Anchor Fastening Technology Manual

HUS3

Screw Anchor

HUS3-H
HUS3-C
HUS3-HF

Size 8 – 14

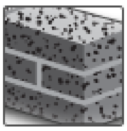
Version 2015-03

HUS3 Screw anchor

	Anchor version	Benefits
	HUS3-H 8 / 10 / 14 Carbon steel concrete screw with hexagonal head	- High productivity – less drilling and fewer operations than with conventional anchors - ETA approval for cracked and non-cracked concrete - ETA approval for adjustability (unscrew-rescrew) - Seismic approval ETA C1
	HUS3-C 8 / 10 Carbon steel concrete screw with countersunk head	- High loads - Small edge and spacing distances - abZ (DIBt) approval for reusability in fresh concrete ($f_{ck,cube}$=10/15/20 Nmm^2) for temporary applications
	HUS3-HF 10 / 14 Carbon steel concrete screw with multilayer coating (≥14 µm) and hexagonal head	- Three embedment depths for maximum design flexibility - HUS3-HF with multilayer coatings for additional corrosion protection

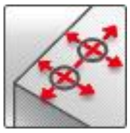

Concrete


Tensile zone


Solid brick


Autoclaved aerated concrete


Seismic ETA-C1


Small edge distance and spacing


Fire resistance


Sprinkler approved

Hilti
Z-21.8-2018

European Technical Approval

CE conformity

DIBt Approval Reusability

PROFIS Anchor design software

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European technical assessment [a]	DIBt, Berlin	ETA-13/1038 / 2015-01-13
DIBt approval (Reusability)	DIBt, Berlin	Z-21.8-2018 / 2014-04-01

a) All data given in this section for HUS3-H, HUS3-C and HUS3-HF according ETA-13/1038, issue 2015-01-13.

Basic loading data (for a single anchor)

All data in this section applies to

For details see Simplified design method

- Correct setting (See setting instruction)
- No edge distance and spacing influence
- *Steel* failure
- Minimum base material thickness
- Cracked and non-cracked Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Adjustment allowed during the installation for size 8 and 10, types H, C and h_{nom2} only.

Mean ultimate resistance

			Data according ETA-13/1038, issue 2015-01-13.								
Anchor size			**8**			**10**			**14**		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete											
Tensile $N_{Ru,m}$		[kN]	11,9	15,9	21,2	15,9	26,6	36,8	23,2	36,2	59,0
Shear $V_{Ru,m}$		[kN]	17,0	*17,9*	*17,9*	18,0	*29,4*	*29,4*	46,4	*47,3*	*47,3*
Cracked concrete											
Tensile $N_{Ru,m}$		[kN]	8,0	11,9	15,9	12,8	21,4	26,3	16,5	25,8	42,0
Shear $V_{Ru,m}$		[kN]	12,1	*17,9*	*17,9*	12,8	*29,4*	*29,4*	33,1	*47,3*	*47,3*

Characteristic resistance

			Data according ETA-13/1038, issue 2015-01-13.								
Anchor size			**8**			**10**			**14**		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete											
Tensile N_{Rk}		[kN]	9,0	12,0	16,0	12,0	20,0	27,8	17,5	27,3	44,4
Shear V_{Rk}		[kN]	12,8	*17,0*	*17,0*	13,5	*28,0*	*28,0*	35,0	*45,0*	*45,0*
Cracked concrete											
Tensile N_{Rk}		[kN]	6,0	9,0	12,0	9,7	16,1	19,8	12,5	19,4	31,7
Shear V_{Rk}		[kN]	9,1	*17,0*	*17,0*	9,7	*28,0*	*28,0*	24,9	38,9	*45,0*

Design resistance

			Data according ETA-13/1038, issue 2015-01-13.							
Anchor size			8			10			14	
Type		**HUS3**	H, C			H, C, HF			H, HF	H
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete											
Tensile N_{Rd}		[kN]	6,0	8,0	10,7	8,0	13,3	18,5	11,7	18,2	29,6
Shear V_{Rd}		[kN]	8,5	*11,3*	*11,3*	9,0	*18,7*	*18,7*	23,3	*30,0*	*30,0*
Cracked concrete											
Tensile N_{Rd}		[kN]	4,0	6,0	8,0	6,4	10,8	13,2	8,3	13,0	21,1
Shear V_{Rd}		[kN]	6,1	*11,3*	*11,3*	6,4	*18,7*	*18,7*	16,6	25,9	*30,0*

Recommended load

			Data according ETA-13/1038, 2015-01-13.							
Anchor size			8			10			14	
Type		**HUS3**	H, C			H, C, HF			H, HF	H
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete											
Tensile N_{Rec}		[kN]	4,3	5,7	7,6	5,7	9,5	13,2	8,3	13,0	21,2
Shear V_{Rec}		[kN]	6,1	8,1	8,1	6,5	13,3	13,3	16,6	21,4	21,4
Cracked concrete											
Tensile N_{Rec}		[kN]	2,9	4,3	5,7	4,6	7,7	9,4	5,9	9,3	15,1
Shear V_{Rec}		[kN]	4,3	8,1	8,1	4,6	13,3	13,3	11,9	18,5	21,4

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.

Materials

Anchor size		8	10	14
Type	**HUS3**	H, C	H, C, HF	H, HF
Nominal tensile strength f_{uk}	[N/mm²]	810	805	730
Yield strength f_{yk}	[N/mm²]	695	690	630
Stressed cross-section $A_{s,}$	[mm²]	48,4	77,0	131,7
Moment of resistance W	[mm³]	47	95	213
Char, bending resistance $M^0_{Rk,s}$	[Nm]	46	92	187

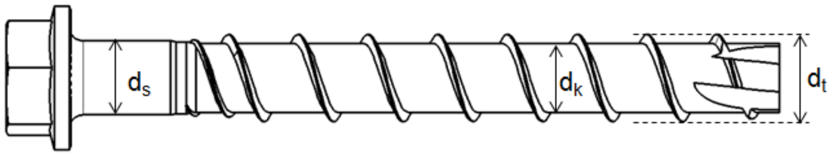
Material quality

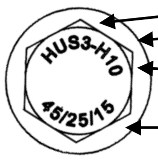
Type	Material	Coating
HUS3-H / HUS3-C	Carbon-steel	Galvanized (≥5 μm)
HUS3-HF	Carbon-steel	Multilayer coating (≥14 μm)

Anchor dimensions

Dimensions

Anchor size			8	10	14
Type		**HUS3**	**H, C**	**H, C, HF**	**H, HF**
Threaded outer diameter	d_t	[mm]	10,30	12,40	16,85
Core diameter	d_k	[mm]	7,85	9,90	12,95
Shaft diameter	d_s	[mm]	8,45	10,55	13,80
Stressed section	A_s	[mm^2]	48,4	77,0	131,7





HUS3 : Hilti Universal Screw 3rd generation

H : Hexagonal head

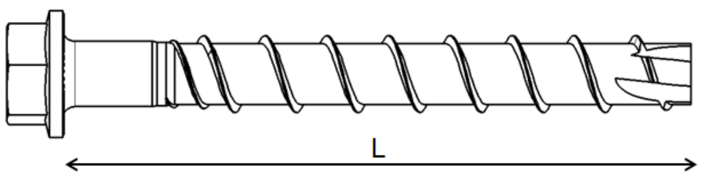
10 : screw diameter

45/25/15 : maximum thickness fixture $t_{fix1}/t_{fix2}/t_{fix3}$ related to the embedment depth $h_{nom1}/h_{nom2}/h_{nom3}$ (see Annex B3)

Screw length and thickness of fixture for HUS3-H, HUS3-HF[1)] (hex head, galvanized)

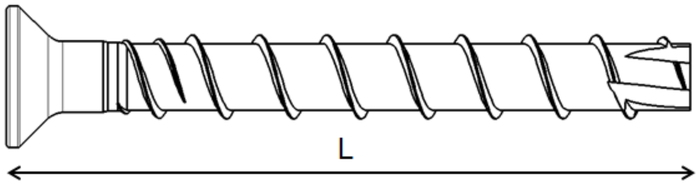
Anchor size **HUS3-H**	**8**			**10**			**14**		
Nominal anchorage depth [mm] / **Length of anchor [mm]**	h_{nom1} 50	h_{nom2} 60	h_{nom3} 70	h_{nom1} 55	h_{nom2} 75	h_{nom3} 85	h_{nom1} 65	h_{nom2} 85	h_{nom3} 115
	Thickness of fixture [mm]								
	t_{fix1}	t_{fix2}	t_{fix3}	t_{fix1}	t_{fix2}	t_{fix3}	t_{fix1}	t_{fix2}	t_{fix3}
55	5	-	-	-	-	-	-	-	-
60	-	-	-	5	-	-	-	-	-
65	15	5	-	-	-	-	-	-	-
70	-	-	-	15	-	-	-	-	-
75	25	15	5	-	-	-	10	-	-
80	-	-	-	25	5	-	-	-	-
85	35	25	15	-	-	-	-	-	-
90	-	-	-	35	15	5	-	-	-
100	50	40	30	45	25	15	35	15	-
110	-	-	-	55	35	25	-	-	-
120	70	60	50	-	-	-	-	-	-
130	-	-	-	75	55	45	65	45	15
150	100	90	80	95	75	65	85	65	35

1) HUS3-HF available only diameter 10 and 14. Diameter 10 all embedment depth, for diameter 14 only h_{nom1} and h_{nom2}



Screw length and thickness of fixture for HUS3-C (countersunk head, galvanized)

Anchor size HUS3-C	8			10		
Nominal anchorage depth [mm]	h_{nom1} 50	h_{nom2} 60	h_{nom3} 70	h_{nom1} 55	h_{nom2} 75	h_{nom3} 85
	Thickness of fixture [mm]					
Length of anchor [mm]	t_{fix1}	t_{fix2}	t_{fix3}	t_{fix1}	t_{fix2}	t_{fix3}
65	15	5	-	-	-	-
70	-	-	-	15	-	-
75	25	15	-	-	-	-
85	35	25	15	-	-	-
90	-	-	-	35	15	-
100	-	-	-	45	25	15



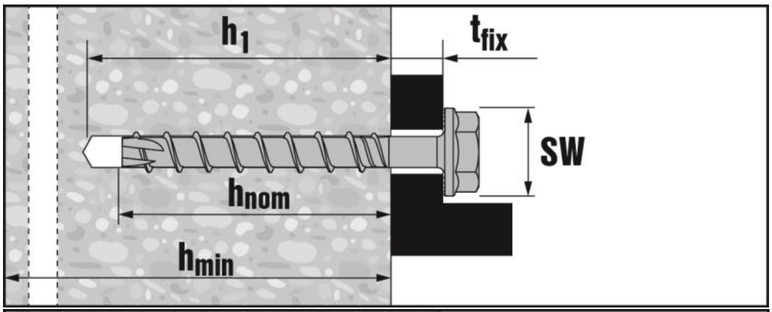
Setting

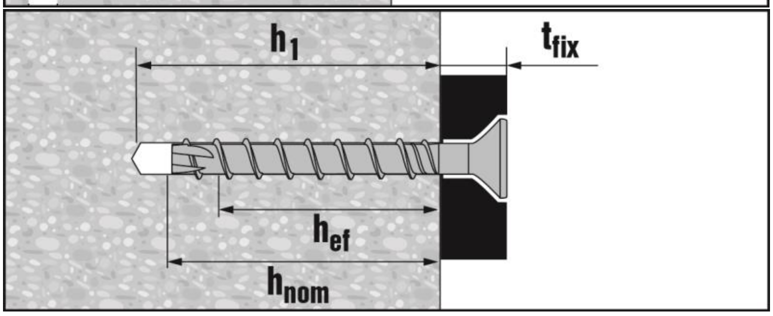
Installation equipment

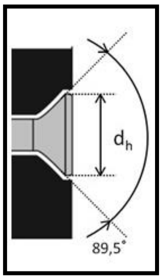
Anchor size		8	10	14
Type	**HUS3**	**H, C**	**H, C, HF**	**H, HF**
Rotary hammer		TE 2 – TE 30	TE 2 – TE 30	TE 2 – TE 30
Drill bit for concrete, solid clay brick and solid sand-lime brick		CX 8	CX 10	CX 14
Drill bit for aerated concrete		CX 6	CX 8	-
Socket wrench insert		SI-S 1/2" 13S	SI-S ½" 15S	SI-S 1/2" 21S
Torx		S-SY TX45	S-SY TX50	-
Tube for temporary application (only for H type)		HRG 8	HRG 10	HRG 14
Setting tool for concrete C12/15 to C50/60		SIW 22T-A		
Setting tool for solid brick and aerated concrete		SFH 22A		
Setting tool for hollow core slab		SIW 22 A		

Setting details for concrete

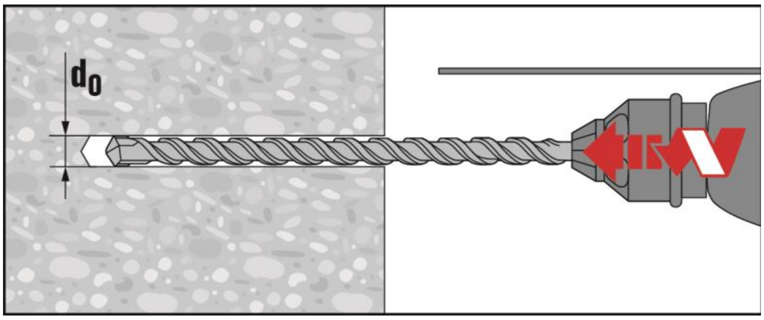
Anchor size			8			10			14		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Nominal diameter of drill bit	d_o	[mm]	8			10			14		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45			10,45			14,50		
Depth of drill hole	$h_1 \geq$	[mm]	60	70	80	65	85	95	75	95	125
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	12			14			18		
Diameter of countersunk head	d_h	[mm]	18			21			-		
Width across (H, HF types)	SW	[mm]	13			15			21		
Torx (C type)	TX	[-]	45			50			-		
Impact screw driver			Hilti SIW 22 T-A								



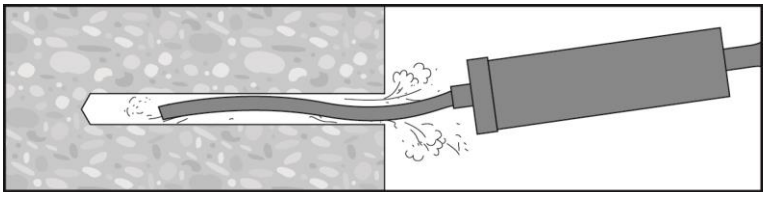


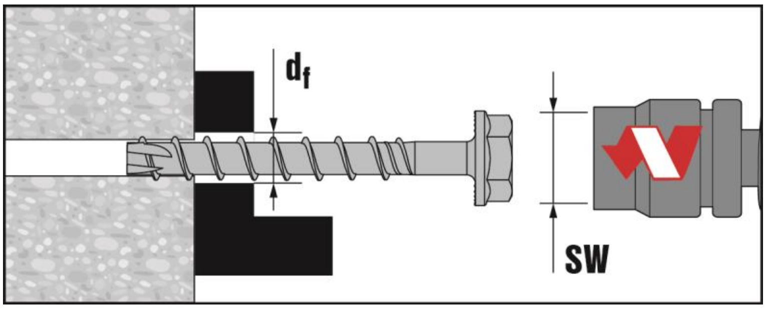


Setting instruction

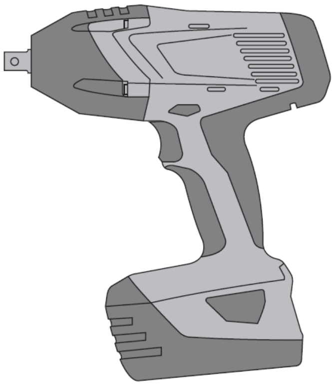


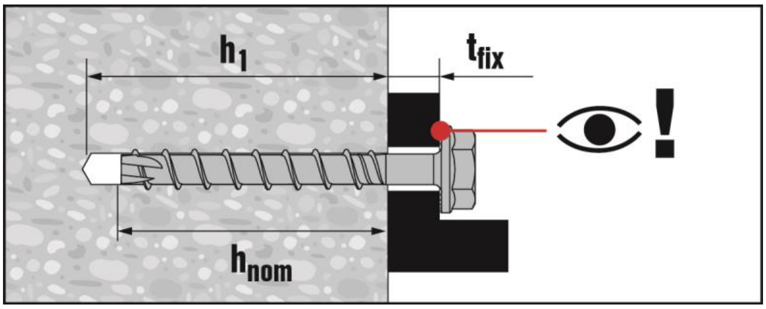
Make a cylindrical hole


Clean the borehole



Install the screw anchor by impact screw driver Hilti SIW 22T-A

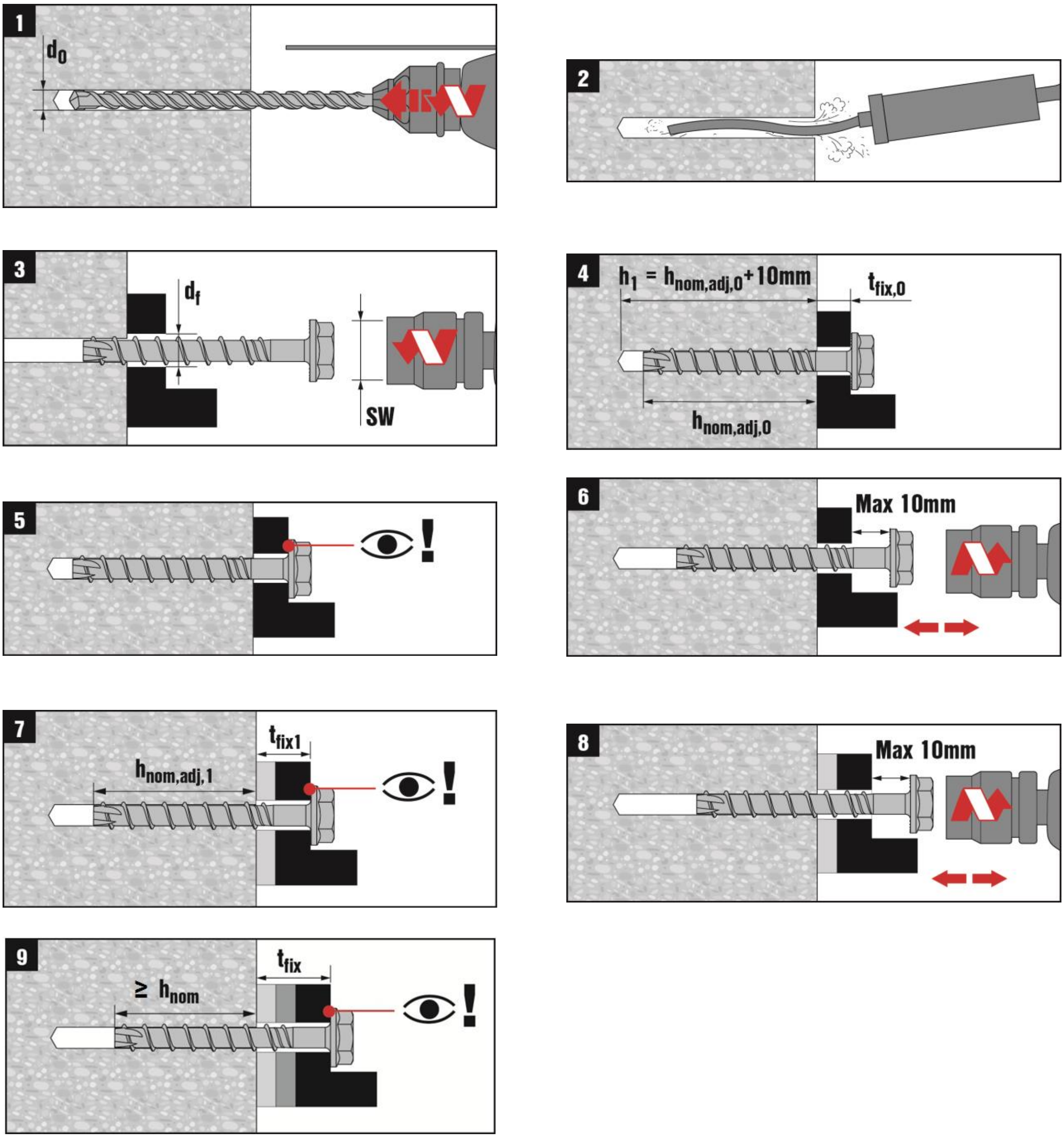




Ensure that the fixture is caught

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

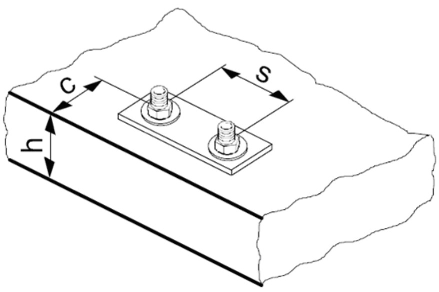
Setting instruction in case of adjustment process
(recommended for HUS3-H,C size 8 and 10 for standard embedment depth h_{nom2} only)



For setting HUS3-H,C 8 (h_{nom2}=60mm) and HUS3-H,C,HF 10 (h_{nom2}=75mm) it is allowed to adjust (loosening max. 10mm and re-tightening) the screw. The adjustment can be done maximum two times, n_a=2. The final embedment depth after adjustment process must be larger or equal than h_{nom2}.
The total allowed thickness of shims added during the adjustment process t_{adj}=10mm.

Design parameters

Anchor size			8			10			14		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Effective anchorage depth	h_{ef}	[mm]	40	46,4	54,9	41,6	58,6	67,1	49,3	66,3	91,8
Minimum base material thickness	h_{min}	[mm]	100	100	120	100	130	140	120	160	200
Minimum spacing	s_{min}	[mm]	40	50	50	50	50	60	60	75	75
Minimum edge distance	c_{min}	[mm]	50	50	50	50	50	60	60	75	75
Critical spacing for splitting failure	$s_{cr,sp}$	[mm]	120	140	170	130	180	220	170	200	280
Critical edge distance for splitting failure	$c_{cr,sp}$	[mm]	60	70	85	65	90	110	85	100	140
Critical spacing for concrete failure	$s_{cr,N}$	[mm]	120	140	170	130	180	202	150	200	280
Critical edge distance for concrete cone failure	$c_{cr,N}$	[mm]	60	70	85	65	90	101	75	100	140



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

Simplified design method

Simplified version of the design method according ETAG 001, Annex C. Design resistance according ETA-13/1038, issue 2015-01-13 (HUS3-H and C types only).

- 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 conservative: They will be lower than the exact values according ETAG 001, Annex C. To avoid this, it is recommended to use the anchor design software PROFIS anchor).

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.

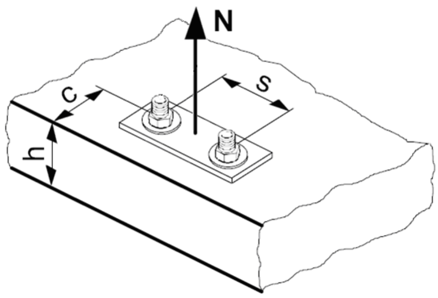
For more complex fastening applications please use the anchor design software PROFIS Anchor.

Tension loading

The design tensile resistance is the lower value of

- Steel resistance: $N_{Rd,s}$
- Concrete pull-out resistance: $N_{Rd,p} = N^0_{Rd,p} \cdot f_B$
- Concrete cone resistance: $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
- Concrete splitting resistance (only non-cracked concrete):

$$N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$$



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

		Data according ETA-13/1038, 2015-01-13.		
Anchor size		**8**	**10**	**14**
Type	**HUS3**	**H, C**	**H, C, HF**	**H, HF**
$N_{Rd,s}$	[kN]	28,0	44,4	69,0

Design pull-out resistance $N_{Rd,p} = N^0_{Rd,p} \cdot f_B$

		Data according ETA-13/1038, 2015-01-13.								
Anchor size		**8**			**10**			**14**		
Type	**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete										
$N^0_{Rd,p}$	[kN]	6,0	8,0	10,7	8,0	13,3	No pull-out	No pull-out		
Cracked concrete										
$N^0_{Rd,p}$	[kN]	4,0	6,0	8,0	No pull-out			No pull-out		

Design concrete cone resistance $N_{Rd,c} = N^0_{Rd,c} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
Design splitting resistance [a)] $N_{Rd,sp} = N^0_{Rd,c} \cdot f_B \cdot f_{1,sp} \cdot f_{2,sp} \cdot f_{3,sp} \cdot f_{h,sp} \cdot f_{re,N}$

			Data according ETA-13/1038, 2015-01-13.								
Anchor size			**8**			**10**			**14**		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete											
$N^0_{Rd,c}$		[kN]	8,5	10,6	13,7	9,0	15,1	18,5	11,7	18,2	29,6
Cracked concrete											
$N^0_{Rd,c}$		[kN]	6,1	7,6	9,8	6,4	10,8	13,2	8,3	13,0	21,1

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**
Pull-out , concrete cone and splitting resistance							
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ [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)]

$c/c_{cr,N}$ **$c/c_{cr,sp}$**	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**
$f_{1,N} = 0,7 + 0,3 \cdot c/c_{cr,N} \leq 1$ $f_{1,sp} = 0,7 + 0,3 \cdot c/c_{cr,sp} \leq 1$	0,73	0,76	0,79	0,82	0,85	0,88	0,91	0,94	0,97	1
$f_{2,N} = 0,5 \cdot (1 + c/c_{cr,N}) \leq 1$ $f_{2,sp} = 0,5 \cdot (1 + c/c_{cr,sp}) \leq 1$	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, These influencing factors must be considered for every edge distance.

Influence of anchor spacing [a)]

$s/s_{cr,N}$ **$s/s_{cr,sp}$**	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1**
$f_{3,N} = 0,5 \cdot (1 + s/s_{cr,N}) \leq 1$ $f_{3,sp} = 0,5 \cdot (1 + s/s_{cr,sp}) \leq 1$	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 base material thickness

h/h_{min}	**1,0**	**1,1**	**1,2**	**1,3**	**1,4**	**1,5**	**1,6**	**1,7**	**1,8**	**≥ 1,84**
$f_{h,sp} = [h/(h_{min})]^{2/3}$	1	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,5

Influence of reinforcement a)

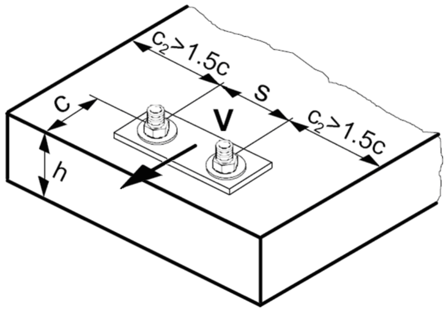
Anchor size			8			10			14		
Type		**HUS3**	**H, C, HF**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
$f_{re,N}$ =	$0{,}5 + h_{ef}/200mm \le 1$		0,70	0,73	0,77	0,71	0,79	0,84	0,75	0,83	0,96

a) This factor applies only for dense reinforcement, 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.

Shear loading

The design shear resistance is the lower value of

- Steel resistance: $\mathbf{V_{Rd,s}}$
- Concrete pryout resistance: $\mathbf{V_{Rd,cp} = k \cdot N_{Rd,c}}$
- Concrete edge resistance: $\mathbf{V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c}$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

		Data according ETA-13/1038, issue 2015-01-13.		
Anchor size		**8**	**10**	**14**
Type	**HUS3**	**H, C**	**H, C, HF**	**H, HF**
$V_{Rd,s}$	[kN]	11,3	18,7	30,0

Design concrete pry-out resistance $V_{Rd,cp} = k \cdot N_{Rd,c}$ a)

			Data according ETA-13/1038, issue 2015-01-13.								
Anchor size			**8**			**10**			**14**		
Type		**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
k			1,0	2,0	2,0	1,0	2,0	2,0	2,0	2,0	2,0

a) $N_{Rd,c}$: Design concrete cone resistance

Design concrete edge resistance [a] $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4 \cdot f_{hef} \cdot f_c$

	Data according ETA-13/1038, issue 2015-01-13.								
Anchor size	**8**			**10**			**14**		
Type HUS3	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth h_{nom} [mm]	50	60	70	55	75	85	65	85	115
Non-cracked concrete									
$V^0_{Rd,c}$ [kN]	6,0	6,0	6,0	8,6	8,6	8,6	15,0	15,1	15,2
Cracked concrete									
$V^0_{Rd,c}$ [kN]	4,2	4,2	4,2	6,1	6,1	6,1	10,6	10,7	10,7

a) For anchor groups only the anchors close to the edge must be considered.

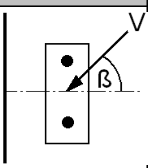
Influencing factors

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
$f_B = (f_{ck,cube}/25N/mm^2)^{1/2}$ [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 angle between load applied and the direction perpendicular to the free edge

Angle ß	0°	10°	20°	30°	40°	50°	60°	70°	80°	≥ 90°
$f_\beta = \sqrt{\dfrac{1}{(\cos\alpha_V)^2 + \left(\dfrac{\sin\alpha_V}{2,5}\right)^2}}$ 	1	1,01	1,05	1,13	1,24	1,40	1,64	1,97	2,32	2,50

Influence of base material thickness

h/c	0,15	0,3	0,45	0,6	0,75	0,9	1,05	1,2	1,35	≥ 1,5
$f_h = \{h/(1,5 \cdot c)\}^{1/2} \leq 1$	0,32	0,45	0,55	0,63	0,71	0,77	0,84	0,89	0,95	1,00

Influence of anchor spacing and edge distance [a] for concrete edge resistance: f_4

$f_4 = (c/h_{ef})^{1,5} \cdot (1 + s / [3 \cdot c]) \cdot 0,5$

c/h_{ef}	Single anchor	Group of two anchors s/h_{ef}														
		0,75	1,50	2,25	3,00	3,75	4,50	5,25	6,00	6,75	7,50	8,25	9,00	9,75	10,50	11,25
0,50	0,35	0,27	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35	0,35
0,75	0,65	0,43	0,54	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
1,00	1,00	0,63	0,75	0,88	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1,25	1,40	0,84	0,98	1,12	1,26	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40	1,40
1,50	1,84	1,07	1,22	1,38	1,53	1,68	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84	1,84
1,75	2,32	1,32	1,49	1,65	1,82	1,98	2,15	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32	2,32
2,00	2,83	1,59	1,77	1,94	2,12	2,30	2,47	2,65	2,83	2,83	2,83	2,83	2,83	2,83	2,83	2,83
2,25	3,38	1,88	2,06	2,25	2,44	2,63	2,81	3,00	3,19	3,38	3,38	3,38	3,38	3,38	3,38	3,38
2,50	3,95	2,17	2,37	2,57	2,77	2,96	3,16	3,36	3,56	3,76	3,95	3,95	3,95	3,95	3,95	3,95
2,75	4,56	2,49	2,69	2,90	3,11	3,32	3,52	3,73	3,94	4,15	4,35	4,56	4,56	4,56	4,56	4,56
3,00	5,20	2,81	3,03	3,25	3,46	3,68	3,90	4,11	4,33	4,55	4,76	4,98	5,20	5,20	5,20	5,20
3,25	5,86	3,15	3,38	3,61	3,83	4,06	4,28	4,51	4,73	4,96	5,18	5,41	5,63	5,86	5,86	5,86
3,50	6,55	3,51	3,74	3,98	4,21	4,44	4,68	4,91	5,14	5,38	5,61	5,85	6,08	6,31	6,55	6,55
3,75	7,26	3,87	4,12	4,36	4,60	4,84	5,08	5,33	5,57	5,81	6,05	6,29	6,54	6,78	7,02	7,26
4,00	8,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75
4,25	8,76	4,64	4,90	5,15	5,41	5,67	5,93	6,18	6,44	6,70	6,96	7,22	7,47	7,73	7,99	8,25
4,50	9,55	5,04	5,30	5,57	5,83	6,10	6,36	6,63	6,89	7,16	7,42	7,69	7,95	8,22	8,49	8,75
4,75	10,35	5,45	5,72	5,99	6,27	6,54	6,81	7,08	7,36	7,63	7,90	8,17	8,45	8,72	8,99	9,26
5,00	11,18	5,87	6,15	6,43	6,71	6,99	7,27	7,55	7,83	8,11	8,39	8,66	8,94	9,22	9,50	9,78
5,25	12,03	6,30	6,59	6,87	7,16	7,45	7,73	8,02	8,31	8,59	8,88	9,17	9,45	9,74	10,02	10,31
5,50	12,90	6,74	7,04	7,33	7,62	7,92	8,21	8,50	8,79	9,09	9,38	9,67	9,97	10,26	10,55	10,85

a) The anchor spacing and the edge distance shall not be smaller than the minimum anchor spacing s_{min} and the minimum edge distance c_{min}.

Influence of embedment depth

Anchor size		8			10			14		
Type	HUS3	H, C			H, C, HF			H, HF		H
Nominal anchorage depth	h_{nom} [mm]	50	60	70	55	75	85	65	85	115
$f_{hef} = 0,05 \cdot (h_{ef} / d)^{1,68}$		0,75	0,96	1,27	0,55	0,98	1,22	0,41	0,68	1,18

Influence of edge distance [a]

c/d	4	6	8	10	15	20	30	40
$f_c = (d / c)^{0,19}$	0,77	0,71	0,67	0,65	0,60	0,57	0,52	0,50

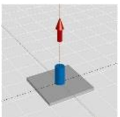
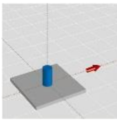
a) The edge distance shall not be smaller than the minimum edge distance c_{min}.

Precalculated values

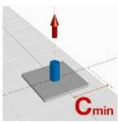
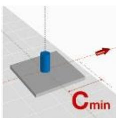
Design resistance calculated according ETAG 001, Annex C and data given in ETA-13/1038 issue 2015-01-13.
All data applies to concrete C 20/25 – $f_{ck,cube}$ =25 N/mm².

Design resistance

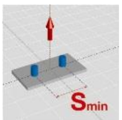
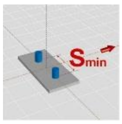
Single anchor, no edge effects

		Data according ETA-13/1038, issue 2015-01-13.								
Anchor size		**8**			**10**			**14**		
Type	**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom} [mm]	50	60	70	55	75	85	65	85	115
Min, base material thickness h_{min} [mm]		100	100	120	100	130	140	120	160	200
 **Tensile N_{Rd}**										
Non-cracked concrete	[kN]	6,0	8,0	10,7	8,0	13,3	18,5	11,7	18,2	29,6
Cracked concrete	[kN]	4,0	6,0	8,0	6,4	10,8	13,2	8,3	13,0	21,1
 **Shear V_{Rd}, without lever arm**										
Non-cracked concrete	[kN]	8,5	11,3	11,3	9,0	18,7	18,7	23,3	30,0	30,0
Cracked concrete	[kN]	6,1	11,3	11,3	6,4	18,7	18,7	16,6	25,9	30,0

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

		Data according ETA-13/1038, issue 2015-01-13.								
Anchor size		**8**			**10**			**14**		
Type	**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom} [mm]	50	60	70	55	75	85	65	85	115
Min. base material thickness h_{min}	**[mm]**	100	100	120	100	130	140	120	160	200
Min. edge distance c_{min}	[mm]	50	50	50	50	50	60	60	75	75
 **Tensile N_{Rd}**										
Non-cracked concrete	[kN]	6,0	8,0	9,5	7,4	10,2	12,3	9,1	14,7	19,6
Cracked concrete	[kN]	4,0	5,9	6,8	5,3	7,3	8,8	6,5	10,5	14,0
 **Shear V_{Rd}, without lever arm**										
Non-cracked concrete	[kN]	4,4	4,5	4,6	4,6	4,9	6,4	6,3	9,0	9,6
Cracked concrete	[kN]	3,1	3,2	3,3	3,2	3,5	4,5	4,5	6,4	6,8

Double anchor, no edge effects, min. spacing ($s = s_{min}$),
(load values are valid for one anchor)

		Data according ETA-13/1038, issue 2015-01-13.								
Anchor size		**8**			**10**			**14**		
Type	**HUS3**	**H, C**			**H, C, HF**			**H, HF**		**H**
Nominal anchorage depth	h_{nom} [mm]	50	60	70	55	75	85	65	85	115
Min. base material thickness	**h_{min} [mm]**	100	100	120	100	130	140	120	160	200
Min. spacing	s_{min} [mm]	40	50	50	50	50	60	60	75	75
 **Tensile N_{Rd}**										
Non-cracked concrete	[kN]	5,7	7,2	8,9	6,3	9,6	11,8	7,9	12,5	18,8
Cracked concrete	[kN]	4,0	5,1	6,3	4,5	6,9	8,4	5,6	8,9	13,4
 **Shear V_{Rd}, without lever arm**										
Non-cracked concrete	[kN]	5,7	11,3	11,3	6,3	18,7	18,7	16,4	25,0	30,0
Cracked concrete	[kN]	4,0	10,3	11,3	4,5	13,8	17,1	11,7	17,8	26,9

Fire resistance

Basic loading data for concrete C20/25 – C50/60

All data in this section applies to:
- Correct setting (see setting instruction)
- No edge distance and spacing influence
- Minimum base material thickness
- HUS3-H only.

The following technical data are based on: ETA-13/1038 issue 2015-01-13.

Recommended loads under fire exposure

Anchor size		HUS3 H		8			10			14		
				h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}	h_{nom1}	h_{nom2}	h_{nom3}
Nominal embedment depth		h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Steel failure for tension and shear load ($F_{Rec,s,fi} = N_{Rec,s,fi} = V_{Rec,s,fi}$)												
Recommended tensile and shear load	R30	$F_{Rec,s,fi}$	[kN]	2,3	2,5	2,7	4,4	4,4		7,4	7,6	
	R60	$F_{Rec,s,fi}$	[kN]	1,7	1,9	2,0	3,3	3,4		5,6	5,8	
	R90	$F_{Rec,s,fi}$	[kN]	1,1	1,1	1,4	2,2	2,3		3,8	3,9	
	R120	$F_{Rec,s,fi}$	[kN]	0,9	0,9	1,1	1,7	1,8		2,9	3,1	
	R30	$M^0_{Rec,s,fi}$	[Nm]	10,4	11,4	12,3	25,1	25,4		56,4	57,0	
	R60	$M^0_{Rec,s,fi}$	[Nm]	7,9	8,4	9,3	19,0	19,4		42,6	43,4	
	R90	$M^0_{Rec,s,fi}$	[Nm]	5,3	5,3	6,3	12,9	13,3		28,7	29,8	
	R120	$M^0_{Rec,s,fi}$	[Nm]	4,1	3,8	4,9	9,8	10,3		21,9	22,9	
Pull-out failure												
Recommended resistance	R30 R60 R90	$N_{Rec,p,fi}$	[kN]	1,1	1,6	2,1	1,7	2,9	3,5	2,2	3,4	5,6
	R120	$N_{Rec,p,fi}$	[kN]	0,9	1,3	1,7	1,4	2,3	2,8	1,8	2,7	4,5
Concrete cone failure												
Characteristic resistance	R30 R60 R90	$N^0_{Rec,c,fi}$	[kN]	1,3	1,9	2,9	1,4	3,4	4,7	2,1	4,6	10,3
	R120	$N^0_{Rec,c,fi}$	[kN]	1,0	1,5	2,3	1,1	2,7	3,8	1,7	3,6	8,2
Edge distance												
	R30 to R120	$c_{cr,N}$	[mm]	$2\ h_{ef}$								
Anchor spacing												
	R30 to R120	$s_{cr,N}$	[mm]	$4\ h_{ef}$								
Concrete pry-out failure												
	R30 to R120	k	[-]	1,0	2,0		1,0	2,0				

a) The recommended loads under fire exposure include a safety factor for resistance under fire exposure $\gamma_{M,fi} = 1{,}0$ and the partial safety factor for action $\gamma_{F,fi} = 1{,}0$. The partial safety factors for action shall be taken from national regulations.

Seismic design

Basic loading data for concrete C20/25 – C50/60

All data in this section applies to:
- Seismic design according to TR045
- HUS3-H and HUS3-C only

The following technical data are based on: ETA-13/1038 issue 2015-01-13.

Anchorage depth range

Anchor size			8	10	14
Type		HUS3	H, C	H, C	H
Nominal anchorage depth range	h_{nom}	[mm]	70	85	115

Tension resistance in case of seismic performance category C1

Anchor size			8	10	14
Type		HUS3	H, C	H, C	H
Characteristic tension resistance to steel failure					
	$N_{Rk,s,seis}$	[kN]	39,2	62,2	96,6
Partial safety factor	$\gamma_{Ms,seis}$	[-]		1,4	
Characteristic pull-out resistance in cracked concrete C20/25 to C50/60					
	$N_{Rk,p,seis}$	[kN]	12	19,8	31,7
Partial safety factor	$\gamma_{Mp,seis}$	[-]		1,5	
Concrete cone resistance and splitting resistance					
Partial safety factor	$\gamma_{Mc,seis} = \gamma_{Msp,seis}$	[-]		1,5	

Displacement under tension load in case of seismic performance category C1 1)

Anchor size			8	10	14
Type		HUS3	H, C	H, C	H
Displacement	$\delta_{N,seis}$	[mm]	0,6	0,9	1,3

1) Maximum displacement during cycling (seismic event).

Shear resistance in case of seismic performance category C1 1)

Anchor size			8	10	14
Type		HUS3	H, C	H, C	H
Characteristic shear resistance to steel failure					
	$V_{Rk,s,seis}$	[kN]	11,9	16,8	22,5
Partial safety factor	$\gamma_{Ms,seis}$	[-]		1,5	
Concrete pryout resistance and concrete edge resistance					
Partial safety factor	$\gamma_{Mc,seis}$	[-]		1,5	

1) Reduction factor α_{gap} = 1,0 when using the Hilti Dynamic Set

Displacement under tension load in case of seismic performance category C1 1)

Anchor size			8	10	14
Type		HUS3	H, C	H, C	H
Displacement	$\delta_{V,seis}$	[mm]	5,3	4,3	5,5

1) Maximum displacement during cycling (seismic event)

Basic loading data for temporary application in standard and fresh concrete < 28 days old, $f_{ck,cube} \geq 10$ N/mm²:

All data in this section applies to the following conditions:

- Strength class, $f_{ck,cube} \geq 10$ N/mm²
- Only temporary use
- Screw is reusable, before each usage it must be checked according Hilti instruction for use with the suited tube Hilti HRG
- Design resistance and recommended load are valid for single anchor only
- Design resistance as well as the recommended load are valid for all load direction and valid for both cracked and non-cracked concrete
- Minimum base material thickness
- No edge distance and spacing influence
- Valid for HUS3-H only.

a) All data given in this section for HUS3-H sizes 10 and 14 according DIBt approval Z-21.8-2018 issue 2014-04-01

Design resistance

			Hilti Tech. Data			DIBt approval Z-21.8-2018					
Anchor size		**HUS3-H**	**8**			**10**			**14**		
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Cracked and non-cracked concrete											
Tensile N_{Rd} = Shear V_{Rd}											
	$f_{ck,cube} \geq 10$ N/mm²	[kN]	2,5	3,2	4,7	3,3	5,3	6,3	4,4	7,0	12,3
	$f_{ck,cube} \geq 15$ N/mm²	[kN]	3,1	4,0	5,7	4,0	6,4	7,8	5,4	8,5	15,0
	$f_{ck,cube} \geq 20$ N/mm²	[kN]	3,6	4,6	6,6	4,7	7,4	9,0	6,2	9,9	17,3

Recommended load

			Hilti Tech. Data			DIBt approval Z-21.8-2018					
Anchor size		**HUS3-H**	**8**			**10**			**14**		
Nominal embedment depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Tensile N_{rec} = Shear V_{rec}											
	$f_{ck,cube} \geq 10$ N/mm²	[kN]	1,8	2,3	3,4	2,4	3,8	4,5	3,1	5,0	8,8
	$f_{ck,cube} \geq 15$ N/mm²	[kN]	2,2	2,9	4,1	2,9	4,6	5,5	3,8	6,1	10,7
	$f_{ck,cube} \geq 20$ N/mm²	[kN]	2,6	3,3	4,7	3,3	5,3	6,4	4,4	7,1	12,4

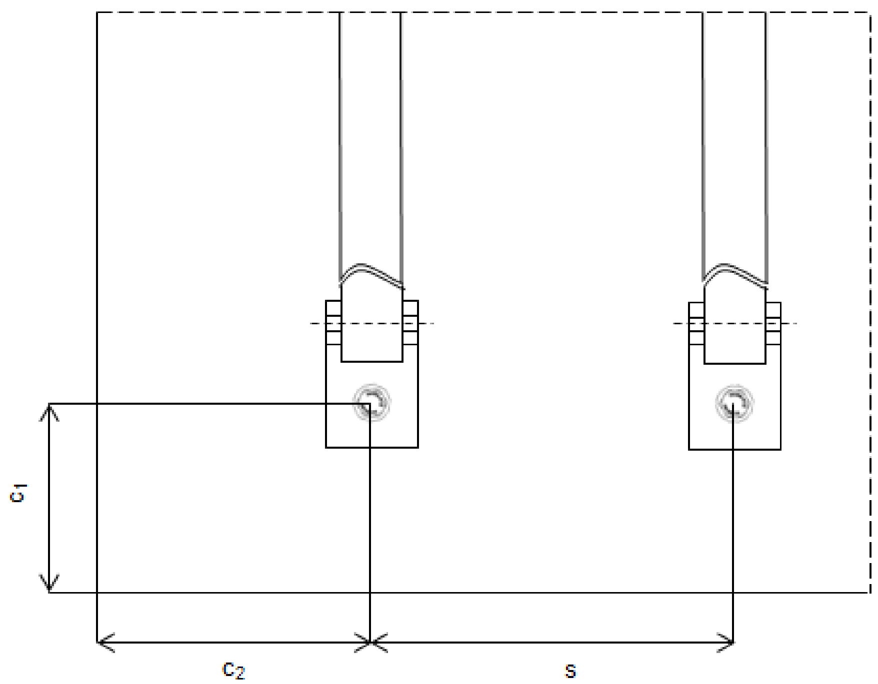
a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

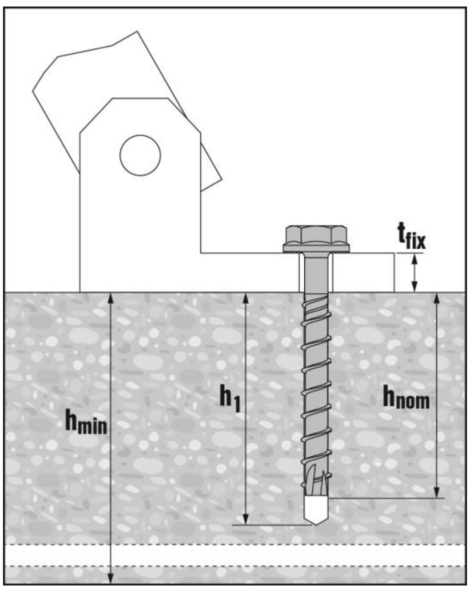
Setting details

			Hilti			DIBt approval Z-21.8-2018					
Anchor size		**HUS3-H**	**8**			**10**			**14**		
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Minimum base material thickness	h_{min}	[mm]	100	115	145	115	150	175	130	175	255
Minimum spacing	s_{min}	[mm]	180	225	285	225	300	345	255	345	510
Minimum edge distance direction 1	c_1	[mm]	60	75	95	75	100	115	85	115	170
Minimum edge distance direction 2	c_2	[mm]	95	115	145	115	150	175	130	180	260

Setting details

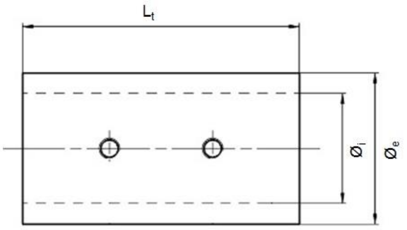
			Hilti			DIBt approval Z-21.8-2018					
Anchor size		**HUS3-H**	**8**			**10**			**14**		
Nominal anchorage depth	h_{nom}	[mm]	50	60	70	55	75	85	65	85	115
Nominal diameter of drill bit	d_o	[mm]	8			10			14		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45			10,45			14,50		
Depth of drill bit	$h_1 \leq$	[mm]	60	70	80	65	85	95	75	95	125
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	12			14			18		
Width across	SW	[mm]	13			15			21		
Impact screw driver			Hilti SIW 22 T-A								
Suited tube			Hilti HRG 8			Hilti HRG 10			Hilti HRG 14		



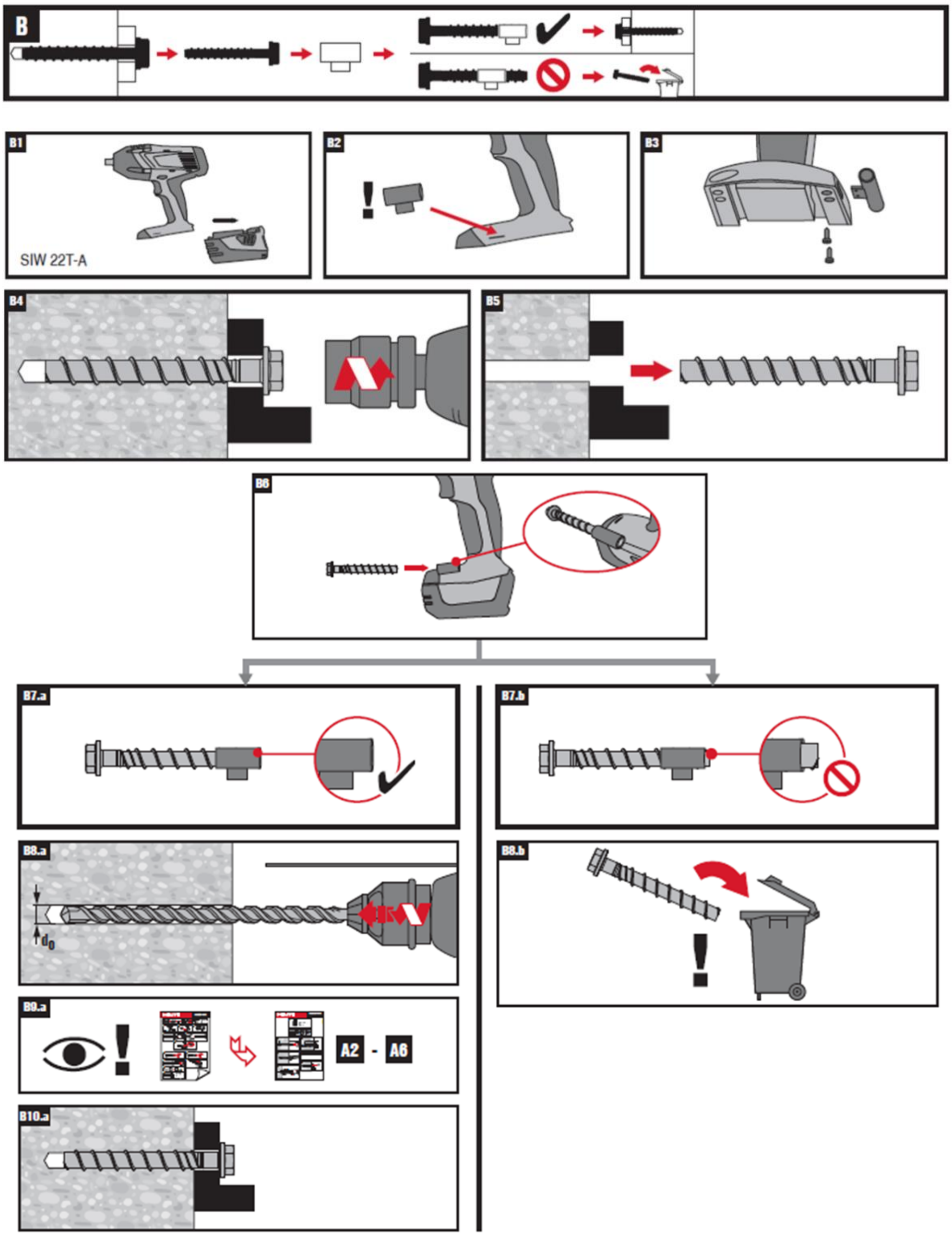


Tube specification

Anchor size / tube			8 / HRG 8	10 / HRG 10	14 / HRG 14
Inner tube diameter	$Ø_i$	[mm]	9,7	11,7	16,0
Outer tube diameter	$Ø_e$	[mm]	15,0	17,0	22,0
Tube length	Lt	[mm]	23,0	28,0	40,3



Instruction for use – re-use of screw



Basic loading data for single anchor in solid masonry units:

All data in this section applies to the following conditions:

Solid bricks: a reduction of the cross section area by a vertical perforation perpendicular to the bed joint area must not be greater than 15%

Drilling:

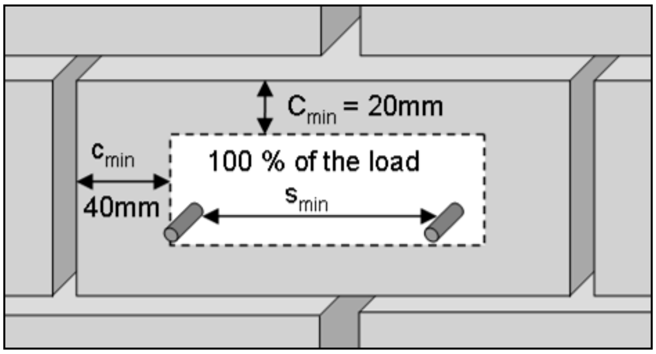
- Holes in Mz and KS drilled with TE rotary hammers drilled with hammering mode
- Holes in PPW drilled with TE rotary hammers drilled without hammering mode

Installation:

- The anchor is correct mounted, if there is neither a turn-through or spinning of the screw in the drill hole nor that an easy turning of the screw is possible after the installation procedure when the head of the screw has touched the fixture
- The recommended setting tool is Hilti SFH 22A

Edge distance and spacing influences:

- Distance to free edge free edge to solid masonry (Mz and KS) units $c_{min,free} \geq 200$ mm
- Distance to free edge free edge to solid masonry (autoclaved aerated gas concrete) units $c_{min,free} \geq 170$ mm
- The minimum distance to horizontal and vertical mortar joint $c_{min,h}$ and $c_{min,v}$ is stated in drawing below
- Minimum anchor spacing in one brick/block is s_{min} = 80 mm



The minimum edge distance to vertical mortar join for aerated gas concrete is 100mm,

Recommended loads

				Hilti	
Base material		Anchor size		8	10
		Type	HUS3	H, C	H, C, HF
		h_{nom}	[mm]	60	75
		Compressive strength class	[N/mm²]	F_{rec} [a] [kN] Tensile and Shear	
	**Solid clay brick** **Mz 2,0-2DF** DIN V 105-100 / EN 771-1 H [mm]: 240x115x113 h_{min} [mm]: 115	≥ 12		1,1	1,4
		≥ 20		1,6	2,0
	**Solid sand-lime brick** **KS 2,0-2DF** DIN V 106-100 / EN 771-2 LxWxH [mm]: 240x115x113 h_{min} [mm]: 115	≥ 12		1,3	1,4
		≥ 20		1,7	2,1
	**Aerated concrete** **PPW 6-0,4** DIN 4165 / EN 771-4 LxWxH [mm]: 499x240x249 h_{min} [mm]: 240	≥ 6		0,7	0,9

a) Characteristic resistance for tension, shear or combined tension and shear loading.
The characteristic resistance is valid for single anchor or for a group of two or four anchors with spacing equal or larger than the minimum spacing s_{min} according to specification.

Load values:

- The technical data for the HUS3 anchors are reference loads for MZ 12 2,0-2DF, KS 12 2,0-2DF and PPW 6-0,4.
- The load Values are valid for non-structural applications.
- Due to the natural variation of stone solid bricks, on site anchor testing is recommended to validate technical data.
- The HUS3 anchor was installed and tested in the center area of solid bricks as shown considering minimal edge and space distances.
- The HUS3 anchor was not tested in the mortar joint between solid bricks or in hollow bricks; however a load reduction is expected.
- For brick walls where anchor position in brick cannot be determined, 100% anchor testing is recommended.

Limitations of loads:

- All data is for redundant fastening for not structural applications
- Plaster, graveling, lining or leveling courses are regarded as non-bearing and may not be taken into account for the calculation of embedment depth,
- The decisive resistance to tension loads is the lower value of N_{rec} (brick breakout, pull out) and $N_{max,pb}$ (pull out of one brick),

Pull out of one brick:

The allowable load of an anchor or a group of anchors in case of single brick pull out, $N_{max,pb}$ [kN], is given in the following tables:

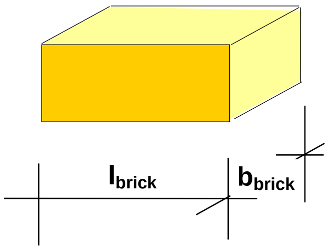
Clay bricks:

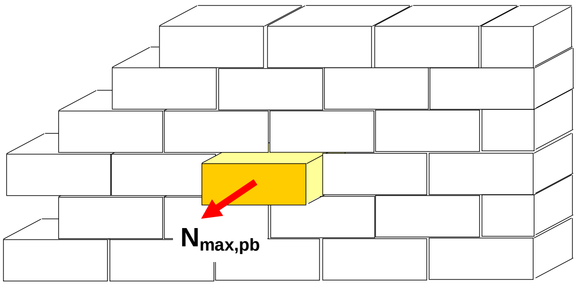
$N_{max,pb}$ [kN]		brick breadth b_{brick} [mm]					
		80	120	200	240	300	360
brick length l_{brick} [mm]	240	1,1	1,6	2,7	3,3	4,1	4,9
	300	1,4	2,1	3,4	4,1	5,1	6,2
	500	2,3	3,4	5,7	6,9	8,6	10,3

All other brick types:

$N_{max,pb}$ [kN]		brick breadth b_{brick} [mm]					
		80	120	200	240	300	360
brick length l_{brick} [mm]	240	0,8	1,2	2,1	2,5	3,1	3,7
	300	1,0	1,5	2,6	3,1	3,9	4,6
	500	1,7	2,6	4,3	5,1	6,4	7,7

$N_{max,pb}$ = resistance for pull out of one brick
l_{brick} = length of the brick
b_{brick} = breadth of the brick

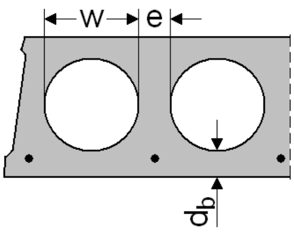




Basic loading data for single anchor in Hollow core slab:

Basic loading data

All data in this section applies to
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Ratio core width / web thickness w/e ≤ 4,2
- Concrete C 30/37 to C 50/60



Characteristic resistance

Anchor size			**8**	**10**
Type		**HUS3**	**C, H**	**C, H, HF**
Bottom flange thickness	$d_b \geq$	[mm]	30	30
All load directions	F_{Rk}	[kN]	2,0	2,0

Design resistance

Anchor size			**8**	**10**
Type		**HUS3**	**C, H**	**C, H, HF**
Bottom flange thickness	$d_b \geq$	[mm]	30	30
All load directions	F_{Rd}	[kN]	1,3	1,3

Recommended loads

Anchor size			**8**	**10**
Type		**HUS3**	**C, H**	**C, H, HF**
Bottom flange thickness	$d_b \geq$	[mm]	30	30
All load directions [a)]	F_{rec}	[kN]	0,95	0,95

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

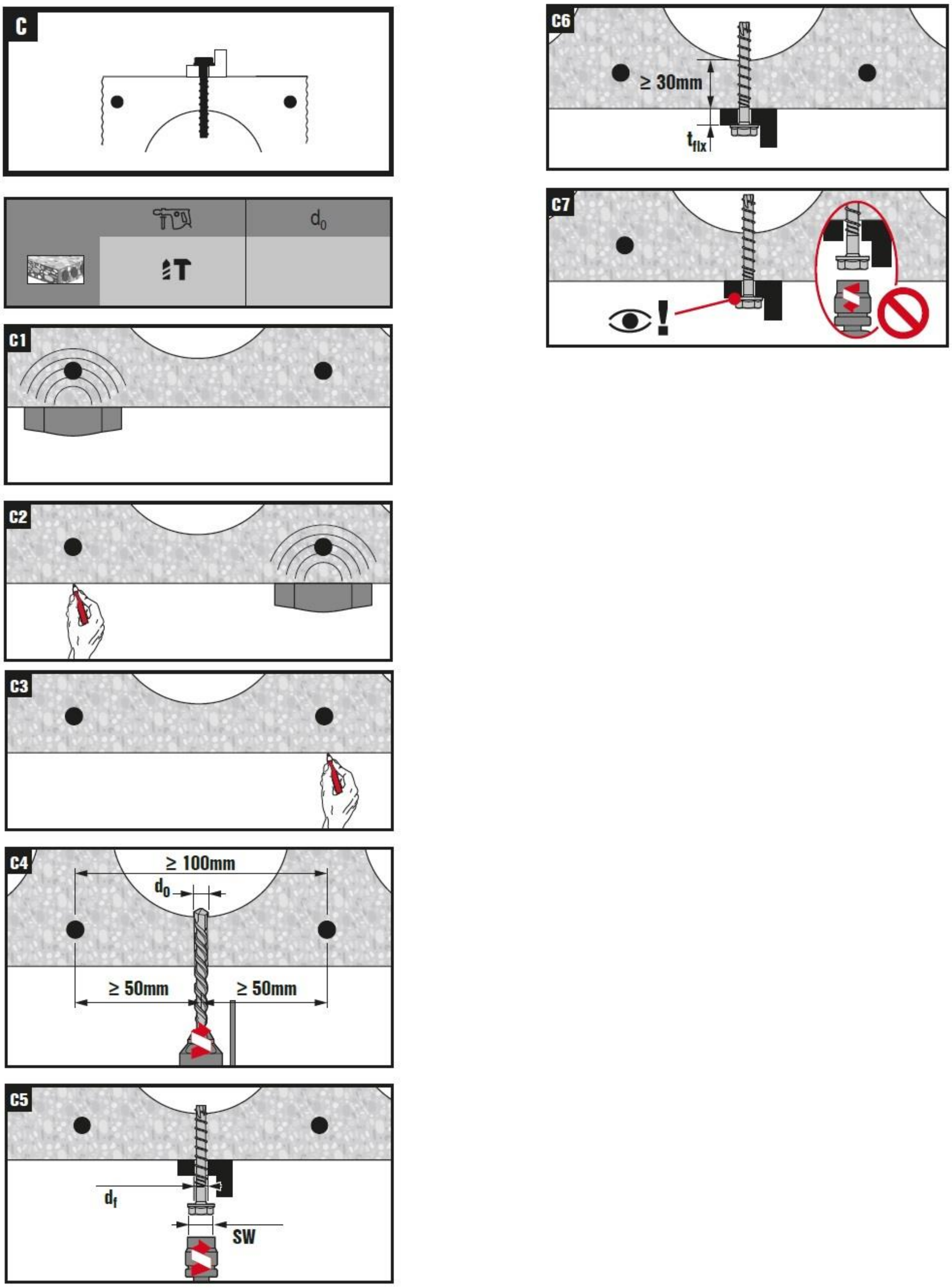
Minimum number of fixing points	**Minimum number of anchors per fixing point**	**Maximum design load of action N_{Sd} per fixing point [a)]**
3	1	2 kN
4	1	3 kN

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.

Setting

Anchor size	8	10
Type **HUS3**	**C, H**	**C, H, HF**
Rotary hammer	Hilti TE 6 / TE 7	
drill bit	TE-CX 4	
Impact screw driver	SIW 22 A, 1st or 2nd gear	

Setting instruction

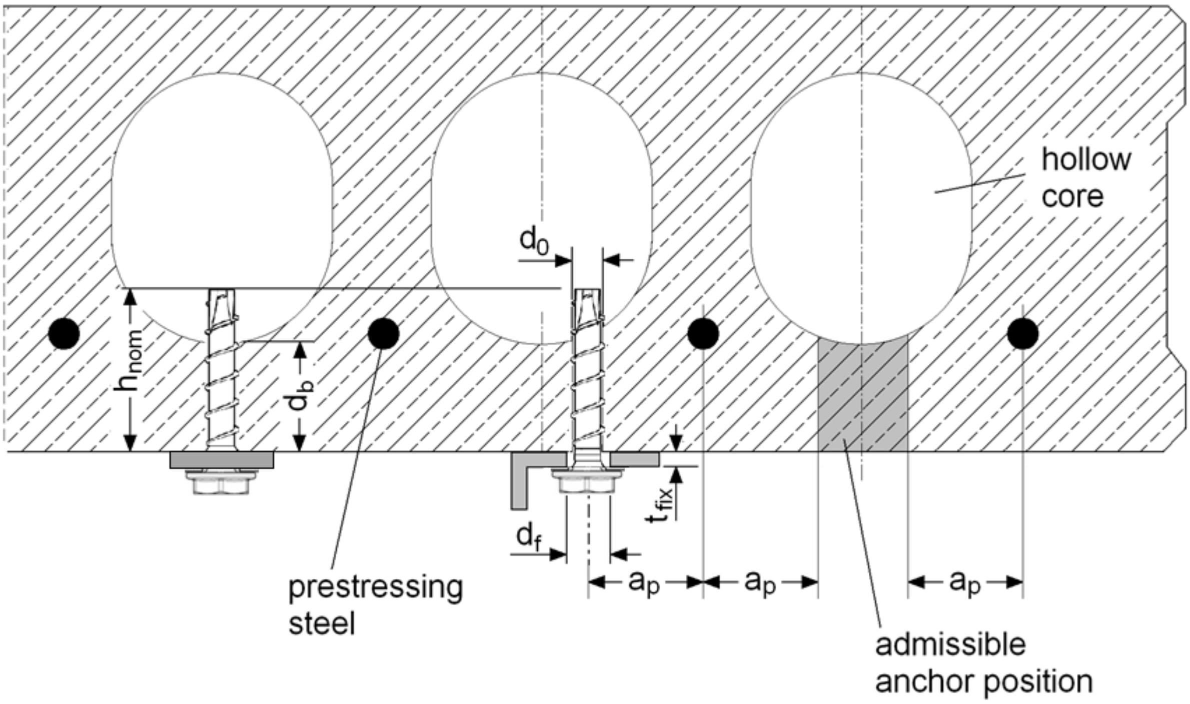


Setting details

Anchor size			8	10
Type		**HUS3**	**C, H**	**C, H, HF**
Nominal embedment depth	$h_{nom} \geq$	[mm]	40	45
Bottom flange thickness	$d_b \geq$	[mm}	30	30
Nominal diameter of drill bit	d_o	[mm]	8	10
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45
Nominal depth of drill hole [a)]	$h_1 \geq$	[mm]	40	40
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	12	14
Nominal effective anchorage depth	h_{ef}	[mm]	30	30
Distance between anchor position and prestressing steel	$a_p \geq$	[mm]	50	50

a) Nominal depth of drill hole may be deeper than bottom flange thickness

Type	Size	Length	d_b=30 [mm]		d_b=35 [mm]		d_b=40 [mm]		d_b=50 [mm]	
	[mm]	[mm]	$t_{fix,min}$ [mm]	$t_{fix,max}$ [mm]	$t_{fix,min}$ [mm]	$t_{fix,max}$ [mm]	$t_{fix,min}$ [mm]	$t_{fix,max}$ [mm]	$t_{fix,min}$ [mm]	$t_{fix,max}$ [mm]
HUS3-H	8	55	5	15	5	10	5	5	5	5
		65	5	25	5	20	5	15	5	5
		75	5	35	5	30	5	25	5	15
		85	15	45	15	40	15	35	15	25
		100	30	60	30	55	30	50	30	40
		120	50	80	50	75	50	70	50	60
		150	80	110	80	105	80	100	80	90
HUS3-C	8	65	15	25	15	20	15	15	15	5
		75	15	35	15	30	15	25	15	15
		85	15	45	15	40	15	35	15	25
HUS3-H	10	60	5	15	5	10	5	5	5	5
		70	15	25	15	20	15	15	15	5
		80	5	35	5	30	5	25	5	15
		90	5	45	5	40	5	35	5	25
		100	15	55	15	50	15	45	15	35
		110	25	65	25	60	25	55	25	45
		130	45	85	45	80	45	75	45	65
		150	65	105	65	100	65	95	65	85
HUS3-HF	10	60	5	15	5	10	5	5	5	5
		80	5	35	5	30	5	25	5	15
		100	15	55	15	50	15	45	15	35
		110	25	65	25	60	25	55	25	45
HUS3-C	10	70	15	25	15	20	15	15	15	10
		90	15	45	15	40	15	35	15	25
		100	15	55	15	50	15	45	15	35



Anchor spacing and edge distance

Anchor size			8	10
Type		**HUS3**	**C, H**	**C, H, HF**
Minimum edge distance	$c_{min} \geq$	[mm]	100	
Minimum anchor spacing	$s_{min} \geq$	[mm]	100	
Minimum distance between anchor groups	$a_{min} \geq$	[mm]	100