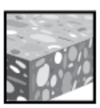
PRODUCT DESCRIPTION

HLS carbon steel anchors

Anchor System	Features and Benefits
 Carbon Steel HLS  Uncracked concrete	• Anti-dust plastic cap for easy threading of the rod • No spinning of anchor in the hole • For non-structural applications. • Suitable for normal weight concrete including waffle concrete. • Two different installation methods for easy use.

MATERIAL SPECIFICATIONS

Carbon steel

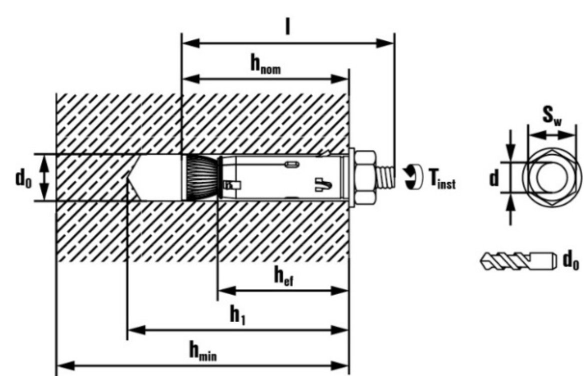
HSL sleeves and cone are manufactured from carbon steel with 5mm zinc plating per ASTM F1941, Fe/Zn 5 AB.

INSTALLATION PARAMETERS - CONCRETE

Table 1 – Hilti HLS setting information

Setting information	Symbol	Units	Nominal anchor diameter (in)	
			1/4	**3/8**
Nominal drill bit diameter	d_{bit}	in.	1/2	5/8
Effective embedment (min.)	h_{ef}	in. (mm)	1 9/16 (40)	1 13/16 (46)
Nominal embedment	h_{nom}	in. (mm)	2 1/16 (52)	2 3/8 (60)
Hole depth in concrete	h_0	in. (mm)	2 3/8 (60)	2 3/4 (70)
Installation torque [1]	T_{inst}	ft-lb (Nm)	9 (12)	15 (20)
Minimum concrete thickness	h_{min}	in. (mm)	8 (203)	8 (203)
Minimum edge distance	c_{min}	in. (mm)	2 (51)	2 (51)
Minimum anchor spacing	s_{min}	in. (mm)	4-1/2 (114)	4-1/2 (114)

Figure 1 – Hilti HLS specifications



For **SI**: 1 inch = 25.4mm, 1 ft-lb = 1.3558 Nm

DESIGN DATA IN CONCRETE

Table 2 - Hilti HLS carbon steel allowable loads in uncracked, normal weight concrete [1,2]

Nominal anchor diameter	Nominal embed.	f'c = 2,000 psi (17.2 MPa)		f'c = 4,000 psi (27.6 MPa)		f'c = 6,000 psi (41.4 MPa)	
		Tension	Shear	Tension	Shear	Tension	Shear
in.	in. (mm)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)
1/4	1-7/8 (48)	765 (3.4)	680 (3.0)	1010 (4.5)	680 (3.0)	1165 (5.2)	680 (3.0)
3/8	2-1/8 (54)	900 (4.0)	1520 (6.8)	1590 (7.1)	1520 (6.8)	2050 (9.1)	1520 (6.8)

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

[2] Apply spacing and edge distance reduction factors in Table **4** as needed. Compare calculated value to the steel strength of the inserted rod in Table **6**. The lesser of the values is to be used for the design.

Table 3 - Hilti HLS carbon steel ultimate loads in uncracked, normal weight concrete

Nominal anchor diameter	Nominal embed.	f'c = 2,000 psi (17.2 MPa)		f'c = 4,000 psi (27.6 MPa)		f'c = 6,000 psi (41.4 MPa)	
		Tension	Shear	Tension	Shear	Tension	Shear
in.	in. (mm)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)
1/4	1-7/8 (48)	3065 (13.6)	2720 (12.1)	4030 (17.9)	2720 (12.1)	4655 (20.7)	2720 (12.1)
3/8	2-1/8 (54)	3595 (16.0)	6080 (27.0)	6350 (28.2)	6080 (27.0)	8190 (36.4)	6080 (27.0)

Combined tension and shear loading for Table 3

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

Table 4 - Load adjustment factors for Hilti HLS carbon steel anchors in concrete

Load adjustment factors (anchor spacing) f_A				Load adjustment factors (edge distance) f_R					
Tension/Shear				Tension f_{RN}				Shear f_{RV}	
Spacing		Anchor diameter (in.)		Edge distance		Anchor diameter (in.)		Anchor diameter (in.)	
in.	(mm)	1/4	3/8	in.	(mm)	1/4	3/8	1/4	3/8
2	(51)	-	-	2	(51)	0.55	0.50	0.55	0.35
2-1/2	(64)	-	-	2-1/2	(64)	0.61	0.56	0.61	0.43
3	(76)	-	-	3	(76)	0.66	0.63	0.66	0.51
3-1/2	(89)	-	-	3-1/2	(89)	0.72	0.69	0.72	0.59
4	(102)	-	-	4	(102)	0.78	0.75	0.78	0.68
4-1/2	(114)	1.00	0.90	4-1/2	(114)	0.83	0.81	0.83	0.76
5	(127)	1.00	0.93	5	(127)	0.89	0.88	0.89	0.84
5-1/2	(140)	1.00	0.97	5-1/2	(140)	0.94	0.94	0.94	0.92
6	(152)	1.00	1.00	6	(152)	1.00	1.00	1.00	1.00

Table 5 - Hilti HLS carbon steel allowable loads in the bottom of a normal weight concrete waffle slab [1,2,3]

Nominal anchor diameter	Nominal embed.	f'c = 3,000 psi (20.1 MPa)	
in.	in. (mm)	Tension lb (kN)	Shear lb (kN)
1/4	1-7/8 (48)	460 (2.0)	475 (2.1)
3/8	2-1/8 (54)	640 (2.8)	500 (2.2)

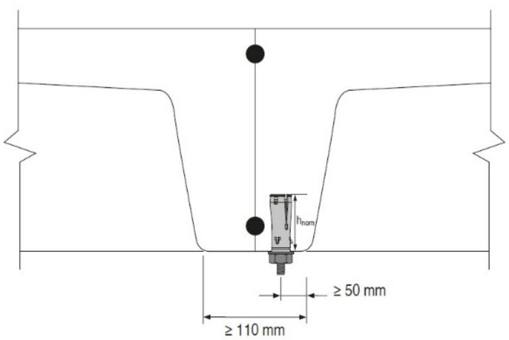
[1] Allowable loads calculated with a factor of safety of 4.

[2] Compare table value to the steel strength of the inserted rod in Table **6**. The lesser of the values is to be used for the design.

[3] Reduction factors from Table **4** do not have to be applied to the values in this table as testing is done in the condition shown in Figure **2**.

Combined tension and shear loading for Table 5

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



Notes:

Figure 2 - Hilti HLS installation parameters in the bottom of uncracked concrete waffle slab beam

Table 6 - Allowable steel strength for common grades of carbon steel threaded rods [1]

Nominal anchor diameter	AISI 1010		ASTM A36		ASTM A307		ASTM A193 B7	
in.	Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)
1/4	855 (3.8)	440 (2.0)	940 (4.2)	485 (2.2)	970 (4.3)	500 (2.2)	2,025 (9.0)	1,045 (4.6)
3/8	1,925 (8.6)	995 (4.4)	2,115 (9.4)	1,090 (4.8)	2,185 (9.7)	1,125 (5.0)	4,555 (20.3)	2,345 (10.4)

1 Steel strength as defined in AISC Manual of Steel Construction (ASD):

Tensile = 0.33 x F_u x Nominal Area

Shear = 0.17 x F_u x Nominal Area

Table 7 - Ultimate steel strength for common grades of carbon steel threaded rods [1]

Nominal anchor diameter in.	AISI 1010			ASTM A36			ASTM A307			ASTM A193 B7		
	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)
1/4	1,405 (6.2)	1,950 (8.7)	1,170 (5.2)	1,145 (5.1)	2,135 (9.5)	1,280 (5.7)	1,195 (5.3)	2,210 (9.8)	1,325 (5.9)	3,340 (14.9)	4,605 (20.5)	2,760 (12.3)
3/8	3,425 (15.2)	4,380 (19.5)	2,630 (11.7)	2,790 (12.4)	4,800 (21.4)	2,880 (12.8)	2,905 (12.9)	4,970 (22.1)	2,980 (13.3)	8,140 (36.2)	10,350 (46.0)	6,210 (27.6)

1 Steel strength as defined in AISC Manual of Steel Construction 2nd Ed. (LRFD):
Yield = F_y x Tensile stress area
Tensile = 0.75 x F_u x Nominal Area
Shear = 0.45 x F_u x Nominal Area

ORDERING INFORMATION

Description	Item number	Quantity
HLS 1/4"	2231054	100
HLS 3/8"	2231055	50