



The following excerpt are pages from the North American Product Technical Guide, Volume 2: Anchor Fastening, Edition 21.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines.

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To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am – 6:00pm CST.



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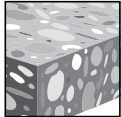
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3.3.12 HDI+, HDI-L+, AND HDI DROP IN ANCHORS

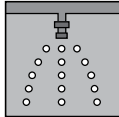
PRODUCT DESCRIPTION

HDI+, HDI-L+, and HDI Drop-in anchors

Anchor System	Features and Benefits
 <p>HDI-L+ and HDI+ with Auto setting tools 1/4" to 1/2"</p>	<ul style="list-style-type: none"> Anchor, setting tool and Hilti drill bit form a matched tolerance system to provide reliable fastenings Allows shallow embedment without sacrificing performance Lip allows accurate flush surface setting, independent of hole depth for the HDI-L+ Ideal for repetitive fastenings with threaded rods of equal length HDI+ and HDI-L+ have an innovative stepped plug that reduces number of hammer blows by up to 50%
 <p>HDI and Manual setting tool 5/8" to 3/4" HDI SS303 1/4" to 3/4" HDI-S 1/2" and 3/4"</p>	<ul style="list-style-type: none"> HDI+ and HDI-L+ can be installed with the new HDI+ Setting Tool system (stop drill bit and machine setting tool) for improved productivity HDI-S speed thread designed to accept coil rods and forms a matched tolerance system for forming applications.



Uncracked concrete



Fire sprinkler listings

Approvals/Listings	
FM (Factory Mutual)	Pipe hanger components for automatic sprinkler systems HDI+ 3/8, HDI-L+ 3/8, HDI+1/2, HDI-L+ 1/2, HDI 5/8 and HDI 3/4
UL and cUL (Underwriters Laboratory)	Pipe hanger equipment for fire protection services HDI+ 3/8, HDI-L+ 3/8, HDI+1/2, HDI-L+ 1/2, HDI 5/8 and HDI 3/4

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INSTALLATION PARAMETERS

Table 1 – Hilti HDI+, HDI-L+HDI, HDI-SS303 and HDI-S specifications

Setting Information	Symbol	Units	HDI+, HDI-L+ and HDI-SS303			HDI and HDI-SS303		HDI-S	
			1/4	3/8	1/2	5/8	3/4	1/2	3/4
Insert thread	d	UNC	1/4-20	3/8-16	1/2-13	5/8-11	3/4-10	1/2-6	3/4-4.5
Nominal bit diameter	d _{bit}	in.	3/8	1/2	5/8	27/32	1	5/8	1
Nominal embedment	h _{nom}	in.	1	1-9/16	2	2-9/16	3-3/16	2	3-3/16
Anchor length	ℓ	(mm)	(25)	(40)	(51)	(65)	(81)	(51)	(81)
Hole depth	h _o								
Useable thread length	ℓ _{th}	in. (mm)	7/16 (11)	5/8 (15)	11/16 (17)	7/8 (22)	1-3/8 (34)	11/16 (17)	1-3/8 (34)
Installation torque	T _{inst}	ft-lb (Nm)	4 (5)	11 (15)	22 (30)	37 (50)	80 (109)	22 (30)	80 (109)
Minimum slab thickness	h	in. (mm)	3 (76)	3-1/8 (79)	4 (102)	5-1/8 (130)	6-3/8 (162)	4 (102)	6-3/8 (162)

MATERIAL SPECIFICATIONS

HDI+, HDI-L, HDI and HDI-S anchors are manufactured from mild carbon steel. Anchor bodies are zinc plated in accordance with ASTM B633, AC 1, Type III

HDI SS303 anchors are manufactured from AISI Type 303 stainless steel

DESIGN DATA IN CONCRETE USING ALLOWABLE STRESS DESIGN

Table 2 — Hilti HDI+, HDI-L+ and HDI carbon steel allowable loads in concrete^{1,2}

Anchor type	Nominal anchor diameter in.	$f'_c = 2,000$				$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	385	(1.7)	450	(2.0)	510	(2.3)	625	(2.8)	640	(2.8)	700	(3.1)
	3/8	635	(2.8)	965	(4.3)	920	(4.1)	1,250	(5.6)	1,260	(5.6)	1,500	(6.7)
	1/2	945	(4.2)	1,500	(6.7)	1,605	(7.1)	2,125	(9.5)	1,950	(8.7)	2,500	(11.1)
HDI	5/8	1,875	(8.3)	2,500	(11.1)	2,920	(13.0)	3,250	(14.5)	3,715	(16.5)	3,750	(16.7)
	3/4	2,500	(11.1)	3,875	(17.2)	4,065	(18.1)	5,000	(22.2)	5,565	(24.8)	5,500	(24.5)

Table 3 — Hilti HDI+, HDI-L+ and HDI carbon steel ultimate loads in concrete¹

Anchor type	Nominal anchor diameter in.	$f'_c = 2,000$				$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	1,535	(6.8)	1,800	(8.0)	2,040	(9.1)	2,500	(11.1)	2,555	(11.4)	2,800	(12.5)
	3/8	2,540	(11.3)	3,850	(17.1)	3,685	(16.4)	5,000	(22.2)	5,035	(22.4)	6,000	(26.7)
	1/2	3,780	(16.8)	6,000	(26.7)	6,425	(28.6)	8,500	(37.8)	7,810	(34.7)	10,000	(44.5)
HDI	5/8	7,500	(33.4)	10,000	(44.5)	11,685	(52.0)	13,000	(57.8)	14,865	(66.1)	15,000	(66.7)
	3/4	10,000	(44.5)	15,500	(68.9)	16,260	(72.3)	20,000	(89.0)	22,250	(99.0)	22,000	(97.9)

1 The shear tests were conducted with SAE Grade 5 bolts with minimum yield strength of 85 ksi and minimum tension strength of 120 ksi. Shear testing for the 1/4-in. models were conducted with SAE Grade 8 bolts with minimum yield strength of 120 ksi and minimum tension strength of 150 ksi in 6,000 psi concrete. High-strength bolts were used to force concrete failure modes. When using steel bolts with a lower tensile strength, steel failure must be considered.

2 Allowable loads calculated with a factor of safety of 4.

Table 4 — Hilti HDI+, HDI-L+ and HDI carbon steel allowable loads in lightweight concrete and lightweight concrete poured over metal deck^{1,2,3,4}

Anchor type	Nominal anchor diameter in.	3,000 psi lightweight concrete over metal deck											
		3,000 psi lightweight concrete				Upper flute				Lower flute			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	465	(2.1)	340	(1.5)	530	(2.4)	335	(1.5)	375	(1.7)	250	(1.1)
	3/8	720	(3.2)	940	(4.2)	810	(3.6)	1,010	(4.5)	500	(2.2)	500	(2.2)
	1/2	1,035	(4.6)	1,700	(7.6)	1,035	(4.6)	1,755	(7.8)	625	(2.8)	750	(3.3)
HDI	5/8	1,465	(6.5)	2,835	(12.6)	1,035	(4.6)	1,755	(7.8)	875	(3.9)	875	(3.9)
	3/4	2,075	(9.2)	3,680	(16.4)	1,250	(5.6)	1,755	(7.8)	1,250	(5.6)	1,000	(4.4)

1 The shear tests were conducted with SAE Grade 5 bolts with minimum yield strength of 85 ksi and minimum tension strength of 120 ksi. Shear testing for the 1/4-in. models were conducted with SAE Grade 8 bolts with minimum yield strength of 120 ksi and minimum tension strength of 150 ksi in 6,000 psi concrete. High-strength bolts were used to force concrete failure modes. When using steel bolts with a lower tensile strength, steel failure must be considered.

2 Minimum compressive strength of structural lightweight concrete is 3,000 psi.

3 See figure 1 for typical details.

4 Allowable loads calculated with a factor of safety of 4.

Table 5 — Hilti HDI stainless steel allowable loads in concrete^{1,2}

Nominal anchor diameter in.	$f'_c = 4,000$				$f'_c = 6,000$			
	Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
1/4	480	(2.1)	600	(2.7)	740	(3.3)	600	(2.7)
3/8	1,040	(4.6)	1,230	(5.5)	1,460	(6.5)	1,230	(5.5)
1/2	1,840	(8.2)	2,760	(12.3)	2,410	(10.7)	2,760	(12.3)
5/8	2,630	(11.7)	4,510	(20.1)	3,770	(16.8)	4,510	(20.1)
3/4	3,830	(17.0)	5,580	(24.8)	5,030	(22.4)	5,580	(24.8)

1 Shear testing conducted with 18-8 stainless steel bolts.

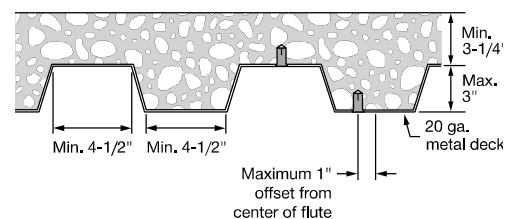
2 Allowable loads calculated with a factor of safety of 4.

Table 6 — Hilti HDI-S speed thread allowable loads in concrete¹

Nominal anchor diameter in.	$f'_c = 4,000$				$f'_c = 6,000$			
	Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
1/2	1,785	(7.9)	1,570	(7.0)	2,345	(10.4)	1,570	(7.0)
3/4	4,065	(18.1)	3,700	(16.5)	5,565	(24.8)	3,700	(16.5)

1 Allowable loads calculated with a factor of safety of 4.

Figure 1 — Installation of Hilti HDI+ and HDI drop-in anchor in the soffit of concrete over metal deck floor and roof assemblies W-deck



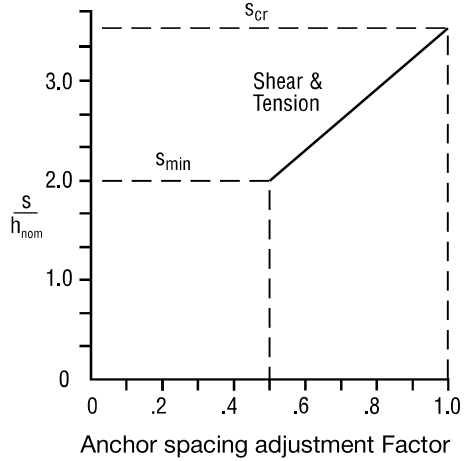
Combined shear and tension loading

$$\left(\frac{N_d}{N_{rec}} \right)^{5/3} + \left(\frac{V_d}{V_{rec}} \right)^{5/3} \leq 1.0$$

Anchor spacing and edge distance guidelines

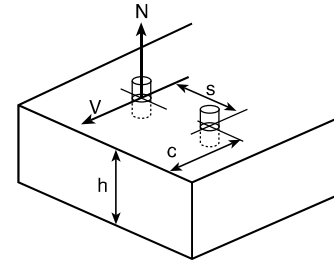
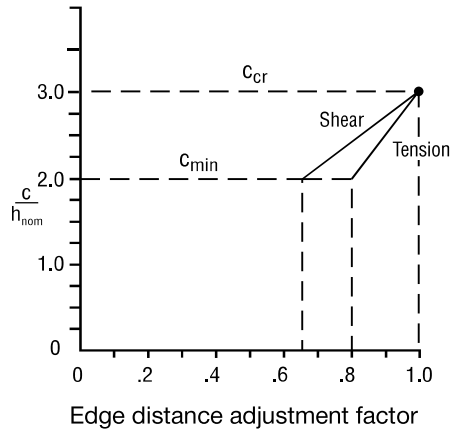
Anchor spacing adjustment factors

s = Actual Spacing
 $s_{min} = 2.0 h_{nom}$
 $s_{cr} = 3.5 h_{nom}$



Edge distance adjustment factors

c = Actual edge distance
 $c_{min} = 2.0 h_{nom}$
 $c_{cr} = 3.0 h_{nom}$



Influence of anchor spacing and edge distance f_A and f_R

Anchor Size		h_{nom}	
in.	(mm)	in.	(mm)
1/4	(6.4)	1	(25)
3/8	(9.5)	1-9/16	(40)
1/2	(12.7)	2	(51)
5/8	(15.8)	2-9/16	(65)
3/4	(19.1)	3-3/16	(81)

h_{nom} = nominal embedment depth

Table 7 — Load adjustment factors for Hilti HDI drop-in anchors in concrete

Load adjustment factors for anchor spacing f_A							Load adjustment factors for edge distance f_R											
Tension/shear loads							Tension f_{RN}						Shear f_{RV}					
Spacing s		Anchor diameter					Edge distance c		Anchor diameter				Anchor diameter					
in.	(mm)	1/4	3/8	1/2	5/8	3/4	in.	(mm)	1/4	3/8	1/2	5/8	3/4	1/4	3/8	1/2	5/8	3/4
2	(51)	.50					2	(51)	.80					.65				
2-1/2	(64)	.67					2-1/2	(64)	.90					.83				
3	(76)	.83	.50				3	(76)	1.0	.80				1.0	.65			
3-1/2	(89)	1.0	.58				3-1/2	(89)		.85					.73			
4	(102)		.69	.50			4	(102)		.91	.80				.85	.65		
4-1/2	(114)		.79	.58			4-1/2	(114)		.98	.85				.96	.74		
5	(127)		.90	.67	.50		5	(127)		1.0	.90	.80			1.0	.83	.65	
5-1/2	(140)		1.0	.75	.55		5-1/2	(140)			.95	.83				.91	.70	
6	(152)			.83	.61	.50	6	(152)			1.0	.87				1.0	.77	
7	(178)			1.0	.74	.57	6-1/2	(165)				.91	.80				.84	.65
8	(203)				.87	.67	7	(178)				.95	.84				.91	.72
9	(229)				1.0	.77	8	(203)				1.0	.90				1.0	.83
10	(254)					.88	9	(229)					.96					.94
11	(279)					.98	10	(254)					1.0					1.0
12	(305)					1.0												

$s_{min} = 2.0 h_{nom}$ $s_{cr} = 3.5 h_{nom}$ $f_A = 0.33 \frac{s}{h_{nom}} - 0.17$ for $s_{cr} > s > s_{min}$	$c_{min} = 2.0 h_{nom}$ $c_{cr} = 3.0 h_{nom}$ $f_{RN} = 0.2 \frac{c}{h_{nom}} + 0.4$ for $c_{cr} > c > c_{min}$	$c_{min} = 2.0 h_{nom}$ $c_{cr} = 3.0 h_{nom}$ $f_{RV} = 0.35 \frac{c}{h_{nom}} - 0.05$ for $c_{cr} > c > c_{min}$
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INSTALLATION INSTRUCTIONS

Manufacturer's Printed Installation Instructions (MPII) are included with each product package. They can also be viewed or downloaded at www.hilti.com. Because of the possibility of changes, always verify that downloaded MPII are 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 MPII.

ORDERING INFORMATION¹

HDI+, HDI-L+ and HDI

Carbon steel

Description	Description	Description	Anchor thread size	Qty / box
HDI+ 1/4	HDI-L+ 1/4	-	1/4	100
HDI+ 3/8	HDI-L+ 3/8	-	3/8	50
HDI+ 1/2	HDI-L+ 1/2	HDI-S 1/2"	1/2	50
HDI 5/8	-	-	5/8	25
HDI 3/4	-	HDI-S 3/4"	3/4	25

HDI-SS303 anchors

Stainless steel

Description	Anchor thread size	Qty / box
HDI 1/4 SS303	1/4	100
HDI 3/8 SS303	3/8	50
HDI 1/2 SS303	1/2	50
HDI 5/8 SS303	5/8	25
HDI 3/4 SS303	3/4	25

Setting Tools for HDI+ and HDI-L+

Anchor thread size	Description
1/4	HST 1/4 Setting tool
	HSD-MM 1/4 (TE-C-24D6 1/4 Setting tool)
	HDI+ Setting Tool includes a TE-CX 3/8x1 carbide bit
3/8	HST 3/8 Setting tool
	HSD-MM 3/8 (TE-C-24SD10 3/8 Setting tool)
	HDI+ Setting Tool includes a TE-CX 1/2x1-9/16 carbide bit
1/2	HST 1/2 Setting tool
	HSD-MM 1/2 (TE-C-24SD12 1/2 Setting tool)
	HDI+ Setting Tool includes a TE-CX 5/8x2 carbide bit



Setting tools for HDI and HDI-SS303 anchors

Description	Sets anchor size	Qty
HST 1/4" Hand Setting Tool	1/4" HDI SS303	1
HST 3/8" Hand Setting Tool	3/8" HDI SS303	1
HST 1/2" Hand Setting Tool	1/2" HDI SS303 / HDI-S	1
HST 5/8" Hand Setting Tool	5/8" HDI / HDI SS303	1
HST 3/4" Hand Setting Tool	3/4" HDI / HDI SS303 / HDI-S	1



¹ All dimensions in inches