
Effective anchorage depth	h_{ef}	[mm]	25	25	25	25	30	30	40	50	60	80
Anchor diameter	d_1	[mm]	7.9	9.95	11.9	14.9	9.95	11.8	11.95	14.9	19.75	24.75
Plug diameter	d_2	[mm]	5.1	6.35	8.1	9.7	6.5	8.2	8.2	10.3	13.8	16.4
Plug length	l_1	[mm]	10	7	7	7.2	12	12	16	20	29	30

Anchor body



Expansions plugs

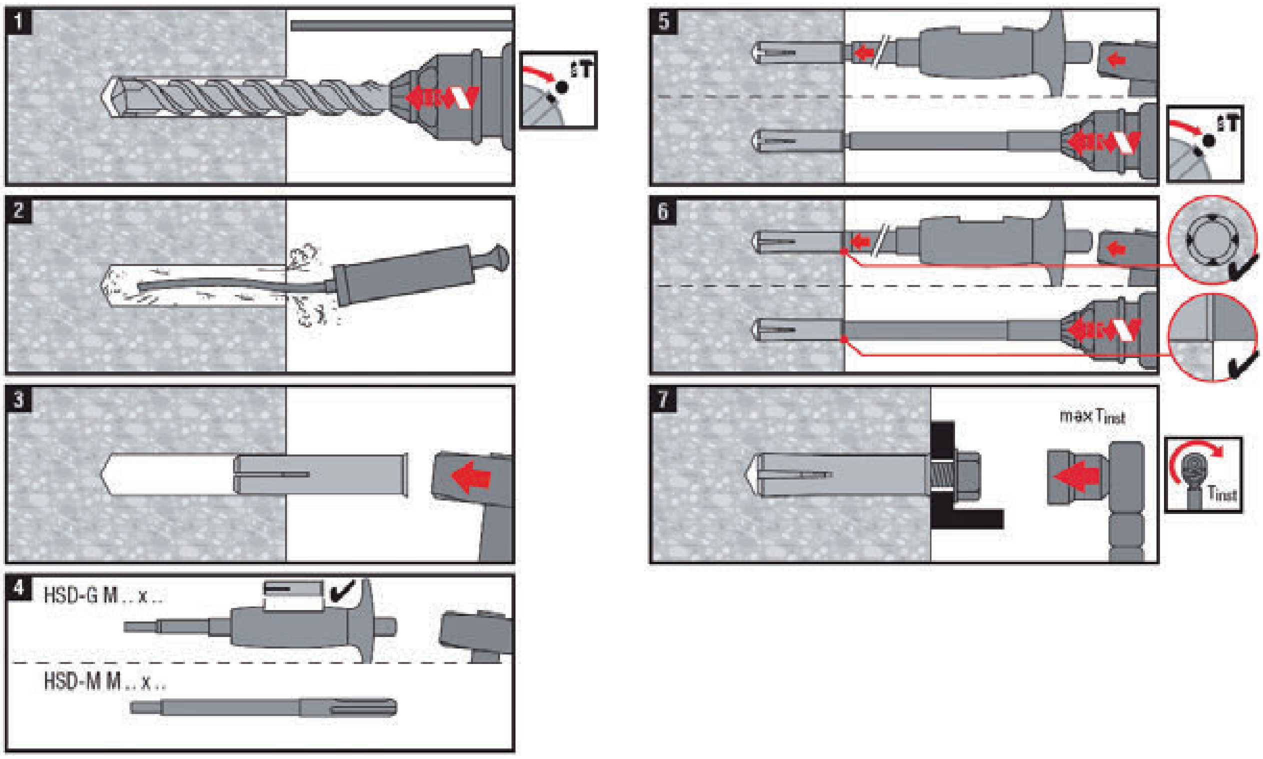


Setting

Installation equipment

Anchor size	M6x25	M8x25	M8x30	M10x25	M10x30	M10x40	M12x25	M12x50	M16x65	M20x80
Rotary hammer	TE 2 – TE 30								TE 40 – 80	
Machine setting tool HSD-M	6x25/30	8x25/30		10x25/30		10x40	12x25	12x50	16x65	20x80
Hand Setting tool HSD-G										
Other tools	hammer, torque wrench, blow out pump									

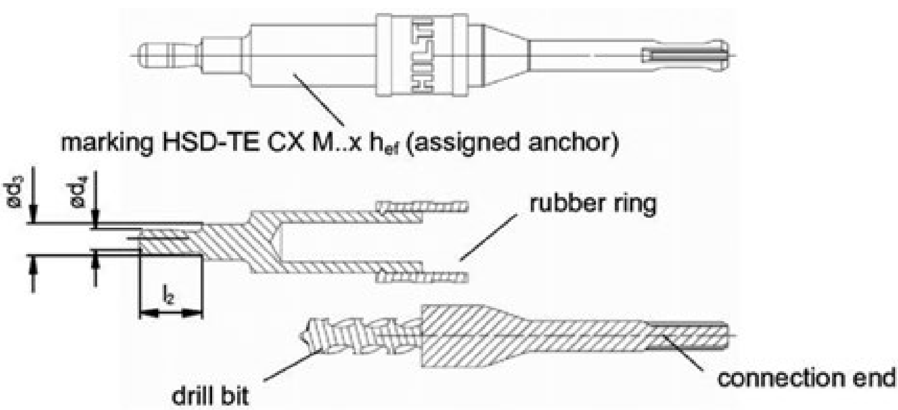
Setting instructions



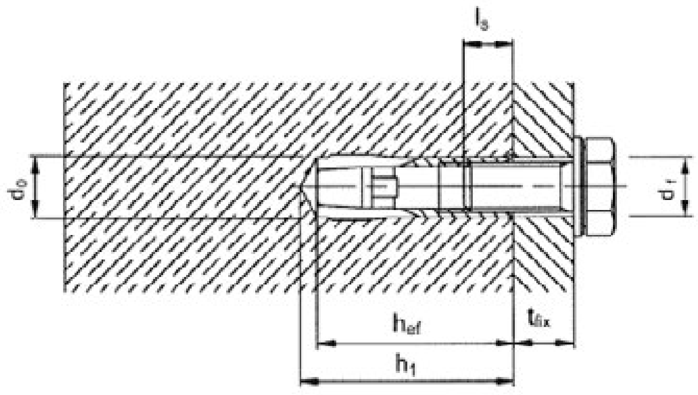
For detailed information on installation see instruction for use given with the package of the product.

Machine setting tools

HSD-TE CX M.. x h_{ef}



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



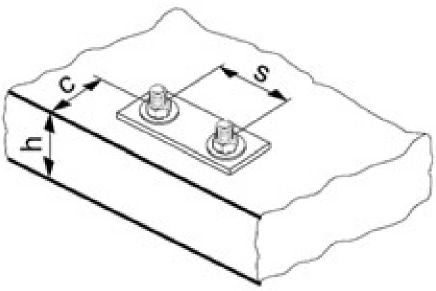
Setting details

Anchor size			M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
Nominal diameter of drill bit	d_0	[mm]	8	10	12	15	10	12	12	15	20	25
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8.45	10.5	12.5	15.5	10.5	12.5	12.5	15.5	20.5	25.5
Depth of drill hole	$h_1 \geq$	[mm]	27	27	27	27	33	33	43	54	70	85
Screwing depth	$l_{s,min}$	[mm]	6	8	10	12	8	10	10	12	16	20
	$l_{s,max}$	[mm]	12	11.5	12	12	14.5	13	18	23.5	30.5	42
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14	9	12	12	14	18	22
Effective anchorage depth	h_{ef}	[mm]	25	25	25	25	30	30	40	50	65	80
Max. Torque moment	T_{inst}	[Nm]	4	8	15	35	8	15	15	35	60	100

With anchor size M10x30 only threaded rod is to be used

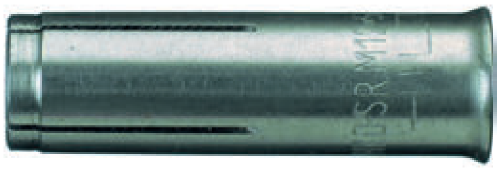
Base material thickness, anchor spacing and edge distances

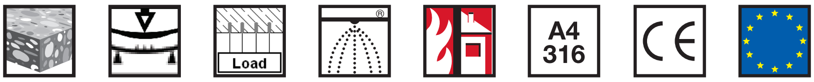
Anchor size				M6x25 M8x25 M10x25 M12x25	M8x30 M10x30	M10x40	M12x50	M16x65	M20x80
Minimum base material thickness		h_{min}	[mm]	100	100	100	100	130	160
Minimum spacing		s_{min}	[mm]	80	60	80	125	130	160
HKD		for c≥	[mm]	140	105	140	175	230	280
Minimum edge distance		c_{min}	[mm]	100	120	140	175	230	280
HKD		for s≥	[mm]	150	80	80	125	130	160
Critical spacing and edge distance for concrete cone failure HKD HKD-SR		$s_{cr, N}$	[mm]	80	90	120	150	195	240
		$c_{cr, N}$	[mm]	40	45	60	75	97	120
Critical spacing and edge distance for splitting failure	HKD	$s_{cr, sp}$	[mm]	200	210	280	350	455	560
		$c_{cr, sp}$	[mm]	100	105	140	175	227	280
	HKD-SR	$s_{cr, sp}$	[mm]	176	210	280	350	455	560
		$c_{cr, sp}$	[mm]	88	105	140	175	227	280



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

HKD push-in anchor – Redundant fastening

Anchor version		Benefits
	HKD Carbon steel with lip	■ simple and well proven ■ approved, tested and confirmed by everyday jobsite experience ■ reliable setting thanks to simple visual check ■ versatile ■ for medium-duty fastening with bolts or threaded rods ■ available in various materials and sizes for maximized coverage of possible applications
	HKD-S(R) stainless steel with lip	



Concrete | Tensile zone[a)] | Redundant fastening | Sprinkler approved | Fire resistance | Corrosion resistance | CE conformity | European Technical Approval

a) Redundant fastening only

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-06/0047 / 2011-03-14
Fire test report	DIBt, Berlin	ETA-06/0047 / 2011-03-14
Assessment report (fire)	warringtonfire	WF 166402 / 2007-10-26

a) All data given in this section for HKD and HKD-SR, according ETA-06/0047, issue 2011-03-14 . The anchor is to be used only for redundant fastening for non-structural applications.

Basic loading data for all load directions according design method B of ETAG 001

All data in this section applies to

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete C 20/25, $f_{c,cyl}$ = 20 N/mm² to $f_{c,cyl}$ = 50 N/mm²
- Minimum base material thickness
- Anchors in redundant fastening

Design Resistance, all load directions

Anchor size			M6x25	M8x25	M8x30	M10x25	M10x30	M10x40	M12x25	M12x50	M16x65
Load F_{Rd}	HKD	[kN]	1.3	2.0	2.8	2.2	3.3	5.0	2.7	6.0	10.7
	HKD-SR	[kN]	-	-	2.0	-	-	4.0	-	4.0	-

Recommended loads[a)], all load directions

Anchor size			M6x25	M8x25	M8x30	M10x25	M10x30	M10x40	M12x25	M12x50	M16x65
Load F_{rec}	HKD	[kN]	1.0	1.4	2.0	1.6	2.4	3.6	1.9	4.3	7.6
	HKD-SR	[kN]	-	-	1.4	-	-	2.9	-	2.9	-

a) With overall partial safety factor for action γ = 1.4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Requirements for redundant fastening

The definition of redundant fastening according to Member States is given in the ETAG 001 Part six, Annex 1.
In Absence of a definition by a Member State the following default values may be taken

Minimum number of fixing points	Minimum number of anchors per fixing point	Maximum design load of action N_{Sd} per fixing point [a)]
3	1	2 kN
4	1	3 kN

a) The value for maximum design load of actions per fastening point N_{Sd} is valid in general that means all fastening points are considered in the design of the redundant structural system. The value N_{Sd} may be increased if the failure of one (= most unfavourable) fixing point is taken into account in the design (serviceability and ultimate limit state) of the structural system e.g. suspended ceiling.

Mechanical properties of HKD and HKD-SR

Anchor size				M6	M8	M10	M12	M16
Nominal tensile strength	f_{uk}	HKD	[N/mm²]	570	570	570	570	640
		HKD-SR	[N/mm²]	540	540	540	540	540
Yield strength	f_{yk}	HKD	[N/mm²]	460	460	460	480	510
		HKD-SR	[N/mm²]	355	355	355	355	355
Stressed cross-section	A_s	HKD	[mm²]	20.7	26.7	32.7	60.1	105
		HKD-SR	[mm²]	20.9	26.1	28.8	58.7	102.8

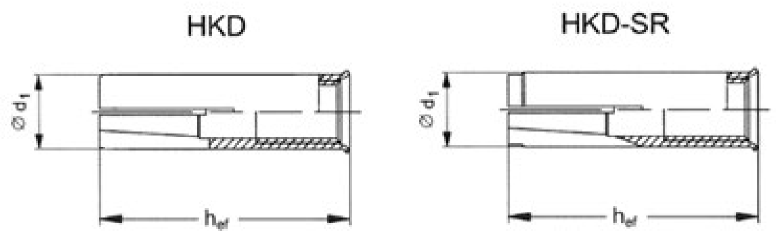
Material quality

Part		Material
Anchor Body	HKD	Steel Fe/Zn5 galvanised to min. 5 µm
	HKD-SR	Stainless steel, 1.4401, 1.4404, 1.4571
Tapered expansion plug	HKD	Steel material
	HKD-SR	Stainless steel, 1.4401, 1.4404, 1.4571

Anchor dimensions

Anchor size Anchor version: HKD, HKD-SR			M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65
Effective anchorage depth	h_{ef}	[mm]	25	25	25	25	30	30	40	50	60
Anchor diameter	d_1	[mm]	7.9	9.95	11.9	14.9	9.95	11.8	11.95	14.9	19.75
Plug diameter	d_2	[mm]	5.1	6.35	8.1	9.7	6.5	8.2	8.2	10.3	13.8
Plug length	l_1	[mm]	10	7	7	7.2	12	12	16	20	29

Anchor body

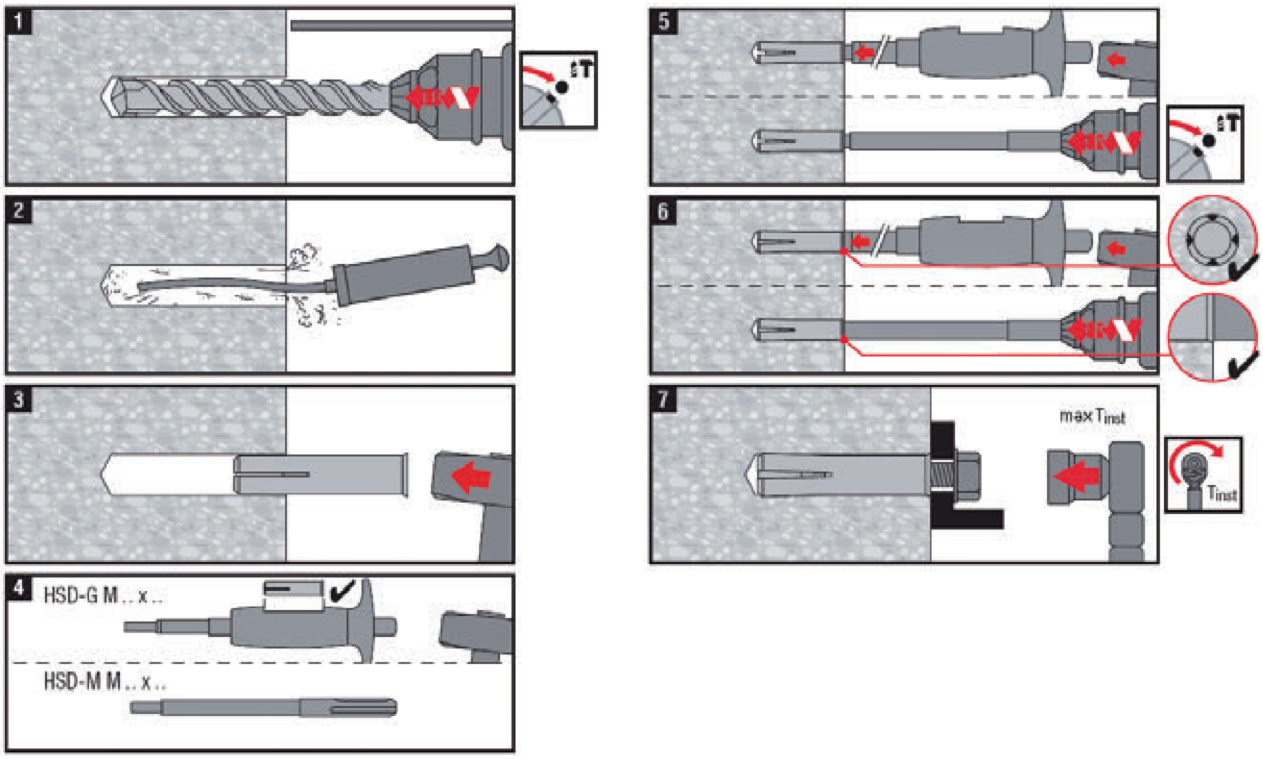


Setting

Installation equipment

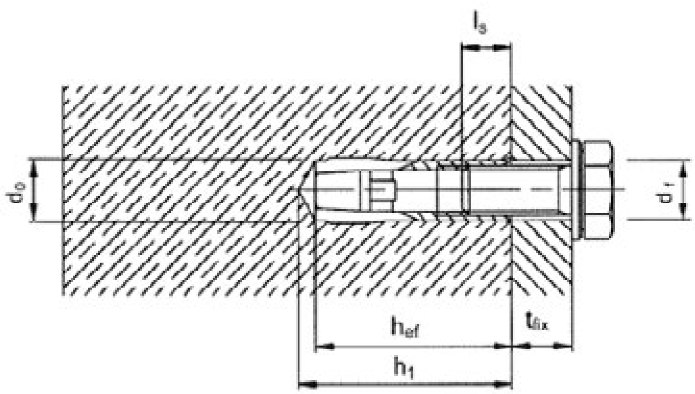
Anchor size		M6x25	M8x25	M8x30	M10x25	M10x30	M10x40	M12x25	M12x50	M16x65
Rotary hammer		TE 2 – TE 30								TE 40 – TE 80
Machine setting tool	HSD-M	6x25/30	8x25/30		10x25/30		10x40	12x25	12x50	16x65
Hand Setting tool	HSD-G	6x25/30	8x25/30		10x25/30		10x40	12x25	12x50	16x65
Other tools		hammer, torque wrench, blow out pump								

Setting instructions



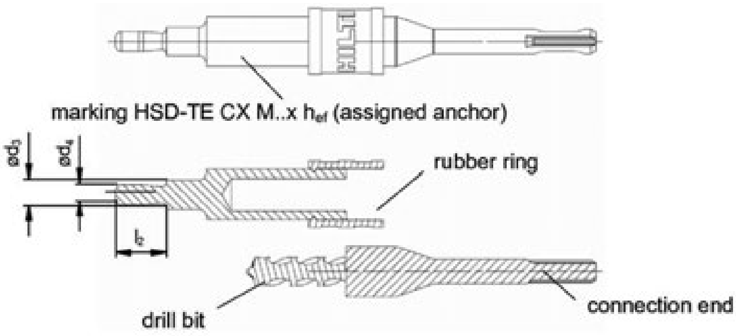
For detailed information on installation see instruction for use given with the package of the product.

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



Machine setting tools

HSD-TE CX M.. x h_{ef}



Setting details

Anchor size			M6x25	M8x25	M10x25	M12x25	M8x30	M10x30	M10x40	M12x50	M16x65
Nominal diameter of drill bit	d_0	[mm]	8	10	12	15	10	12	12	15	20
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8.45	10.5	12.5	15.5	10.5	12.5	12.5	15.5	20.5
Depth of drill hole	$h_1 \geq$	[mm]	27	27	27	27	33	33	43	54	70
Screwing depth	$l_{s,min}$	[mm]	6	8	10	12	8	10	10	12	16
	$l_{s,max}$	[mm]	12	11.5	12	12	14.5	13	18	22	30.5
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14	9	12	12	14	18
Effective anchorage depth	h_{ef}	[mm]	25	25	25	25	30	30	40	50	65
Max. Torque moment	T_{inst}	[Nm]	4	8	15	35	8	15	15	35	60

Base material thickness, anchor spacing and edge distances

Anchor size				M6x25 M8x25 M10x25 M12x25	M8x30 M10x30	M10x40	M12x50	M16x65
Minimum base material thickness		h_{min}	[mm]	100	100	100	100	130
Minimum spacing		s_{min}	[mm]	80	60	80	125	130
HKD		for c≥	[mm]	140	105	140	175	230
Minimum edge distance		c_{min}	[mm]	100	120	140	175	230
HKD		for s≥	[mm]	150	80	80	125	130
Critical spacing and edge distance for concrete cone failure HKD HKD-SR		$s_{cr, N}$	[mm]	80	90	120	150	195
		$c_{cr, N}$	[mm]	40	45	60	75	97
Critical spacing and edge distance for splitting failure	HKD	$s_{cr, sp}$	[mm]	200	210	280	350	455
		$c_{cr, sp}$	[mm]	100	105	140	175	227
	HKD-SR	$s_{cr, sp}$	[mm]	176	210	280	350	455
		$c_{cr, sp}$	[mm]	88	105	140	175	227