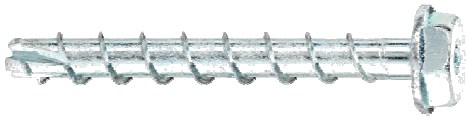
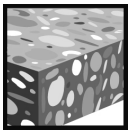
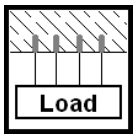
HUS 6 Screw anchor, Redundant fastening

	Anchor version	Benefits
	HUS-A 6 Carbon steel Concrete Screw with hex head	- Quick and easy setting - Low expansion forces in base materials - Through fastening - Removable - Forged-on washer and hexagon head with no protruding thread
	HUS-H 6 Carbon steel Concrete Screw with hex head	
	HUS-I 6 Carbon steel Concrete Screw with hex head	
	HUS-P 6 Carbon steel Concrete Screw with pan head	
	HUS-HR 6 Stainless steel Concrete Screw	


Concrete


Tensile zone



Redundant fastening


Small edge distance and spacing


Fire resistance

Corrosion Resistance


European Technical Approval


CE conformity

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical approval [a)]	DIBt, Berlin	ETA-10/0005 / 2011-08-23
Fire test report	DIBt, Berlin	ETA-10/0005 / 2011-08-23

a) Data for HUS-HR 6 with nominal embedment depth = 30 mm for multiple use for non-structural applications (= redundant fastening) are not part of ETA-10/0005 issue 2011-08-23

Basic loading data

All data in this section applies to For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²

The following technical data are based on:
ETA: Data according ETA-05/0005 issue 2011-08-23 **Hilti:** Additional Hilti technical data

Characteristic resistance

				Hilti tech. data	Data according ETA-10/0005, issue 2011-08-23	
Anchor version				**HUS-HR 6**		**HUS-A, -H, -I, -P 6**
Nominal embedment depth		h_{nom}	[mm]	30	35	35
All load directions	35 ≤ c < 80 mm	F^0_{Rk}	[kN]	2,0	3,0	2,0
	c ≥ 80 mm	F^0_{Rk}	[kN]		5,0	3,0

Design resistance

				Hilti tech. data	Data according ETA-10/0005, issue 2011-08-23	
Anchor version				**HUS-HR 6**		**HUS-A, -H, -I, -P 6**
Nominal embedment depth		h_{nom}	[mm]	30	35	35
All load directions	35 ≤ c < 80 mm	F^0_{Rd}	[kN]	1,0	1,4	1,3
	c ≥ 80 mm	F^0_{Rd}	[kN]		2,4	2,0

Recommended loads

				Hilti tech. data	Data according ETA-10/0005, issue 2011-08-23	
Anchor version				**HUS-HR 6**		**HUS-A, -H, -I, -P 6**
Nominal embedment depth		h_{nom}	[mm]	30	35	35
All load directions [a)]	35 ≤ c < 80 mm	F^0_{Rec}	[kN]	0,7	1,0	0,9
	c ≥ 80 mm	F^0_{Rec}	[kN]		1,7	1,4

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.

Materials

Mechanical properties

Anchor version			HUS-HR 6	HUS-A, -H, -I, -P 6
Nominal tensile strength	f_{uk}	[N/mm²]	1040	930
Stressed cross-section	A_s	[mm²]	23	26,9
Moment of resistance	W	[mm³]	15,5	19,7
Design bending resistance	$M_{Rd,s}$	[Nm]	12,9	14,6

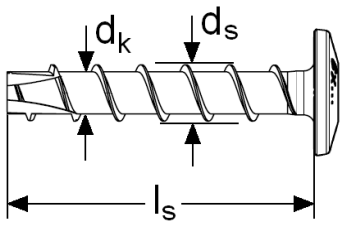
Material quality

Anchor version	HUS-HR 6	HUS-A, -H, -I, -P 6
Material	Stainless steel (grade A4)	Steel, Galvanised ≥ 5 µm

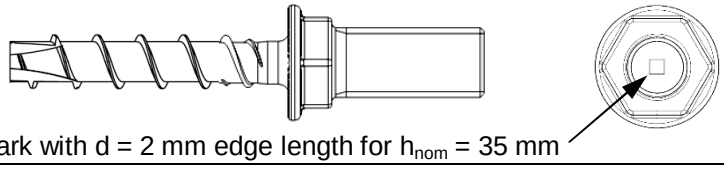
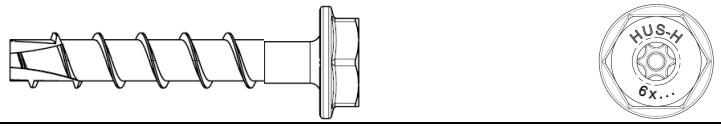
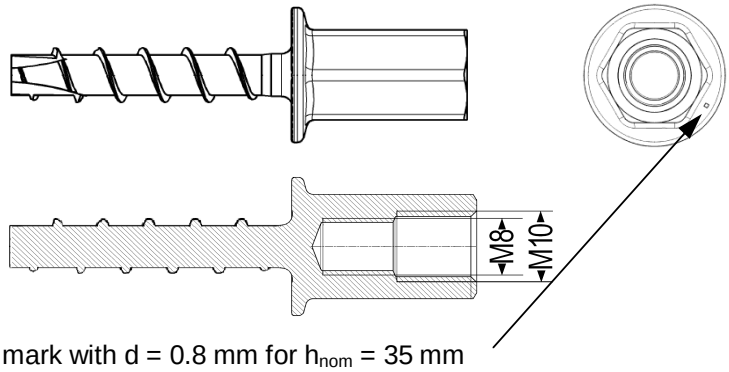
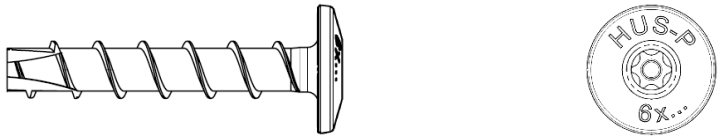
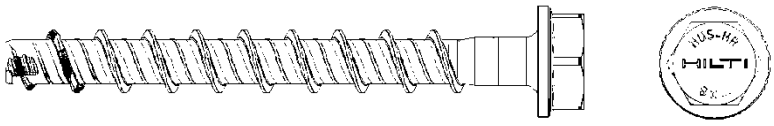
Anchor dimensions

Dimensions

Anchor version			HUS-HR 6	HUS-A 6	HUS-H 6	HUS-I 6	HUS-P 6
Nominal length	l_S	[mm]	35 … 70	35	40..120	35	40..80
Outer diameter of thread	d_S	[mm]	7,6	7,85			
Core diameter	d_k	[mm]	5,4	5,85			



Head configuration

HUS-A 6	External thread M8 or M10	
HUS-H 6	Hex head and Torx T30	
HUS-I 6	Internal threads M8 and M10	
HUS-P 6	Pan head with	
HUS-HR 6	Hexagon head SW = 13 mm	

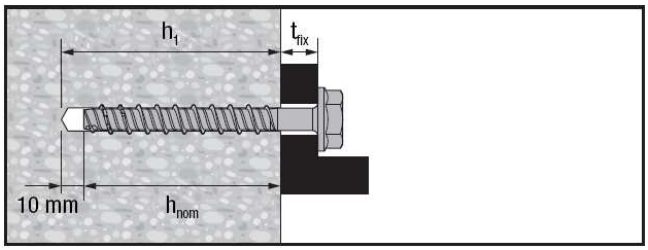
Setting

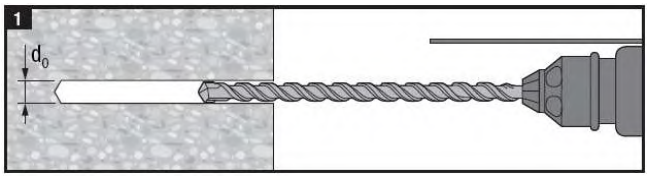
Recommended installation equipment

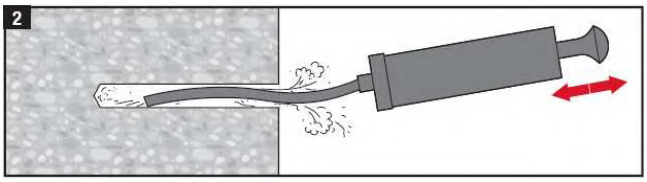
Anchor size	HUS-HR 6	HUS-A 6	HUS-I 6	HUS-H 6	HUS-P 6
Rotary hammer	Hilti TE 6 / TE 7				
drill bit	TE-CX 6				
Socket wrench insert	S-NSD 13 ½ (L)	S-NSD 13 ½ L	S-NSD 13 ½ (L)		-
Torx	-			T30	
Impact screw driver	See setting instruction				

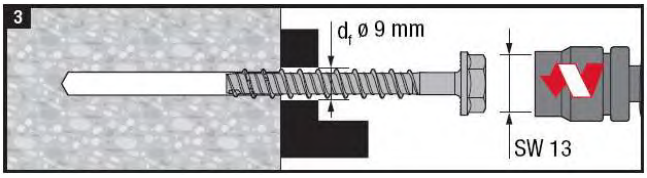
Setting instruction

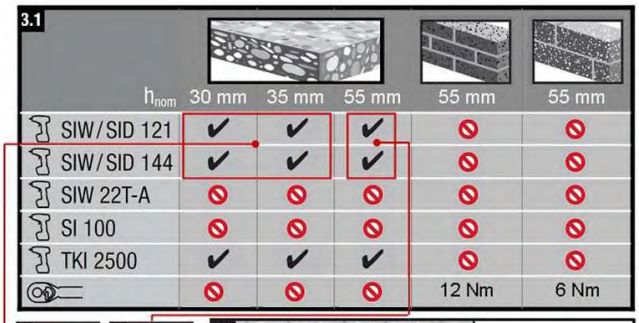
HUS-HR 6

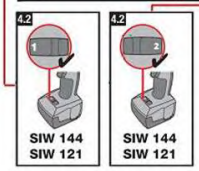


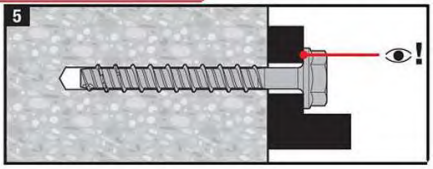




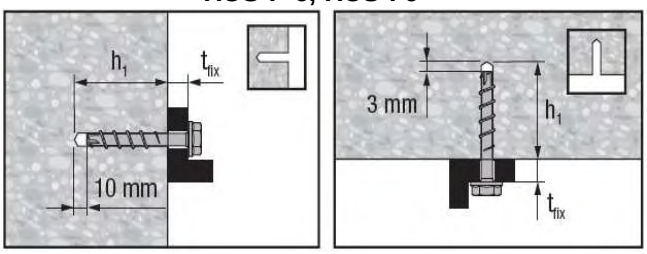




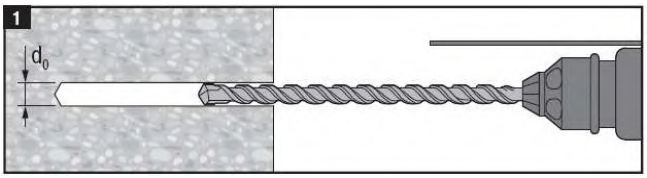


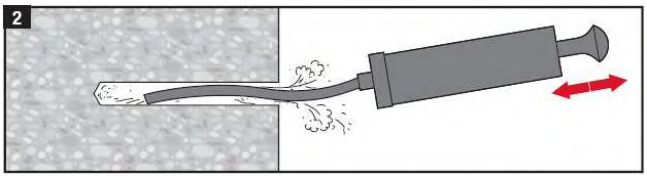


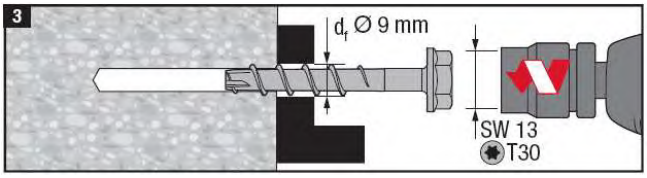
HUS-P 6, HUS-I 6

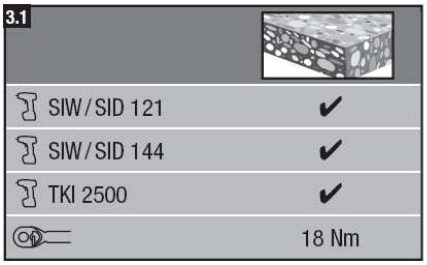


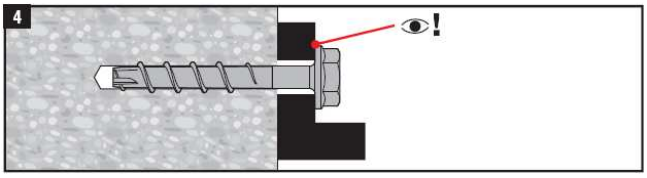
reduced drilling depth
for overhead installation









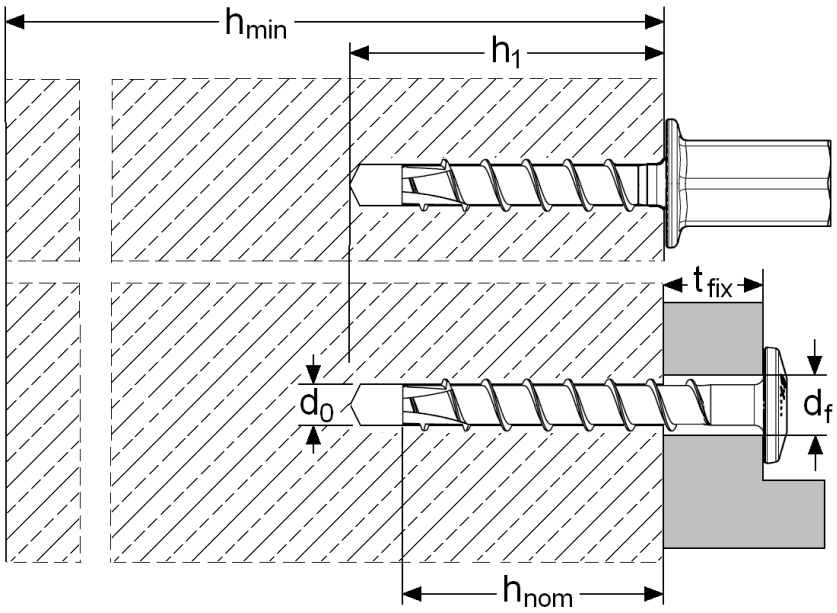


For detailed information on installation see instruction for use given with the package of the product.

Setting details

Anchor version			HUS-HR 6		HUS-A 6	HUS-H 6	HUS-I 6	HUS-P 6
Nominal embedment depth	$h_{nom} \geq$	[mm]	30	35	35			
Nominal diameter of drill bit	d_o	[mm]	6					
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,4					
Depth of drill hole	$h_1 \geq$	[mm]	40	45	45			
Depth of drill hole for overhead installation	$h_1 \geq$	[mm]	40	45	38			
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9		-	9	-	9
Effective anchorage depth	h_{ef}	[mm]	23	27	25			
Nominal length of screw	l_s	[mm]	35 … 70	60 … 70	35	40 … 120	35	40 … 80
Max. fastening thickness	t_{fix}	[mm]	$l_s - h_{nom}$		-	$l_s - h_{nom}$	-	$l_s - h_{nom}$
Max. installation torque	T_{inst}	[Nm]	- a)	- a)	18			

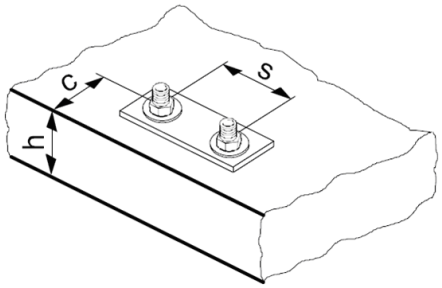
a) Hilti recommends machine setting only



Base material thickness, anchor spacing and edge distance

Anchor version			HUS-HR 6		HUS-A, -H, -I, -P 6
Nominal embedment depth	h_{nom}	[mm]	30	35	35
Effective anchorage depth	h_{ef}	[mm]	23	27	25
Minimum base material thickness	h_{min}	[mm]	80	80	80
Minimum spacing	s_{min}	[mm]	35	35	35
Minimum edge distance	c_{min}	[mm]	35	35 (80)[1)]	35 (80)[1)]
Critical spacing	s_{cr}	[mm]	3 h_{ef}		
Critical edge distance	c_{cr}	[mm]	1,5 h_{ef}		

[1)] see basic loading data



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

Simplified design method for multiple use for non-structural applications (= redundant fastening)

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-10/0005 issue 2011-08-23.

- Influence of concrete strength
- Influence of edge distance
- Influence of spacing
- Valid for a group of two anchors. (The method may also be applied for anchor groups with more than two anchors or more than one edge. The influencing factors must then be considered for each edge distance and spacing. The calculated design loads are then on the save side: They will be lower than the exact values according ETAG 001, Annex C.

The design method is based on the following simplification:

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

The values are valid for one anchor.

Design load – all load directions

Design resistance $F_{Rd} = F^0_{Rd} \cdot f_B \cdot f_1 \cdot f_2 \cdot f_3 \cdot f_{re}$

Basic design resistance

				Hilti tech. data	Data according ETA-10/0005, issue 2011-08-23	
Anchor version				**HUS-HR 6**		**HUS-A, -H, -I, -P 6**
Nominal embedment depth		h_{nom}	[mm]	30	35	35
Basic design resistance in all load directions	35 ≤ c < 80 mm	F^0_{Rd}	[kN]	1,0	1,4	1,3
	c ≥ 80 mm	F^0_{Rd}	[kN]		2,4	2,0

Influencing factors

Influence of concrete strength

Concrete strength designation (ENV 206)	**C 20/25**	**C 25/30**	**C 30/37**	**C 35/45**	**C 40/50**	**C 45/55**	**C 50/60**
$f_B = (f_{ck,cube}/25N/mm^2)^{0,5}$ a)	1	1,1	1,22	1,34	1,41	1,48	1,55

a) $f_{ck,cube}$ = concrete compressive strength, measured on cubes with 150 mm side length

Influence of edge distance a)

c/c_{cr},	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**
$f_1 = 0,7 + 0,3 \cdot c/c_{cr} \le 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_2 = 0,5 \cdot (1 + c/c_{cr}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The edge distance shall not be smaller than the minimum edge distance c_{min} given in the table with the setting details. The influencing factors must be considered for every edge distance.

Influence of anchor spacing a)

s/s_{cr}	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**
$f_3 = 0,5 \cdot (1 + s/s_{cr}) \le 1$	0,55	0,60	0,65	0,70	0,75	0,80	0,85	0,90	0,95	1

a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min} given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

Influence of reinforcement

	Dense reinforcement		**Standard reinforcement a)**	
h_{nom} [mm]	**30**	**35**	**30**	**35**
$f_{re} = 0,5 + h_{ef}/200mm \le 1$	0,62	0,63	1	

a) If in the area of anchorage there is reinforcement with a spacing ≥ 150 mm (any diameter) or with a diameter ≤ 10 mm and a spacing ≥ 100 mm, then a factor $f_{re,N} = 1$ may be applied.