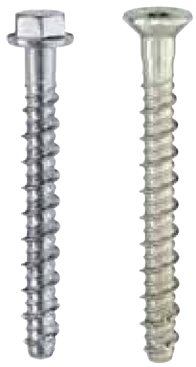
DRILL. DRIVE. DONE. EVERYWHERE.

Screw anchor HUS-HR/CR (SS 316)

DBS • 11/17

COMBINE THE ADVANTAGES OF SCREW ANCHORS WITH SUPERB CORROSION RESISTANCE

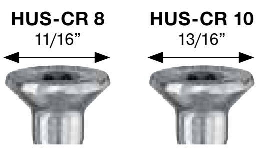


The Hilti KWIK HUS-EZ difference

Material

- Pure 316 stainless steel > 99%
- No welded carbon tip

Countersunk available



- Enables flush setting for a clean finish
- Significant reduction of installation time compared to other methods for countersunk baseplate (HSL-SK)

Technical data

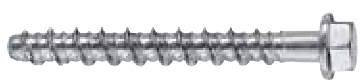
- Tested in accordance with ACI 318 and CSA A23.3
- Available in PROFIS Anchor Design software for fast and easy design

Carbide cutter blades setting

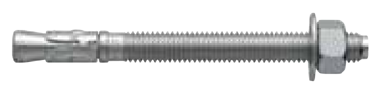
- Welded to the thread
- Ensuring perfect setting even under critical conditions (high-strength concrete, used drill bits)
- Necessary because of lower cutting strength of stainless vs. carbon steel

Advantages of screw anchors

Compared to stud anchors



VS.



Productivity

- Up to 50% faster installation time compared to stud anchors
- Drill. Drive. Done.

Reliability

- No torque-wrench required
- Set flush with surface, be done

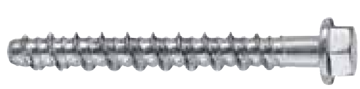
Removability

- Fully removable solution
- No grinding or hammer-in necessary

Edge distance and spacing

- Reduce base plate size with closer spacing
- Manage challenging situations with reduced edging

Compared to chemical anchors



VS.

Productivity

- Faster and easier installation

Removability and safety

- Fully removable solution
- No grinding necessary
- Immediate load bearing

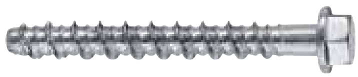
HILTI DELIVERS THE FULL PORTFOLIO TO MAKE YOU SUCCESSFUL

Metric drill bits

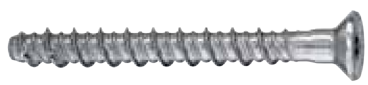
Metric diameter	Work length [in inch]	Item number
M6	4"	433789
M8	6"	409177
M10	6"	409189
M10	8"	409190
M14	8"	409207

Drills

HUS-HR and HUS-CR anchors



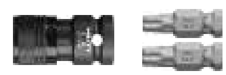
Diameter HUS-HR	Comparable fractional diameter	Base plate hole	Length in inch
M6	1/4"	5/16"	1-3/4"
	1/4"	5/16"	2-3/4"
M8	3/8"	7/16"	3"
	3/8"	7/16"	3-1/4"
	3/8"	7/16"	4-1/8"
M10	1/2"	9/16"	3-1/4"
	1/2"	9/16"	4-1/8"
	1/2"	9/16"	5-1/8"
M14	5/8"	11/16"	3-1/8"
	5/8"	11/16"	5-1/4"



Diameter HUS-CR	Comparable fractional diameter	Base plate hole	Length in inch
M8	3/8"	7/16"	3"
	3/8"	7/16"	3-3/4"
M10	1/2"	9/16"	3-1/4"
	1/2"	9/16"	4-1/8"

Sockets

For anchor	Socket size	Item number
M6 & M8	13mm	2070371
M10	15mm	2070372
M14	21mm	2070377



For anchor	Driver	Item number
M8 & M10	1/2" - TX	2094451
M8	TX45	2094673
M10	TX50	2094675

Impacts

Anchor package I:
1 box of anchors + 1 drill bit

- Small projects
- Additional job-site orders

Diameter HUS-HR	Length in inches	Number of anchors	Drill bits	Item number
M6	1-3/4"	50	1	3563440
	2-3/4"	50	1	3563441
M8	3"	25	1	3563442
	3-1/4"	25	1	3563533
	4-1/8"	20	1	3563534
M10	3-1/4"	25	1	3563535
	4-1/8"	25	1	3563536
	5-1/8"	25	1	3563537
M14	3-1/8"	12	1	3563538
	5-1/4"	12	1	3563539

Diameter HUS-CR	Length in inches	Number of anchors	Drill bits	Item number
M8	3"	25	1	3563436
	3-3/4"	25	1	3563437
M10	3-1/4"	25	1	3563438
	4-1/8"	25	1	3563439

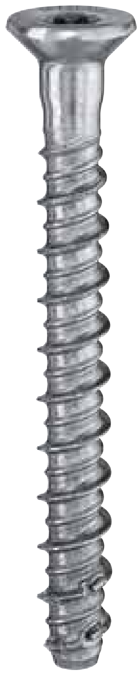
Anchor package II:
1 master carton + drill bits + 1 socket

- Regular project orders
- Purchase for stock

Diameter HUS-HR	Length in inches	Number of anchors	Drill bits	Sockets	Item number
M6	1-3/4"	200	3	1	3563544
	2-3/4"	200	3	1	3563545
M8	3"	100	2	1	3563546
	3-1/4"	100	2	1	3563547
	4-1/8"	100	2	1	3563548
M10	3-1/4"	100	2	1	3563549
	4-1/8"	100	2	1	3563550
	5-1/8"	100	2	1	3563551
M14	3-1/8"	45	2	1	3563552
	5-1/4"	45	2	1	3563553

Diameter HUS-CR	Length in inches	Number of anchors	Drill bits	Driver Sets	Item number
M8	3"	100	2	1	3563540
	3-3/4"	100	2	1	3563541
M10	3-1/4"	100	2	1	3563542
	4-1/8"	100	2	1	3563543

HUS-HR



HUS-CR

Listings/Approvals

European Technical Approval	ETA-08/0307

Code evaluation

IBC® / IRC® 2015, 2012, 2009
ACI 318-14 Ch. 17
ACI 318-11 Appendix D
NBC-C® 2015, 2010
CSA A23.3-14 Annex D

PRODUCT INFORMATION AND TECHNICAL DATA SUPPLEMENT

The Hilti HUS-HR and HUS-CR stainless steel screw anchors are high performing, easy to use screw anchors with a stainless steel body for use in areas where standard zinc-coated carbon steel screw anchors cannot be used. Along with the high performing Hilti KWIK HUS-EZ screw anchor, you can now have the high productivity and ultimate performance you need in most environments.

This document contains the product information and is a technical supplement to the Hilti North American Product Technical Guide Volume 2: Anchor Fastening Guide Ed. 17 (HNA Tech Guide).

The HUS-HR and HUS-CR is a screw comprised of A4 (SS316) stainless steel. It has been tested for use in cracked and uncracked normal-weight or lightweight concrete. The anchors can be used for seismic applications (some sizes are not available for cracked and seismic use, see technical data for specific sizes permitted for seismic).

The HUS-HR is a hex-head version available with a nominal 6mm, 8mm, 10mm, and 14mm shank. The HUS-CR is a countersunk head version available with a nominal 8mm and 10mm shank.

Product features

- Higher productivity — less drilling and few operations than with conventional anchors
- Cutting edges are welded to the thread to ensure perfect setting even under critical conditions (high-strength concrete, used drill bits, rebar hits)
- Reduced edge and spacing distances
- European Technical Approval for use in cracked concrete and seismic conditions
- Evaluated in accordance with ACI 355.2 and ICC-ES AC193 for use with ACI 318 and CSA A23.3 designs

Product features

- Installing railings
- Anchoring façade panels
- Installing installation channels
- Tunnel construction

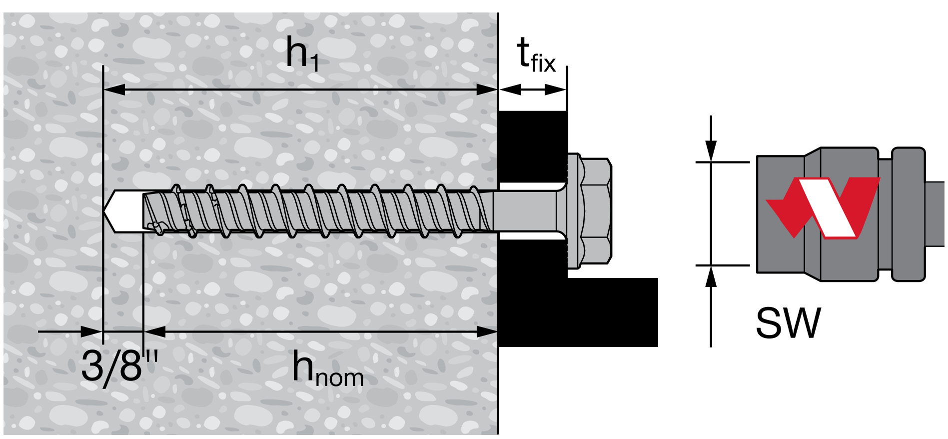
HUS-HR AND HUS-CR INSTALLATION PARAMETERS

Table 1 — Hilti HUS-HR and HUS-CR installation specifications

Setting information	Symbol	Units	Nominal anchor diameter (mm)						
			6	8		10		14	
Anchor head style	-	-	HR	HR, CR 2)		HR, CR 2)		HR	
Drill bit diameter	d_o	mm	6	8		10		14	
Nominal minimum embedment 2	h_{nom}	in. (mm)	2-3/16 (55)	2-3/8 (60)	3-1/8 (80)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	4-5/16 (110)
Fixture hole diameter	d_f	in. (mm)	3/8 (9)	7/16...1/2 (12)		1/2...9/16 (14)		11/16 (18)	
Socket wrench size, HUS-HR only	SW	mm	13	13		15		21	
TORX size, HUS-CR only	-	-	-	T45		T50		-	
Installation torque	T_{inst}	ft-lb (Nm)	- 1)	- 1)		33 (45)		48 (65)	
Impact wrench setting tools 3)	-	-	SIW 14-A SIW 22-A	SIW 14-A SIW 22-A SIW 22T-A		SIW 22-A SIW 22T-A		SIW 22T-A	
Min. hole depth in concrete	h_1	in. (mm)	2-9/16 (65)	2-3/4 (70)	3-1/2 (90)	3-1/8 (80)	4 (100)	3-1/8 (80)	4-3/4 (120)
Min. concrete thickness	h_{min}	in. (mm)	4 (100)	4 (100)	4-3/4 (120)	4-3/4 (120)	5-1/2 (140)	5-1/2 (140)	6-5/16 (160)
Minimum edge distance	c_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)
Minimum anchor spacing	s_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)

1 Installation with hand setting and torque wrench not permitted for this diameter. Install with impact wrench setting tool only.
2 HUS-CR must be installed with impact wrench setting tool only.
3 Hilti recommended electrical impact screw drivers and proper tool settings are listed in the instructions for use included in the product sales box.

Figure 1 — Hilti HUS-HR installation specifications



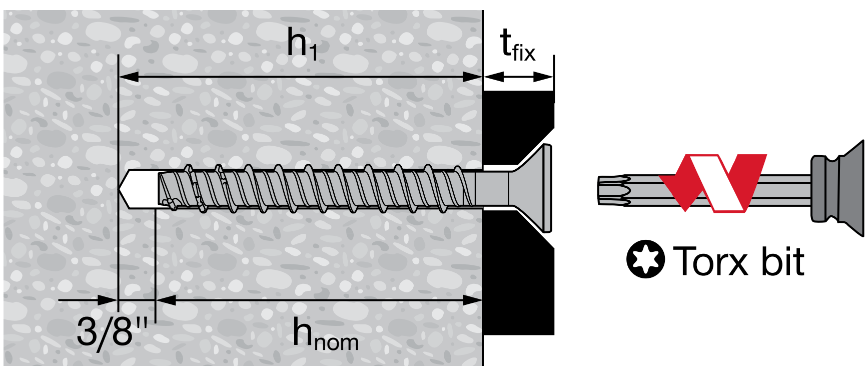
NOTE: HUS-HR may be loosened by a maximum of one turn and retightened with a torque wrench or the specific impact wrenches listed in the Instructions For Use (IFU) to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not permitted.

HUS-HR AND HUS-CR INSTALLATION PARAMETERS

Table 2 — Hilti HUS-HR length and fixture thickness

Name and size	Total length under the head mm	Min. nominal embed. $h_{nom,min}$ in (mm)	Min. fixture thickness $t_{fix,min}$ in (mm)	Max. fixture thickness $t_{fix,max}$ in (mm)
HUS-HR 6x70	70	2-3/16 (55)	0	9/16 (15)
HUS-HR 8x75	75	2-3/8 (60)	0	9/16 (15)
HUS-HR 8x85	85	3-1/8 (80)	0	3/16 (5)
HUS-HR 8x105	105	3-1/8 (80)	0	1 (25)
HUS-HR 10x85	85	2-3/4 (70)	0	9/16 (15)
HUS-HR 10x105	105	3-9/16 (90)	0	9/16 (15)
HUS-HR 10x130	130	3-9/16 (90)	0	1-9/16 (40)
HUS-HR 14x80	80	2-3/4 (70)	0	3/8 (10)
HUS-HR 14x135	135	4-5/16 (110)	0	1 (25)

Figure 2 — Hilti HUS-CR installation specifications



NOTE: HUS-CR may be loosened by a maximum of one turn and retightened with a torque wrench or the specific impact wrenches listed in the Instructions For Use (IFU) to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not permitted.

Table 3 — Hilti HUS-CR length and fixture thickness

Name and size	Total length under the head mm	Min. nominal embed. $h_{nom,min}$ in (mm)	Min. fixture thickness $t_{fix,min}$ in (mm)	Max. fixture thickness $t_{fix,max}$ in (mm)
HUS-CR 8x75	75	2-3/8 (60)	3/16 (5)	9/16 (15)
HUS-CR 8x95	95	3-1/8 (80)	3/16 (5)	5/8 (15)
HUS-CR 10x85	85	2-3/4 (70)	3/16 (5)	9/16 (15)
HUS-CR 10x105	105	3-9/16 (90)	3/16 (5)	9/16 (15)

INSTALLATION INSTRUCTIONS

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.hilti.com (US) and www.hilti.ca (Canada). Due to the possibility of changes, always verify that the downloaded IFU is current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

TECHNICAL DATA IN ACCORDANCE WITH ACI 318

The technical data contained in this section is for designs in uncracked and cracked normal-weight and lightweight concrete according to ACI 318-14 Chapter 17 (also applicable to older versions of ACI 318 Appendix D). The values have been evaluated in accordance with the test criteria ACI 355.2-07 and ICC ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193).

Table 4 is the technical data and variables required for the design equations of ACI 318-14 Chapter 17. In addition, pre-calculated tables are also provided. Tables 5 to 15 are Hilti Simplified Design Tables using the ACI 318-14 Ch. 17 equations. Refer to the 2017 HNA Technical Guide, section 3.1.8, for a detailed explanation of the Hilti Simplified Design Tables.

Table 4 — Hilti HUS-HR and HUS-CR stainless steel design information in accordance with ACI 318-14 Chapter 17 [1]

Design parameter	Symbol	Units	Nominal anchor diameter (mm)							Ref
			6	8		10		14		ACI 318-14
Anchor head style	-	-	HR	HR, CR		HR, CR		HR		
Anchor O.D.	d_a	mm	6	8		10		14		
Effective minimum embedment	h_{ef}	in. (mm)	1.77 (45)	1.85 (47)	2.52 (64)	2.13 (54)	2.80 (71)	2.05 (52)	3.39 (86)	
Nominal minimum embedment [2]	h_{nom}	in. (mm)	2-3/16 (55)	2-3/8 (60)	3-1/8 (80)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	4-5/16 (110)	
Min. hole depth in concrete	h_1	in. (mm)	2-9/16 (65)	2-3/4 (70)	3-1/2 (90)	3-1/8 (80)	4 (100)	3-1/8 (80)	4-3/4 (120)	
Min. concrete thickness	h_{min}	in. (mm)	4 (100)	4 (100)	4-3/4 (120)	4-3/4 (120)	5-1/2 (140)	5-1/2 (140)	6-5/16 (160)	
Critical edge distance	c_{ac}	in. (mm)	2.66 (68)	2.78 (71)	3.78 (96)	3.83 (97)	5.03 (128)	3.69 (94)	6.09 (155)	
Minimum edge distance	c_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)	
Minimum anchor spacing	s_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)	
Strength reduction factor for steel in tension [3]	$\phi_{sa,N}$	-	0.65							17.3.3 b) i)
Min. specified yield strength	f_{ya}	psi (N/mm^2)	130,500 (900)	108,025 (745)		118,175 (815)		85,550 (590)		
Min. specified ult. strength	f_{uta}	psi (N/mm^2)	152,250 (1,050)	126,150 (870)		137,750 (950)		100,050 (690)		
Effective-cross sectional steel area in tension	$A_{se,N}$	in^2 (mm^2)	0.035 (22.9)	0.060 (39.0)		0.086 (55.4)		0.222 (143.1)		
Nominal steel strength in tension	N_{sa}	lb (kN)	5,405 (24.0)	7,630 (33.9)		11,830 (52.6)		22,200 (98.7)		Eq. 17.4.1.2

1 Design information in accordance with ACI 355.2-07 and AC193
2 See Figure 1 and 2 of this document.
3 The HUS-HR and HUS-CR is considered a brittle steel element as defined by ICC-ES AC193 section 6.3.6.
4 For use with the load combinations of ACI 318-14 section 5.3. Condition B applies where supplementary reinforcement in conformance with ACI 318-14 section 17.3.3 c) is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.
5 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.
6 For all design cases, $\psi_{c,P}$ = 1.0. Tabular value for pullout strength is for a concrete compressive strength of 2,500 psi (17.2 MPa). Pullout strength for concrete compressive strength greater than 2,500 psi (17.2 MPa) may be increased by multiplying the tabular pullout strength by $(f'_c / 2{,}500)^{0.5}$ for psi or $(f'_c / 17.2)^{0.5}$ for MPa. NA (not applicable) denotes that pullout strength does not need to be considered for design.
7 Shear and seismic shear tests are all performed in cracked concrete member according to ICC-ES AC193 section 9.4 and 9.6 respectively. Value of $V_{sa(,eq)} \leq 0.6\ A_{se,V}\ f_{uta}$ for all cases.
8 NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.

Table 4 (cont) — Hilti HUS-HR and HUS-CR stainless steel design information in accordance with ACI 318-14 Chapter 17 [1]

Design parameter	Symbol	Units	Nominal anchor diameter (mm)							Ref
			6	8		10		14		ACI 318-14
Anchor head style	-	-	HR	HR, CR		HR, CR		HR		
Anchor O.D.	d_a	mm	6	8		10		14		
Anchor category	-	-	3	3	2	2	2	1	3	17.3.3
Strength reduction factor for concrete failure modes in tension, Condition B [4]	$\phi_{c,N}$	-	0.45	0.45	0.55	0.55	0.55	0.65	0.45	17.3.3 c) ii)
Effectiveness factor for uncracked concrete	k_{uncr}	in-lb (SI)	24 (10.0)					27 (11.3)		17.4.2.2
Effectiveness factor for cracked concrete	k_{cr}	in-lb (SI)	17 (7.1)					21 (8.8)		17.4.2.2
Modification factor for anchor resistance, tension, uncracked conc. [5]	$\psi_{c,N}$	-	1.0							17.4.2.6
Pullout strength in uncracked concrete [6]	$N_{p,uncr}$	lb (kN)	2,025 (9.0)	2,430 (10.8)	3,595 (16.0)	NA	NA	NA	NA	17.4.3.2
Pullout strength in cracked concrete [6]	$N_{p,cr}$	lb (kN)	1,145 (5.1)	1,890 (8.4)	2,835 (12.6)	2,270 (10.1)	NA	3,010 (13.4)	NA	17.4.3.2
Pullout strength in cracked concrete, seismic [6]	$N_{p,eq}$	lb (kN)	NP [8]	NP [8]	2,385 (10.6)	NP [8]	3,080 (13.7)	NP [8]	4,610 (20.5)	17.4.3.2
Strength reduction factor for steel in shear [3]	$\phi_{sa,V}$	-	0.60							17.3.3 b) ii)
Nominal steel strength in shear [7]	V_{sa}	lb (kN)	1,550 (6.9)	3,190 (14.2)		4,970 (22.1)		9,325 (41.5)		17.5.1.2 [7]
Nominal steel strength in shear, seismic [7]	$V_{sa,eq}$	lb (kN)	NP [8]	NP [8]	2,250 (10.0)	NP [8]	3,710 (16.5)	NP [8]	6,475 (28.8)	17.5.1.2 [7]
Strength reduction factor for concrete failure modes in shear, Condition B [4]	$\phi_{c,V}$	-	0.70							17.3.3 c) i)
Effectiveness factor for pryout	k_{cp}	-	1.0	1.0	2.0	1.0	2.0	1.0	2.0	17.4.2.2

1 Design information in accordance with ACI 355.2-07 and AC193
2 See Figures 1 and 2 of this document.
3 The HUS-HR and HUS-CR is considered a brittle steel element as defined by ICC-ES AC193 section 6.3.6.
4 For use with the load combinations of ACI 318-14 section 5.3. Condition B applies where supplementary reinforcement in conformance with ACI 318-14 section 17.3.3 c) is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.
5 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.
6 For all design cases, $\psi_{c,P}$ = 1.0. Tabular value for pullout strength is for a concrete compressive strength of 2,500 psi (17.2 MPa). Pullout strength for concrete compressive strength greater than 2,500 psi (17.2 MPa) may be increased by multiplying the tabular pullout strength by $(f'_c / 2{,}500)^{0.5}$ for psi or $(f'_c / 17.2)^{0.5}$ for MPa. NA (not applicable) denotes that pullout strength does not need to be considered for design.
7 Shear and seismic shear tests are all performed in cracked concrete member according to ICC-ES AC193 section 9.4 and 9.6 respectively. Value of $V_{sa(eq)} \leq 0.6 A_{se,V} f_{uta}$ for all cases.
8 NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.

Table 5 — Hilti HUS-HR and HUS-CR design strength with concrete / pullout failure in uncracked concrete[1,2,3,4]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
			f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
6	HR	2-3/16 (55)	910 (4.0)	995 (4.4)	1,150 (5.1)	1,410 (6.3)	1,980 (8.8)	2,170 (9.7)	2,505 (11.1)	3,070 (13.7)
8	HR CR	2-3/8 (60)	1,095 (4.9)	1,195 (5.3)	1,380 (6.1)	1,695 (7.5)	2,115 (9.4)	2,315 (10.3)	2,675 (11.9)	3,275 (14.6)
		3-1/8 (80)	1,980 (8.8)	2,165 (9.6)	2,500 (11.1)	3,065 (13.6)	6,720 (29.9)	7,360 (32.7)	8,500 (37.8)	10,410 (46.3)
10	HR CR	2-3/4 (70)	2,045 (9.1)	2,240 (10.0)	2,590 (11.5)	3,170 (14.1)	2,605 (11.6)	2,850 (12.7)	3,295 (14.7)	4,035 (17.9)
		3-9/16 (90)	3,085 (13.7)	3,380 (15.0)	3,900 (17.3)	4,780 (21.3)	7,850 (34.9)	8,600 (38.3)	9,930 (44.2)	12,165 (54.1)
14	HR	2-3/4 (70)	2,570 (11.4)	2,815 (12.5)	3,250 (14.5)	3,980 (17.7)	2,770 (12.3)	3,030 (13.5)	3,500 (15.6)	4,290 (19.1)
		4-5/16 (110)	3,785 (16.8)	4,145 (18.4)	4,785 (21.3)	5,865 (26.1)	11,775 (52.4)	12,900 (57.4)	14,895 (66.3)	18,240 (81.1)

1 See Section 3.1.8.6 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in tables 8 to 15 as necessary. Compare to the steel values in table 7. The lesser of the values is to be used for the design.
4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.68. For all-lightweight, λ_a = 0.60.

Table 6 — Hilti HUS-HR and HUS-CR design strength with concrete / pullout failure in cracked concrete[1,2,3,4,5,6]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
			f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
6	HR	2-3/16 (55)	515 (2.3)	565 (2.5)	655 (2.9)	800 (3.6)	1,405 (6.2)	1,535 (6.8)	1,775 (7.9)	2,175 (9.7)
8	HR CR	2-3/8 (60)	850 (3.8)	930 (4.1)	1,075 (4.8)	1,315 (5.8)	1,500 (6.7)	1,640 (7.3)	1,895 (8.4)	2,320 (10.3)
		3-1/8 (80)	1,560 (6.9)	1,705 (7.6)	1,970 (8.8)	2,415 (10.7)	4,760 (21.2)	5,215 (23.2)	6,020 (26.8)	7,375 (32.8)
10	HR CR	2-3/4 (70)	1,250 (5.6)	1,370 (6.1)	1,580 (7.0)	1,935 (8.6)	1,845 (8.2)	2,020 (9.0)	2,335 (10.4)	2,855 (12.7)
		3-9/16 (90)	2,185 (9.7)	2,395 (10.7)	2,765 (12.3)	3,385 (15.1)	5,560 (24.7)	6,090 (27.1)	7,035 (31.3)	8,615 (38.3)
14	HR	2-3/4 (70)	1,960 (8.7)	2,145 (9.5)	2,475 (11.0)	3,035 (13.5)	2,155 (9.6)	2,360 (10.5)	2,725 (12.1)	3,335 (14.8)
		4-5/16 (110)	2,945 (13.1)	3,225 (14.3)	3,725 (16.6)	4,560 (20.3)	9,160 (40.7)	10,030 (44.6)	11,585 (51.5)	14,190 (63.1)

1 See Section 3.1.8.6 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in tables 8 to 15 as necessary. Compare to the steel values in table 7. The lesser of the values is to be used for the design.
4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.68. For all-lightweight, λ_a = 0.60.
5 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by the following reduction factors.
8x80: $\alpha_{N,seis}$ = 0.64.
10x90: $\alpha_{N,seis}$ = 0.59.
14x110: $\alpha_{N,seis}$ = 0.53.
No reduction needed for seismic shear. See Section 3.1.8.7 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, for additional information on seismic applications.
6 Use of HUS-HR or HUS-CR has not been evaluated for and is not permitted for seismic applications for shaded areas of table.

Table 7 — Steel design strength for Hilti HUS-HR and HUS-CR screw anchors[1,2]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tensile [3] ΦN_{sa} lb (kN)	Shear [4] ΦV_{sa} lb (kN)	Seismic Shear [5] $\Phi V_{sa,eq}$ lb (kN)
6	HR	2-3/16 (55)	3,515 (15.6)	930 (4.1)	NP
8	HR CR	2-3/8 (60)	4,960 (22.1)	1,915 (8.5)	NP
		3-1/8 (80)	4,960 (22.1)	1,915 (8.5)	1,350 (6.0)
10	HR CR	2-3/4 (70)	7,690 (34.2)	2,980 (13.3)	NP
		3-9/16 (90)	7,690 (34.2)	2,980 (13.3)	2,225 (9.9)
14	HR	2-3/4 (70)	14,430 (64.2)	5,600 (24.9)	NP
		4-5/16 (110)	14,430 (64.2)	5,600 (24.9)	3,885 (17.3)

1 See Section 3.1.8.6 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, to convert design strength value to ASD value.
2 Hilti HUS-HR and HUS-CR anchors are to be considered brittle steel elements.
3 Tensile $\phi N_{sa} = \phi\ A_{se,N}\ f_{uta}$ as noted in ACI 318-14 section 17.4.1.2.
4 Shear values determined by static shear tests with $\phi V_{sa} < \phi\ 0.60\ A_{se,V}\ f_{uta}$ as noted in ACI 318-14 section 17.5.1.2.
5 Seismic shear values determined by seismic shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V}\ f_{uta}$ as noted in ACI 318-14 section 17.5.1.2.
See Section 3.1.8.7 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, for additional information on seismic applications.
NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.

Table 8 — Load adjustment factors for 6mm diameter HUS-HR in uncracked concrete [1,2]

HUS-HR 6mm uncracked concrete			Spacing factor in tension f_{AN}	Edge distance factor in tension f_{RN}	Spacing factor in shear [3] f_{AV}	Edge distance in shear: ⊥ Toward edge f_{RV}	Edge distance in shear: ‖ to and away from edge f_{RV}	Conc. thickness factor in shear [4] f_{HV}
Nominal embed. h_{nom}		in. (mm)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-3/8	(35)	0.63	0.64	0.56	0.20	0.41	n/a
	2	(51)	0.69	0.81	0.58	0.36	0.71	n/a
	3	(76)	0.78	1.00	0.63	0.65	1.00	n/a
	4	(102)	0.88		0.67	1.00		0.82
	5	(127)	0.97		0.71			0.92
	6	(152)	1.00		0.75			1.00
	8	(203)			0.83			
	10	(254)			0.92			
	12	(305)			1.00			

Table 9 — Load adjustment factors for 6mm diameter HUS-HR in cracked concrete [1,2]

HUS-HR 6mm cracked concrete			Spacing factor in tension f_{AN}	Edge distance factor in tension f_{RN}	Spacing factor in shear [3] f_{AV}	Edge distance in shear: ⊥ Toward edge f_{RV}	Edge distance in shear: ‖ to and away from edge f_{RV}	Conc. thickness factor in shear [4] f_{HV}
Nominal embed. h_{nom}		in. (mm)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)	2-3/16 (55)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-3/8	(35)	0.63	0.65	0.56	0.20	0.41	n/a
	2	(51)	0.69	0.81	0.58	0.36	0.72	n/a
	3	(76)	0.78	1.00	0.63	0.66	1.00	n/a
	4	(102)	0.88		0.67	1.00		0.82
	5	(127)	0.97		0.71			0.92
	6	(152)	1.00		0.75			1.00
	8	(203)			0.84			
	10	(254)			0.92			
	12	(305)			1.00			

1 Linear interpolation not permitted
2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 or CSA A23.3-14.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

Table 10 — Load adjustment factors for 8mm diameter HUS-HR and HUS-CR in uncracked concrete [1,2]

HUS-HR/-CR 8mm uncracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear: ⊥ Toward edge f_{RV}		Edge distance in shear: ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm): 1-3/4	(44)	0.66	n/a	0.72	n/a	0.57	n/a	0.30	n/a	0.60	n/a	n/a	n/a
2	(51)	0.68	0.63	0.78	0.66	0.59	0.54	0.37	0.12	0.73	0.25	n/a	n/a
3	(76)	0.77	0.70	1.00	0.84	0.63	0.56	0.67	0.23	1.00	0.45	n/a	n/a
4	(102)	0.86	0.76		1.00	0.67	0.58	1.00	0.35		0.69	0.83	n/a
4-3/4	(121)	0.93	0.81			0.70	0.60		0.45		0.90	0.90	0.63
5	(127)	0.95	0.83			0.71	0.60		0.49		0.97	0.92	0.64
6	(152)	1.00	0.90			0.76	0.62		0.64		1.00	1.00	0.70
8	(203)		1.00			0.84	0.66		0.98				0.81
10	(254)					0.93	0.71		1.00				0.91
12	(305)					1.00	0.75						0.99
18	(457)						0.87						1.00
24	(610)						0.99						
> 25	(635)						1.00						

Table 11 — Load adjustment factors for 8mm diameter HUS-HR and HUS-CR in cracked concrete [1,2]

HUS-HR/-CR 8mm cracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear: ⊥ Toward edge f_{RV}		Edge distance in shear: ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)	2-3/8 (60)	3-1/8 (80)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm): 1-3/4	(44)	0.66	n/a	0.72	n/a	0.58	n/a	0.30	n/a	0.61	n/a	n/a	n/a
2	(51)	0.68	0.63	0.79	0.66	0.59	0.54	0.37	0.12	0.74	0.25	n/a	n/a
3	(76)	0.77	0.70	1.00	0.84	0.63	0.56	0.68	0.23	1.00	0.46	n/a	n/a
4	(102)	0.86	0.76		1.00	0.67	0.58	1.00	0.35		0.70	0.83	n/a
4-3/4	(121)	0.93	0.81			0.70	0.60		0.45		0.91	0.90	0.63
5	(127)	0.95	0.83			0.71	0.60		0.49		0.98	0.93	0.64
6	(152)	1.00	0.90			0.76	0.62		0.64		1.00	1.00	0.70
8	(203)		1.00			0.84	0.67		0.99				0.81
10	(254)					0.93	0.71		1.00				0.91
12	(305)					1.00	0.75						1.00
18	(457)						0.87						
24	(610)						1.00						
> 25	(635)												

1 Linear interpolation not permitted
2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 or CSA A23.3-14.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

Table 12 — Load adjustment factors for 10mm diameter HUS-HR and HUS-CR in uncracked concrete [1,2]

HUS-HR/-CR 10mm uncracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear: ⊥ Toward edge f_{RV}		Edge distance in shear: ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	2 (51)	0.66	0.62	0.60	0.52	0.58	0.54	0.33	0.11	0.60	0.23	n/a	n/a
	3 (76)	0.74	0.68	0.80	0.65	0.62	0.56	0.60	0.21	0.80	0.42	n/a	n/a
	4 (102)	0.81	0.74	1.00	0.80	0.66	0.58	0.93	0.32	1.00	0.65	n/a	n/a
	4-3/4 (121)	0.87	0.78		0.94	0.69	0.59	1.00	0.42		0.84	0.87	n/a
	5 (127)	0.89	0.80		0.99	0.70	0.60		0.45		0.91	0.89	n/a
	5-1/2 (140)	0.93	0.83		1.00	0.72	0.61		0.52		1.00	0.93	n/a
	6 (152)	0.97	0.86			0.74	0.62		0.60			0.97	0.69
	8 (203)	1.00	0.98			0.82	0.66		0.92			1.00	0.79
	10 (254)		1.00			0.90	0.70		1.00				0.89
	12 (305)					0.98	0.74						0.97
	18 (457)					1.00	0.85						1.00
	24 (610)						0.97						
	> 26 (660)						1.00						

Table 13 — Load adjustment factors for 10mm diameter HUS-HR and HUS-CR in cracked concrete [1,2]

HUS-HR/-CR 10mm cracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear: ⊥ Toward edge f_{RV}		Edge distance in shear: ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	3-9/16 (90)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	2 (51)	0.66	0.62	0.72	0.62	0.58	0.54	0.33	0.12	0.66	0.23	n/a	n/a
	3 (76)	0.74	0.68	0.95	0.78	0.62	0.56	0.61	0.21	0.95	0.43	n/a	n/a
	4 (102)	0.81	0.74	1.00	0.96	0.66	0.58	0.93	0.33	1.00	0.65	n/a	n/a
	4-3/4 (121)	0.87	0.78		1.00	0.69	0.59	1.00	0.42		0.85	0.87	n/a
	5 (127)	0.89	0.80			0.70	0.60		0.46		0.91	0.89	n/a
	5-1/2 (140)	0.93	0.83			0.72	0.61		0.53		1.00	0.94	n/a
	6 (152)	0.97	0.86			0.74	0.62		0.60			0.98	0.69
	8 (203)	1.00	0.98			0.82	0.66		0.93			1.00	0.80
	10 (254)		1.00			0.90	0.70		1.00				0.89
	12 (305)					0.98	0.74						0.97
	18 (457)					1.00	0.86						1.00
	24 (610)						0.97						
	> 26 (660)						1.00						

1 Linear interpolation not permitted
2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 or CSA A23.3-14.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

Table 14 — Load adjustment factors for 14mm diameter HUS-HR in uncracked concrete [1,2]

HUS-HR 14mm uncracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear ⊥ Toward edge f_{RV}		Edge distance in shear ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	2 (51)	0.66	n/a	0.61	n/a	0.58	n/a	0.34	n/a	0.61	n/a	n/a	n/a
	2-3/8 (60)	0.69	0.62	0.69	0.51	0.60	0.54	0.44	0.11	0.69	0.23	n/a	n/a
	4 (102)	0.83	0.70	1.00	0.70	0.66	0.57	0.96	0.25	1.00	0.50	n/a	n/a
	5 (127)	0.91	0.75		0.82	0.70	0.58	1.00	0.35		0.70	n/a	n/a
	5-1/2 (140)	0.95	0.77		0.90	0.72	0.59		0.40		0.80	n/a	n/a
	6 (152)	0.99	0.80		0.98	0.74	0.60		0.46		0.91	0.99	n/a
	6-5/16 (160)	1.00	0.81		1.00	0.76	0.60		0.49		0.99	1.00	0.65
	8 (203)		0.89			0.82	0.63		0.70		1.00		0.73
	10 (254)		0.99			0.90	0.66		0.98				0.81
	12 (305)		1.00			0.99	0.70		1.00				0.89
	18 (457)					1.00	0.80						1.00
	24 (610)						0.90						
	> 28 (711)						0.96						

Table 15 — Load adjustment factors for 14mm diameter HUS-HR in cracked concrete [1,2]

HUS-HR 14mm cracked concrete		Spacing factor in tension f_{AN}		Edge distance factor in tension f_{RN}		Spacing factor in shear [3] f_{AV}		Edge distance in shear ⊥ Toward edge f_{RV}		Edge distance in shear ‖ to and away from edge f_{RV}		Conc. thickness factor in shear [4] f_{HV}	
Nominal embed. h_{nom}	in. (mm)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)	2-3/4 (70)	4-5/16 (110)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	2 (51)	0.66	n/a	0.74	n/a	0.58	n/a	0.31	n/a	0.62	n/a	n/a	n/a
	2-3/8 (60)	0.69	0.62	0.83	0.62	0.59	0.54	0.40	0.10	0.80	0.21	n/a	n/a
	4 (102)	0.83	0.70	1.00	0.84	0.65	0.56	0.88	0.23	1.00	0.46	n/a	n/a
	5 (127)	0.91	0.75		0.99	0.69	0.58	1.00	0.32		0.64	n/a	n/a
	5-1/2 (140)	0.95	0.77		1.00	0.71	0.59		0.37		0.74	n/a	n/a
	6 (152)	0.99	0.80			0.73	0.59		0.42		0.84	0.96	n/a
	6-5/16 (160)	1.00	0.81			0.74	0.60		0.45		0.91	0.98	0.63
	8 (203)		0.89			0.81	0.62		0.65		1.00	1.00	0.71
	10 (254)		0.99			0.88	0.66		0.90				0.79
	12 (305)		1.00			0.96	0.69		1.00				0.86
	18 (457)					1.00	0.78						1.00
	24 (610)						0.87						
	> 28 (711)						0.94						

1 Linear interpolation not permitted
2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 or CSA A23.3-14.
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then f_{AV} = f_{AN}.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

TECHNICAL DATA IN ACCORDANCE WITH CSA A23.3

The technical data contained in this section is for designs in uncracked and cracked normal-weight and lightweight concrete according to CSA A23.3-14 Annex D. The values have been evaluated in accordance with the test criteria ACI 355.2-07 and ICC ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193).

Table 16 is the technical data and variables required for the design equations of CSA A23.3-14 Annex D. In addition, pre-calculated tables are also provided. Tables 17 to 19 are Hilti Simplified Design Tables using the CSA A23.3-14 Annex D equations. Refer to the 2017 HNA Technical Guide, section 3.1.8, for a detailed explanation of the Hilti Simplified Design Tables.

Table 16 — Hilti HUS-HR and HUS-CR stainless steel design information in accordance with CSA A23.3-14 Annex D [1]

Design parameter	Symbol	Units	Nominal anchor diameter (mm)							Ref
			6	8		10		14		CSA A23.3-14
Anchor head style	-	-	HR	HR, CR		HR, CR		HR		
Anchor O.D.	d_a	mm	6	8		10		14		
Effective minimum embedment	h_{ef}	in. (mm)	1.77 (45)	1.85 (47)	2.52 (64)	2.13 (54)	2.80 (71)	2.05 (52)	3.39 (86)	
Nominal minimum embedment [2]	h_{nom}	in. (mm)	2-3/16 (55)	2-3/8 (60)	3-1/8 (80)	2-3/4 (70)	3-9/16 (90)	2-3/4 (70)	4-5/16 (110)	
Min. hole depth in concrete	h_1	in. (mm)	2-9/16 (65)	2-3/4 (70)	3-1/2 (90)	3-1/8 (80)	4 (100)	3-1/8 (80)	4-3/4 (120)	
Min. concrete thickness	h_{min}	in. (mm)	4 (100)	4 (100)	4-3/4 (120)	4-3/4 (120)	5-1/2 (140)	5-1/2 (140)	6-5/16 (160)	
Critical edge distance	c_{ac}	in. (mm)	2.66 (68)	2.78 (71)	3.78 (96)	3.83 (97)	5.03 (128)	3.69 (94)	6.09 (155)	
Minimum edge distance	c_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)	
Minimum anchor spacing	s_{min}	in. (mm)	1-3/8 (35)	1-3/4 (45)	2 (50)	2 (50)	2 (50)	2 (50)	2-3/8 (60)	
Steel embed. material resistance factor for reinforcement	ϕ_s	-	0.85							8.4.3
Resistance modification factor for tension, steel failure modes [3]	R	-	0.70							D.5.3 b)
Min. specified yield strength	f_{ya}	psi (N/mm^2)	130,500 (900)	108,025 (745)		118,175 (815)		85,550 (590)		
Min. specified ult. strength	f_{uta}	psi (N/mm^2)	152,250 (1,050)	126,150 (870)		137,750 (950)		100,050 (690)		
Effective-cross sectional steel area in tension	$A_{se,N}$	in^2 (mm^2)	0.035 (22.9)	0.060 (39.0)		0.086 (55.4)		0.222 (143.1)		
Nominal steel strength in tension	$N_{s,uta}$	lb (kN)	5,405 (24.0)	7,630 (33.9)		11,830 (52.6)		22,200 (98.7)		D.6.1.2 Eq. D.2

1 Design information in accordance with ACI 355.2-07 and AC193
2 See Figure 1 and 2 of this document.
3 The HUS-HR and HUS-CR is considered a brittle steel element as defined by CSA A23.3-14 Annex D section D.2.
4 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.
5 For all design cases, $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.
6 For all design cases, $\psi_{c,P} = 1.0$. Tabular value for pullout strength is for a concrete compressive strength of 17.2 MPa (2,500 psi). Pullout strength for concrete compressive strength greater than 17.2 MPa (2,500 psi) may be increased by multiplying the tabular pullout strength by $(f'_c / 2{,}500)^{0.5}$ for psi or $(f'_c / 17.2)^{0.5}$ for MPa. NA (not applicable) denotes that pullout strength does not need to be considered for design.
7 Shear and seismic shear tests are all performed in cracked concrete member according to ICC-ES AC193 section 9.4 and 9.6 respectively. Value of $V_{sar(,eq)} \leq 0.6\, A_{Ase,V}\, \Phi_s\, 0.60\, f_{uta}\, R$ for all cases
8 NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.

Table 16 (cont) — Hilti HUS-HR and HUS-CR stainless steel design information in accordance with CSA A23.3-14 Annex D [1]

Design parameter	Symbol	Units	Nominal anchor diameter (mm)							Ref
			6	8		10		14		
Anchor head style	-	-	HR	HR, CR		HR, CR		HR		CSA A23.3-14
Anchor O.D.	d_a	mm	6	8		10		14		
Concrete material resistance factor	ϕ_c	-	0.65							8.4.2
Anchor category	-	-	3	3	2	2	2	1	3	D.5.3 c)
Resistance modification factor for tension, concrete or pullout failure modes, Condition B [4]	R	-	0.75	0.75	0.85	0.85	0.85	1.00	0.75	D.5.3 c)
Coeff. for factored conc. breakout resistance, uncracked concrete	$k_{c,uncr}$	in-lb (SI)	24 (10.0)					27 (11.3)		D.6.2.2
Coeff. for factored conc. breakout resistance, cracked concrete	$k_{c,cr}$	in-lb (SI)	17 (7.1)					21 (8.8)		D.6.2.2
Modification factor for anchor resistance, tension, uncracked conc. [5]	$\psi_{c,N}$	-	1.0							D.6.2.6
Factored pullout resistance in 2,500 psi uncracked concrete [6]	$N_{p,uncr}$	lb (kN)	2,025 (9.0)	2,430 (10.8)	3,595 (16.0)	NA	NA	NA	NA	D.6.3.2
Factored pullout resistance in 2,500 psi cracked concrete [6]	$N_{p,cr}$	lb (kN)	1,145 (5.1)	1,890 (8.4)	2,835 (12.6)	2,270 (10.1)	NA	3,010 (13.4)	NA	D.6.3.2
Factored seismic pullout resistance in 2,500 psi cracked concrete [6]	$N_{p,eq}$	lb (kN)	NP [8]	NP [8]	2,385 (10.6)	NP [8]	3,080 (13.7)	NP [8]	4,610 (20.5)	D.6.3.2
Resistance modification factor for shear, steel failure modes [3]	R	-	0.65							D.5.3 b)
Factored steel resistance in shear [7]	$V_{s,uta}$	lb (kN)	1,550 (6.9)	3,190 (14.2)		4,970 (22.1)		9,330 (41.5)		D7.1.2
Factored steel resistance in shear, seismic [7]	$V_{s,uta,eq}$	lb (kN)	NP [8]	NP [8]	2,250 (10.0)	NP [8]	3,710 (16.5)	NP [8]	6,475 (28.8)	
Resistance modification factor for shear, concrete or pryout failure modes, Condition B [4]	R	-	1.00							D.5.3 c)
Coefficient for pryout resistance	k_{cp}	-	1.0	1.0	1.0	1.0	2.0	1.0	2.0	D.7.3

1 Design information in accordance with ACI 355.2-07 and AC193
2 See Figure 1 and 2 of this document.
3 The HUS-HR and HUS-CR is considered a brittle steel element as defined by CSA A23.3-14 Annex D section D.2.
4 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.
5 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate effectiveness factor for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.
6 For all design cases, $\psi_{c,P}$ = 1.0. Tabular value for pullout strength is for a concrete compressive strength of 17.2 MPa (2,500 psi). Pullout strength for concrete compressive strength greater than 17.2 MPa (2,500 psi) may be increased by multiplying the tabular pullout strength by $(f'_c / 2{,}500)^{0.5}$ for psi or $(f'_c / 17.2)^{0.5}$ for MPa. NA (not applicable) denotes that pullout strength does not need to be considered for design.
7 Shear and seismic shear tests are all performed in cracked concrete member according to ICC-ES AC193 section 9.4 and 9.6 respectively. Value of $V_{sar(,eq)} \le 0.6 A_{Ase,V} \Phi_s 0.60 f_{uta}$ R for all cases
8 NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.

Table 17 — Hilti HUS-HR and HUS-CR factored resistance with concrete / pullout failure in uncracked concrete[1,2,3,4]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tension - N_r f'_c = 20 MPa (2,900 psi) lb (kN)	Tension - N_r f'_c = 25 MPa (3,625 psi) lb (kN)	Tension - N_r f'_c = 30 MPa (4,350 psi) lb (kN)	Tension - N_r f'_c = 40 MPa (5,800 psi) lb (kN)	Shear - V_r f'_c = 20 MPa (2,900 psi) lb (kN)	Shear - V_r f'_c = 25 MPa (3,625 psi) lb (kN)	Shear - V_r f'_c = 30 MPa (4,350 psi) lb (kN)	Shear - V_r f'_c = 40 MPa (5,800 psi) lb (kN)
6	HR	2-3/16 (55)	1,065 (4.7)	1,190 (5.3)	1,300 (5.8)	1,505 (6.7)	1,480 (6.6)	1,655 (7.4)	1,810 (8.1)	2,090 (9.3)
8	HR CR	2-3/8 (60)	1,275 (5.7)	1,425 (6.3)	1,560 (6.9)	1,805 (8.0)	1,580 (7.0)	1,765 (7.9)	1,935 (8.6)	2,235 (9.9)
		3-1/8 (80)	2,140 (9.5)	2,395 (10.6)	2,620 (11.7)	3,030 (13.5)	2,845 (12.7)	3,180 (14.1)	3,485 (15.5)	4,020 (17.9)
10	HR CR	2-3/4 (70)	2,205 (9.8)	2,465 (11.0)	2,700 (12.0)	3,115 (13.9)	2,205 (9.8)	2,465 (11.0)	2,700 (12.0)	3,115 (13.9)
		3-9/16 (90)	3,325 (14.8)	3,715 (16.5)	4,070 (18.1)	4,700 (20.9)	6,645 (29.6)	7,430 (33.1)	8,140 (36.2)	9,400 (41.8)
14	HR	2-3/4 (70)	2,755 (12.3)	3,080 (13.7)	3,375 (15.0)	3,900 (17.3)	2,755 (12.3)	3,080 (13.7)	3,375 (15.0)	3,900 (17.3)
		4-5/16 (110)	4,395 (19.6)	4,915 (21.9)	5,385 (24.0)	6,220 (27.7)	8,795 (39.1)	9,835 (43.7)	10,770 (47.9)	12,440 (55.3)

Table 18 — Hilti HUS-HR and HUS-CR factored resistance with concrete / pullout failure in cracked concrete[1,2,3,4,5,6]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tension - N_r f'_c = 20 MPa (2,900 psi) lb (kN)	Tension - N_r f'_c = 25 MPa (3,625 psi) lb (kN)	Tension - N_r f'_c = 30 MPa (4,350 psi) lb (kN)	Tension - N_r f'_c = 40 MPa (5,800 psi) lb (kN)	Shear - V_r f'_c = 20 MPa (2,900 psi) lb (kN)	Shear - V_r f'_c = 25 MPa (3,625 psi) lb (kN)	Shear - V_r f'_c = 30 MPa (4,350 psi) lb (kN)	Shear - V_r f'_c = 40 MPa (5,800 psi) lb (kN)
6	HR	2-3/16 (55)	600 (2.7)	675 (3.0)	735 (3.3)	850 (3.8)	1,035 (4.6)	1,160 (5.2)	1,270 (5.6)	1,465 (6.5)
8	HR CR	2-3/8 (60)	990 (4.4)	1,110 (4.9)	1,215 (5.4)	1,405 (6.2)	1,105 (4.9)	1,235 (5.5)	1,355 (6.0)	1,565 (7.0)
		3-1/8 (80)	1,685 (7.5)	1,885 (8.4)	2,065 (9.2)	2,385 (10.6)	1,990 (8.9)	2,225 (9.9)	2,440 (10.8)	2,815 (12.5)
10	HR CR	2-3/4 (70)	1,350 (6.0)	1,510 (6.7)	1,655 (7.4)	1,910 (8.5)	1,545 (6.9)	1,725 (7.7)	1,890 (8.4)	2,180 (9.7)
		3-9/16 (90)	2,325 (10.3)	2,600 (11.6)	2,850 (12.7)	3,290 (14.6)	4,650 (20.7)	5,200 (23.1)	5,700 (25.3)	6,580 (29.3)
14	HR	2-3/4 (70)	2,110 (9.4)	2,360 (10.5)	2,585 (11.5)	2,985 (13.3)	2,145 (9.5)	2,395 (10.7)	2,625 (11.7)	3,030 (13.5)
		4-5/16 (110)	3,420 (15.2)	3,825 (17.0)	4,190 (18.6)	4,835 (21.5)	6,840 (30.4)	7,650 (34.0)	8,380 (37.3)	9,675 (43.0)

1 See Section 3.1.8.6 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in tables 8 to 15 as necessary. Compare to the steel values in table 19. The lesser of the values is to be used for the design.
4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.68. For all-lightweight, λ_a = 0.60.
5 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by the following reduction factors.
8x80: $\alpha_{N,seis}$ = 0.64.
10x90: $\alpha_{N,seis}$ = 0.59.
14x110: $\alpha_{N,seis}$ = 0.53.
No reduction needed for seismic shear. See Section 3.1.8.7 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, for additional information on seismic applications.
6 Use of HUS-HR or HUS-CR has not been evaluated for and is not permitted for seismic applications for shaded areas of table.

Table 19 — Steel resistance for Hilti HUS-HR and HUS-CR screw anchors[1,2]

Nominal anchor diameter mm	Head style	Nominal embed. depth in. (mm)	Tensile[3] N_{sar} lb (kN)	Shear[4] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)
6	HR	2-3/16 (55)	3,215 (14.3)	855 (3.8)	NP
8	HR CR	2-3/8 (60)	4,540 (20.2)	1,755 (7.8)	NP
		3-1/8 (80)	4,540 (20.2)	1,755 (7.8)	1,235 (5.5)
10	HR CR	2-3/4 (70)	7,035 (31.3)	2,745 (12.2)	NP
		3-9/16 (90)	7,035 (31.3)	2,745 (12.2)	2,045 (9.1)
14	HR	2-3/4 (70)	13,195 (58.7)	5,150 (22.9)	NP
		4-5/16 (110)	13,195 (58.7)	5,150 (22.9)	3,575 (15.9)

1 See Section 3.1.8.6 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, to convert design strength value to ASD value.
2 Hilti HUS-HR and HUS-CR anchors are to be considered brittle steel elements.
3 Tensile $N_{sar} = A_{se,N}\ \Phi_s\ f_{uta}\ R$ as noted in CSA A23.3-14 Annex D.
4 Shear determined by static shear tests with $V_{sar} < 0.6\ A_{se,V}\ \Phi_s\ f_{uta}\ R$ as noted in CSA A23.3-14 Annex D.
5 Seismic shear values determined by seismic shear tests with Vsar,eq < 0.60 $A_{se,V}\ \Phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.
See Section 3.1.8.7 of Hilti Vol. 2: Anchor Fastening Technical Guide, Ed. 17, for additional information on seismic applications.
NP (not permitted) denotes that HUS-HR or HUS-CR has not been evaluated for use in seismic applications for specific size and embedment depth.