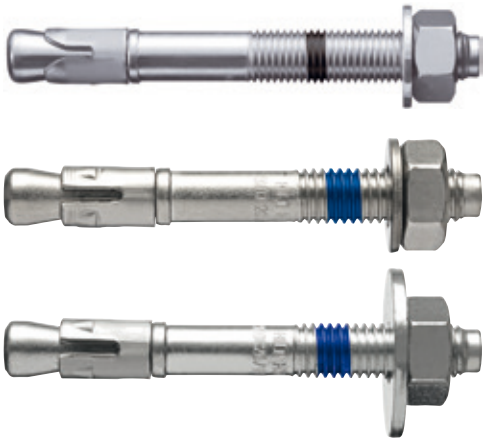
HSA stud anchor

Anchor version



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

Benefits

- 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

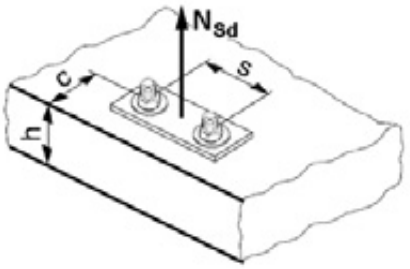
Background of the design method:

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) $N_{Rd,s}$**

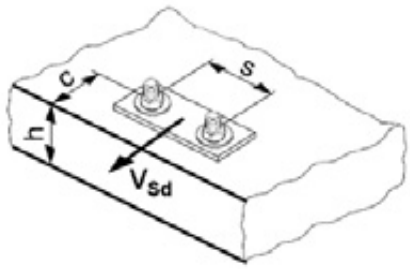
Anchor size			M6	M8	M10	M12	M16	M20
$N_{Rd,s}$	HSA	[kN]	6.4	11.8	20.0	29.6	59.0	88.5
	HSA-R	[kN]	8.7	13.1	25.0	31.9	62.6	68.5

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

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

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

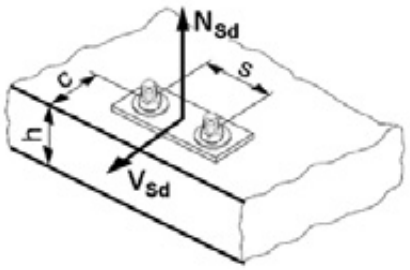
STEP 3: COMBINED TENSION AND SHEAR LOADING

The following equations must be satisfied:

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

and

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



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 321-366
- 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 $N^*_{Rd,c}$									
	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 $V_{Rd,s}$ (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 $N^*_{Rd,c}$											
	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 $V^*_{Rd,c}$ (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 $N^*_{Rd,c}$									
	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 $V^*_{Rd,c}$ (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 $N^*_{Rd,c}$											
	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 $V^*_{Rd,c}$ (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 $N^*_{Rd,c}$									
	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 $V^*_{Rd,c}$ (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 $N^*_{Rd,c}$											
	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 $V^*_{Rd,c}$ (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

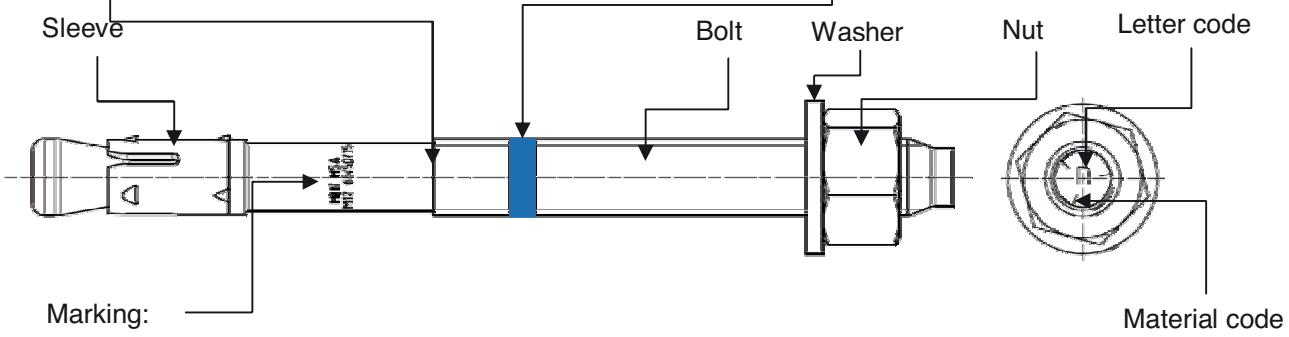
Anchor size		M12			M16			M20		
Effective anchorage depth	h_{ef} [mm]	50	65	100	65	80	120	75	100	115
Nominal anchorage depth	h_{nom} [mm]	64	79	114	77	92	132	90	115	130

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

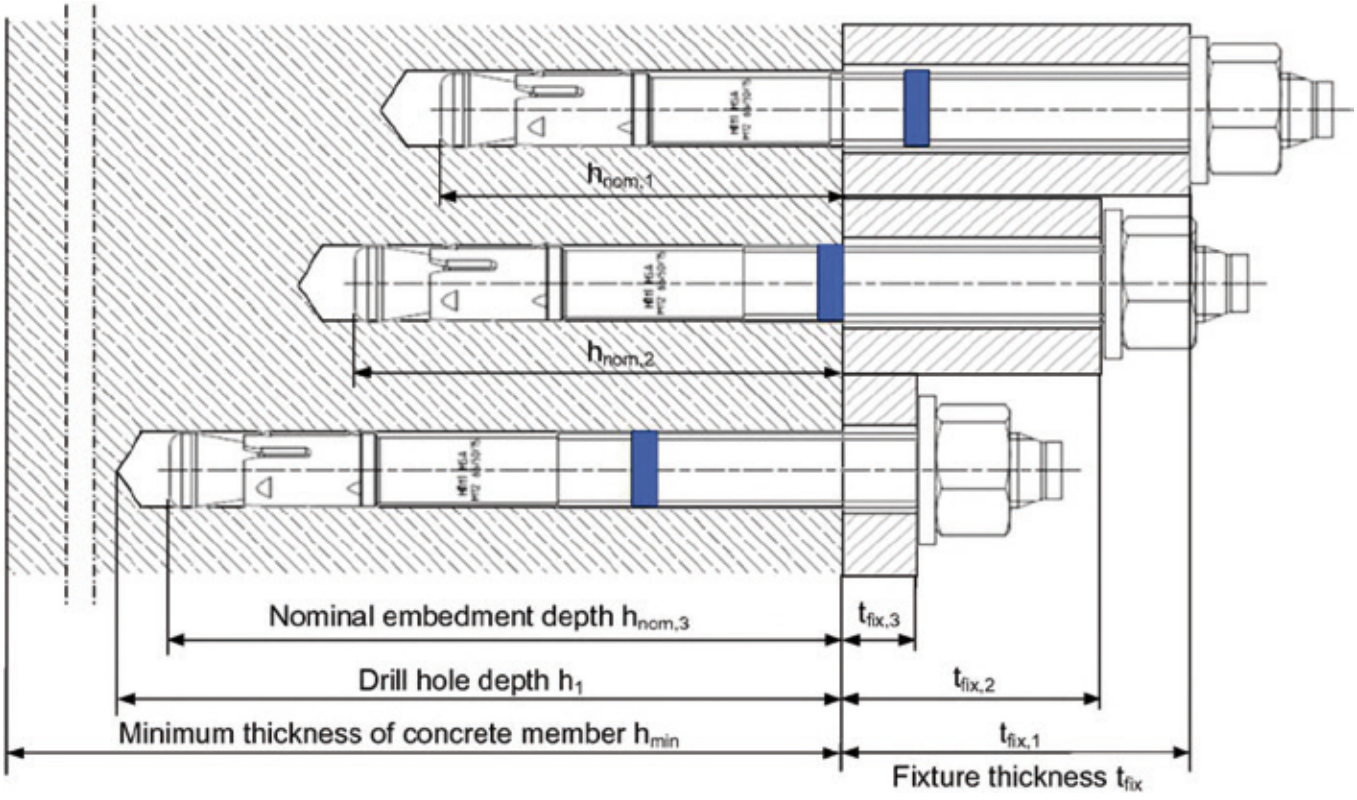
Blue ring: setting depth indicator for $h_{nom,2}$
$h_{nom,2}$ is reached when the blue ring is completely below the concrete surface



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

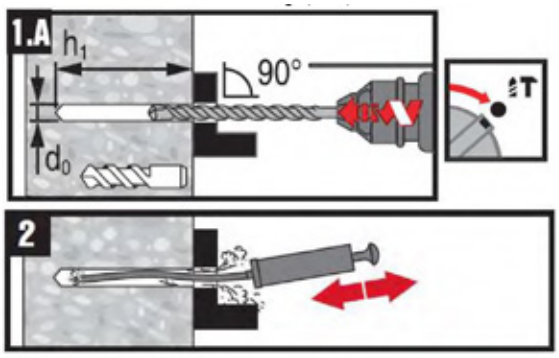
Installation equipment

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					

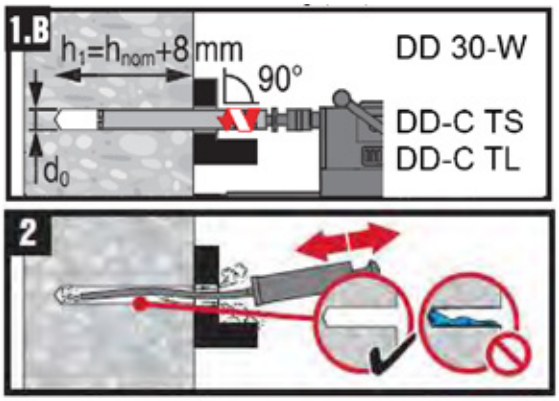
Setting instructions

Drill and clean borehole

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

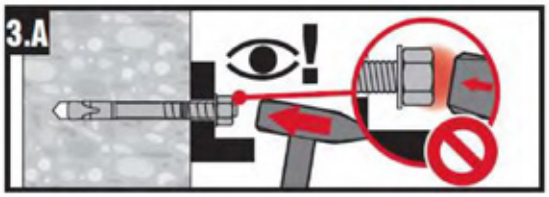


Alternative drilling method
M12 – M20: Diamond drilling (DD)

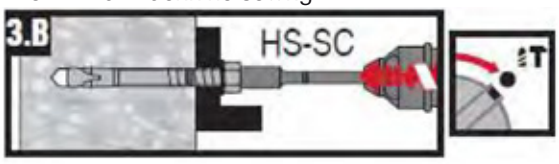


Install anchor with hammer or machine setting tool

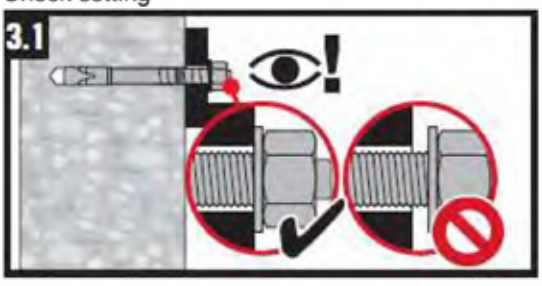
Standard setting method
M6 – M20: Hammer setting



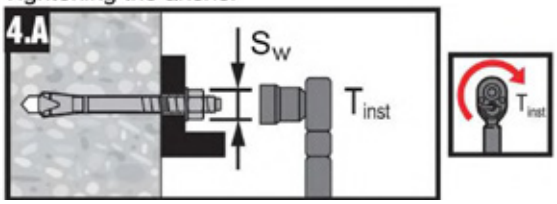
Alternative setting method
M8 – M16: Machnine setting



Check setting



Tightening the anchor



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

Setting details

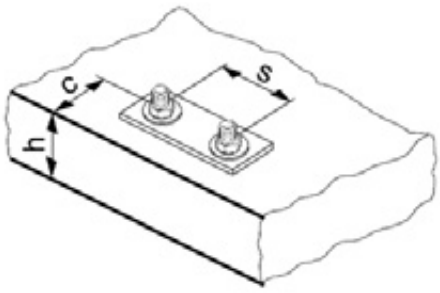
Anchor size			M6			M8			M10		
Nominal anchorage depth	h_{nom}	[mm]	37	47	67	39	49	79	50	60	90
Minimum base material thickness	h_{min}	[mm]	100	100	120	100	100	120	100	120	160
Minimum spacing	s_{min}	[mm]	35	35	35	35	35	35	50	50	50
Minimum edge distance	c_{min}	[mm]	35	35	35	40	35	35	50	40	40
Nominal 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_{inst}	[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_{inst}	[Nm]	50			80			200		
Width across	SW	[mm]	19			24			30		

Setting details

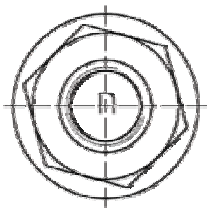
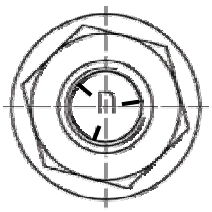
Anchor size			M6			M8			M10		
Nominal anchorage depth	h_{nom}	[mm]	37	47	67	39	49	79	50	60	90
Effective anchorage depth	h_{ef}	[mm]	30	40	60	30	40	70	40	50	80
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	100	120	130	130	180	200	190	210	290
Critical edge distance for splitting failure	$c_{cr,sp}$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