HUS-HR Screw anchor, stainless steel

	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 and spacing | Solid brick | Autoclaved aerated concrete | Fire resistance | 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-08/0307 / 2009-03-30
Fire test report	DIBt, Berlin	ETA-08/0307 / 2011-01-21
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.

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 as specified in the table
- *Steel* failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²

Mean ultimate resistance

		Non-cracked concrete				Cracked concrete			
Anchor size	**HUS-HR**	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
Tensile $N_{Ru,m}$	[kN]	- [a)]	12,0	16,0	-	- [a)]	6,7	10,0	-
Shear $V_{Ru,m}$	[kN]	- [a)]	31,5	41,9	-	- [a)]	22,5	30,0	-
Reduced embedment									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
Tensile $N_{Ru,m}$	[kN]	-	16,0	21,3	25,2	-	8,0	12,0	16,0
Shear $V_{Ru,m}$	[kN]	-	34,7	44,0	50,4	-	30,9	38,1	36,0
Standard embedment									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
Tensile $N_{Ru,m}$	[kN]	12,0	21,3	33,3	53,6	6,7	16,0	21,3	33,3
Shear $V_{Ru,m}$	[kN]	22,7	34,7	44,0	102,7	21,7	34,7	44,0	76,6

a) Please refer to resistance table in all load directions for multiple use fastenings in section HUS 6 screw anchor for redundant fastening.

Characteristic resistance

		Non-cracked concrete				Cracked concrete			
Anchor size	**HUS-HR**	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
Tensile N_{Rk}	[kN]	- [a)]	9,0	12,0	-	- [a)]	5,0	7,5	-
Shear V_{Rk}	[kN]	- [a)]	23,6	31,4	-	- [a)]	16,9	22,5	-
Reduced embedment (ETA-08/0307)									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
Tensile N_{Rk}	[kN]	-	12,0	16,0	18,9	-	6,0	9,0	12,0
Shear V_{Rk}	[kN]	-	26,0	33,0	37,8	-	23,2	28,6	27,0
Standard embedment (ETA-08/0307)									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
Tensile N_{Rk}	[kN]	9,0	16,0	25,0	40,2	5,0	12,0	16,0	25,0
Shear V_{Rk}	[kN]	17,0	26,0	33,0	77,0	16,3	26,0	33,0	57,4

a) Please refer to resistance table in all load directions for multiple use fastenings in section HUS 6 screw anchor for redundant fastening.

Design resistance

		Non-cracked concrete				Cracked concrete			
Anchor size	**HUS-HR**	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
Tensile N_{Rd}	[kN]	- a)	5,0	6,7	-	- a)	2,8	4,2	-
Shear V_{Rd}	[kN]	- a)	15,7	21,0	-	- a)	11,2	15,0	-
Reduced embedment (ETA-08/0307)									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
Tensile N_{Rd}	[kN]	-	6,7	8,9	10,5	-	3,3	5,0	6,7
Shear V_{Rd}	[kN]	-	17,3	22,0	25,2	-	15,5	19,0	18,0
Standard embedment (ETA-08/0307)									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
Tensile N_{Rd}	[kN]	4,3	8,9	13,9	22,3	2,4	6,7	8,9	13,9
Shear V_{Rd}	[kN]	11,3	17,3	22,0	51,3	10,9	17,3	22,0	38,3

a) Please refer to resistance table in all load directions for multiple use fastenings in section HUS 6 screw anchor for redundant fastening.

Recommended loads

		Non-cracked concrete				Cracked concrete			
Anchor size	**HUS-HR**	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
Tensile N_{rec} a)	[kN]	- b)	3,0	4,0	-	- b)	1,7	2,5	-
Shear V_{rec} a)	[kN]	- b)	7,9	10,5	-	- b)	5,6	7,5	-
Reduced embedment (ETA-08/0307)									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
Tensile N_{rec} a)	[kN]	-	4,0	5,3	6,3	-	2,0	3,0	4,0
Shear V_{rec} a)	[kN]	-	8,7	11,0	12,6	-	7,7	9,5	9,0
Standard embedment (ETA-08/0307)									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
Tensile N_{rec} a)	[kN]	3,0	5,3	8,3	13,4	1,7	4,0	5,3	8,3
Shear V_{rec} a)	[kN]	5,7	8,7	11,0	2,3	5,4	8,7	11,0	19,1

a) With overall global safety factor γ = 3. The recommended loads vary according to the safety factor requirement from national regulations.
b) Please refer to resistance table in all load directions for multiple use fastenings in section HUS 6 screw anchor for redundant fastening.

Basic loading data for single anchor in solid masonry units

All data in this section applies to

- Load values valid for holes drilled with TE rotary hammers in hammering mod
- Correct anchor setting (see instruction for use, setting details)
- The core / material ratio may not exceed 15% of a bed joint area.
- The brim area around holes must be at least 70mm
- Edge distances, spacing and other influences, see below

Recommended loads[a)]

				Hilti		
Base material		**Anchor size**		**HUS-HR 6**	**HUS-HR 8**	**HUS-HR 10**
Germany, Austria, Switzerland		h_{nom}	[mm]	**55**	**60**	**70**
Solid clay brick Mz12/2,0 	DIN 105/ EN 771-1 f_b a) ≥ 12 N/mm²	Tensile N_{rec} b)	[kN]	0,9	1,0	1,1
		Shear V_{rec} b)	[kN]	1,4	2,0	2,3
Solid sand-lime brick KS 12/2,0 	DIN 106/ EN 771-2 f_b a) ≥12 N/mm²	Tensile N_{rec} c)	[kN]	0,6	0,6	1,0
		Shear V_{rec} c)	[kN]	0,9	1,1	1,7
Aerated concrete PPW 6-0,4 	DIN 4165/ EN 771-4 f_b a) ≥ 6 N/mm²	Tensile N_{rec} d)	[kN]	0,2	0,2	0,4
		Shear V_{rec} d)	[kN]	0,4	0,4	0,9

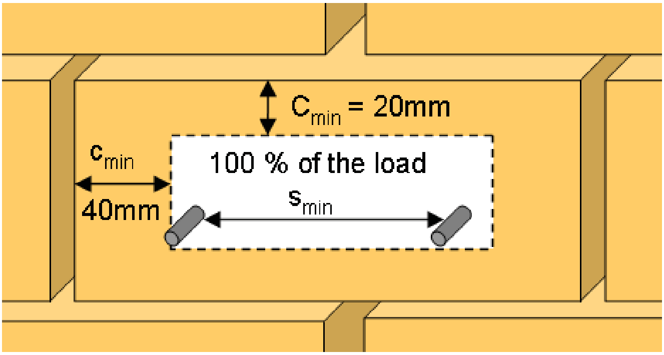
a) f_b = brick strength

b) Values only valid for Mz (DIN 105) with brick strength ≥ 24 N/mm², density 2,0 kg/dm³, minimum brick size NF (24,0cm x 11,5cm x 11,5cm)

c) Values only valid for KS (DIN 106) with brick strength ≥ 29,4 N/mm², density 2,0 kg/dm³, minimum brick size NF (24,0cm x 11,5cm x 11,5cm)

d) Values only valid for KS (DIN 4165) with brick strength ≥ 7,6 N/mm², density 0,04 kg/dm³

Permissible anchor location in brick and block walls



Edge distance and spacing influences

- The technical data for the HUS-HR anchors are reference loads for MZ 12 and KS 12. Due to the large variation of natural stone solid bricks, on site anchor testing is recommended to validate technical data.
- The HUS-HR anchor was installed and tested in center of solid bricks as shown. The HUS-HR 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 can not be determined, 100% anchor testing is recommended.
- Distance to free edge free edge to solid masonry (Mz and KS) units ≥ 200 mm
- Distance to free edge free edge to solid masonry (autoclaved aerated gas concrete) units ≥ 170 mm
- The minimum distance to horizontal and vertical mortar joint (c_{min}) is stated in drawing above.
- Minimum anchor spacing (s_{min}) in one brick/block is ≥ 2*c_{min}

Limits

- Applied load to individual bricks may not exceed 1,0 kN without compression or 1,4 kN with compression
- All data is for multiple use for non structural applications
- Plaster, graveling, lining or levelling courses are regarded as non-bearing and may not be taken into account for the calculation of embedment depth.

Materials

Mechanical properties

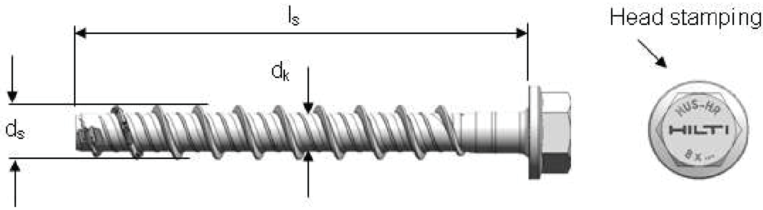
Anchor size		HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
Nominal tensile strength f_{uk}	[N/mm²]	1040	870	950	820
Stressed cross-section A_s	[mm²]	23	39	55	125
Moment of resistance W	[mm³]	15,5	34,4	58,2	196,4
Design bending resistance $M_{Rd,s}$	[Nm]	12,9	23,9	44,2	128,8

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

Anchor dimensions

Dimensions

Anchor version	l_s [mm]	d_s [mm]	d_k [mm]
HUS-HR 6	35 … 70	7,5	5,4
HUS-HR 8	55 … 105	10,1	7,1
HUS-HR 10	65 … 130	12,3	8,4
HUS-HR 14	80 … 135	16,5	12,6

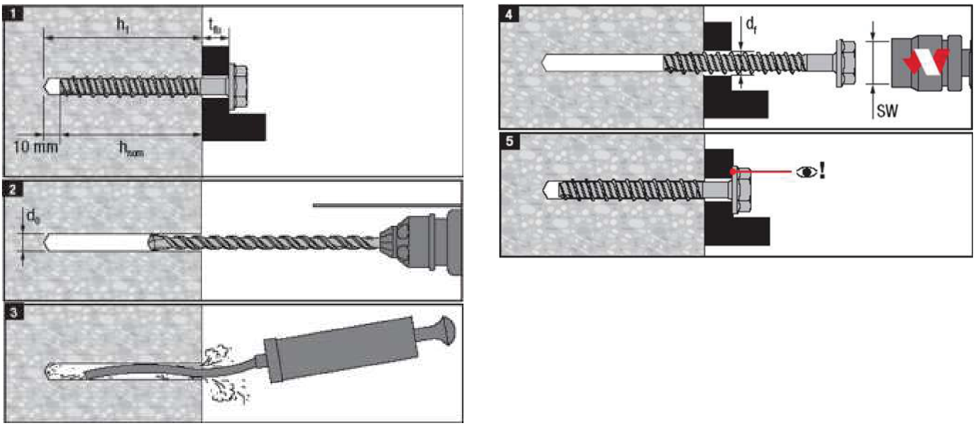


Setting

Recommended installation equipment

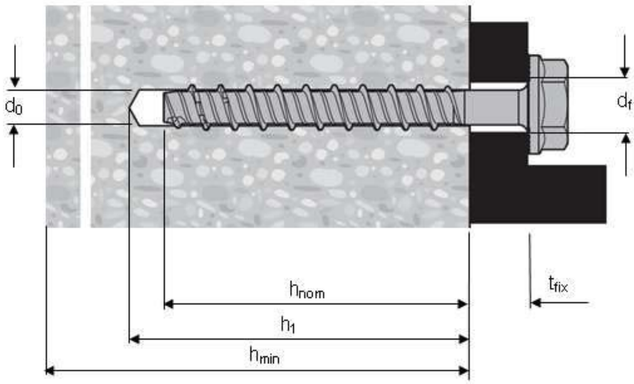
Anchor size	HUS-HR 6	HUS-HR 8	HUS-HR 10	HUS-HR 14
Rotary hammer	**Hilti TE 6**	**Hilti TE 6**	**Hilti TE 16**	**Hilti -TE 16**
drill bit	TE-C3X 6/17	TE-C3X 8/17	TE-C3X 10/22	TE-C3X 14/22
Socket wrench insert	S-NSD 13 ½ (L)	S-NSD 13 ½ (L)	S-NSD 15 ½ (L)	S-NSD 21 ½
Impact screw driver	Hilti SIW 144-A or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

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}



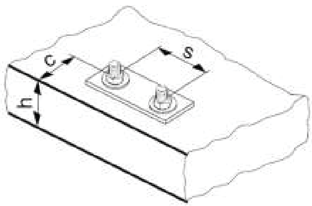
Setting details

Anchor version		HUS-HR		6		8			10			14	
Nominal embedment depth		h_{nom}	[mm]	30	55	50	60	80	60	70	90	70	110
Nominal diameter of drill bit		d_o	[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]	40	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]	23	45	38	47	64	46	54	71	52	86
Max. fastening thickness		t_{fix}	[mm]	$l_s - h_{nom}$									
Max. installation torque	Concrete	T_{inst}	[Nm]	20	- a)	35	- a)	- a)	45	45	45	65	65
	Solid m. Mz 12	T_{inst}	[Nm]	- b)	10	- b)	16	16	-	20	20	- b)	- b)
	Solid m. KS 12	T_{inst}	[Nm]	- b)	10	- b)	16	16	-	20	20	- b)	- b)
	Aerated conc.	T_{inst}	[Nm]	- b)	4	- b)	8	8	-	10	10	- b)	- b)

a) Hilti recommends machine setting only in concrete
b) 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
Critical spacing for concrete cone and splitting failure	$s_{cr,N}$ = $s_{cr,sp}$	[mm]	69	135	114	141	192	166	194	256	187	310
Critical edge distance for concrete cone and splitting failure	$c_{cr,N}$ = $c_{cr,sp}$	[mm]	35	68	57	71	96	83	97	128	94	155



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

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.

Simplified design method

Simplified version of the design method according ETAG 001, Annex C. Design resistance according data given in ETA-08/0307 issue 2009-03-30.

- 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. 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)

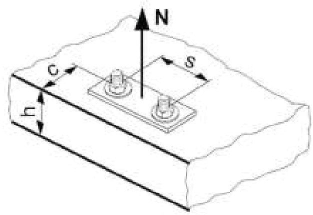
The values are valid for one anchor (single point fastening), multiple use applications are not part of this design method.

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



Basic design tensile resistance

Design steel resistance $N_{Rd,s}$

$\gamma_{Ms} = 1.4$

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

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

$\gamma_{Mp} \geq 1.8$

		Non-cracked concrete				Cracked concrete			
Anchor size		**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	30	50	60	-	30	50	60	-
Tensile N_{Rd}	[kN]	-	5,0	6,7	-	-	2,8	4,2	-
Reduced embedment									
h_{nom}	[mm]	-	60	70	70	-	60	70	70
Tensile N_{Rd}	[kN]	-	6,7	8,9	10,5	-	3,3	5,0	6,7
Standard embedment									
h_{nom}	[mm]	55	80	90	110	55	80	90	110
Tensile N_{Rd}	[kN]	4,3	8,9	13,9	22,3	2,4	6,7	8,9	13,9

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

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

$\gamma_{Mc} \geq 1.8$

	Non-cracked concrete				Cracked concrete			
Anchor size	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)								
h_{nom} [mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
$N^0_{Rd,c}$ [kN]	-	6,6	8,7	-	-	4,7	6,2	-
Reduced embedment								
h_{nom} [mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
$N^0_{Rd,c}$ [kN]	-	9,0	11,1	10,5	-	6,4	7,9	7,5
Standard embedment								
h_{nom} [mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
$N^0_{Rd,c}$ [kN]	7,2	14,3	16,8	22,3	5,2	10,2	12,0	16,0

a) Splitting resistance must only be considered for non-cracked concrete

ETA: Data according ETA-08/0307 issue 2008-12-12 Hilti: Additional Hilti technical data

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
b) For design data of $f_{ck,cube}$ = 15 and 20, please contact Hilti technical advisory service

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_{ef}	2,0	2,2	2,4	2,6	2,8	3,0	3,2	3,4	3,6	≥ 3,68
$f_{h,sp} = [h/(2 \cdot h_{ef})]^{2/3}$	1	1,07	1,13	1,19	1,25	1,31	1,37	1,42	1,48	1,5

Influence of reinforcement

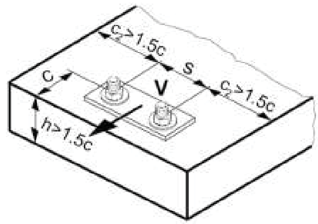
Anchor size	HUS-HR 6		HUS-HR 8			HUS-HR 10			HUS-HR 14	
h_{nom} [mm]	30	55	50	60	80	60	70	90	70	110
h_{ef} [mm]	23	45	38	47	64	46	54	71	52	86
$f_{re,N} = 0,5 + h_{ef}/200mm \le 1$	0,62	0,73	0,69	0,74	0,82	0,73	0,77	0,86	0,76	0,93

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: $V_{Rd,s}$
- Concrete pryout resistance: $V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$
- Concrete edge resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_ß \cdot f_h \cdot f_4$



Basic design shear resistance

Design steel resistance $V_{Rd,s}$

$\gamma_{Ms} = 1.5$

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	51,3

Design concrete pryout resistance $V_{Rd,cp} = V^0_{Rd,cp} \cdot f_B \cdot f_{1,N} \cdot f_{2,N} \cdot f_{3,N} \cdot f_{re,N}$

$\gamma_{Mc} = 1.5$

		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**	**-**
$V^0_{Rd,cp}$	[kN]	-	15,7	21,0	-	-	11,2	15,0	-
Reduced embedment									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
$V^0_{Rd,cp}$	[kN]	-	21,7	26,7	25,2	-	15,5	19,0	18,0
Standard embedment									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
$V^0_{Rd,cp}$	[kN]	15,2	34,4	40,2	53,6	10,9	24,6	28,7	38,3

Design concrete edge resistance $V_{Rd,c} = V^0_{Rd,c} \cdot f_B \cdot f_\beta \cdot f_4$

$\gamma_{Mc} = 1.5$

		Non-cracked concrete				Cracked concrete			
Anchor size	**HUS-HR**	**6**	**8**	**10**	**14**	**6**	**8**	**10**	**14**
Extra reduced embedment (Hilti Tech Data)									
h_{nom}	[mm]	**30**	**50**	**60**	**-**	**30**	**50**	**60**	**-**
$V^0_{Rd,c}$	[kN]	-	2,4	3,2	-	-	1,4	2,3	-
Reduced embedment									
h_{nom}	[mm]	**-**	**60**	**70**	**70**	**-**	**60**	**70**	**70**
$V^0_{Rd,c}$	[kN]	-	2,6	3,3	3,6	-	1,7	2,3	2,6
Standard embedment									
h_{nom}	[mm]	**55**	**80**	**90**	**110**	**55**	**80**	**90**	**110**
$V^0_{Rd,c}$	[kN]	1,9	3,2	3,5	5,3	1,4	1,8	2,5	3,8

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

b) For design data of $f_{ck,cube}$ = 15 and 20, please contact Hilti technical advisory service

Influence of edge distance a)

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

Influence of anchor spacing [a)]

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

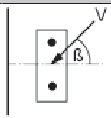
a) The anchor spacing shall not be smaller than the minimum anchor spacing s_{min} given in the table with the setting details. This influencing factor must be considered for every anchor spacing.

Influence of reinforcement

Anchor size	HUS-HR 6		HUS-HR 8			HUS-HR 10			HUS-HR 14	
h_{nom} [mm]	30	55	50	60	80	60	70	90	70	110
h_{ef} [mm]	23	45	38	47	64	46	54	71	52	86
$f_{re,N}$ = $0{,}5 + h_{ef}/200\text{mm} \leq 1$	0,62	0,73	0,69	0,74	0,82	0,73	0,77	0,86	0,76	0,93

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.

Influence of angle between load applied and the direction perpendicular to the free edge

Angle ß		0° - 55°	60°	65°	70°	75°	80°	85°	90° - 180°
$f_ß$		1,00	1,07	1,14	1,23	1,35	1,50	1,71	2,00

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 = $\{h/(1{,}5 \cdot c)\}^{-1/3} \geq 1$	2,15	1,71	1,49	1,36	1,26	1,19	1,13	1,08	1,04	1

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

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}.

Combined TENSION and SHEAR loading

For combined tension and shear loading see section “Anchor Design”.