Attached are page(s) from the 2013 Hilti North American Product Technical Guide Volume 1 Direct Fastening. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the full Product Technical Guide, or contact Hilti.

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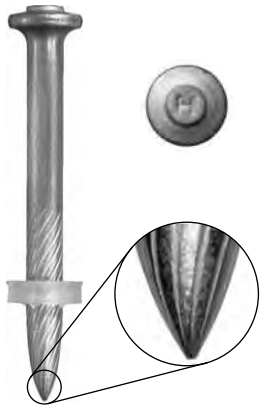
3.2.3 X-U Universal Knurled Shank Fasteners



3.2.3.1 Product Description

The Hilti X-U universal knurled shank fastener is designed as a high performance solution to simplify powder-actuated fastener selection. The X-U is one fastener type that performs equally well on both high and standard strength concrete and steel.

To help ensure reliable fastenings, the X-U fastener has matched tolerance to all Hilti powder-actuated tools using 8 mm fastener guides and drive pistons through an 8 mm nail head diameter and an 8 mm plastic guidance washer set near the nail tip. The X-U program also includes fasteners with pre-mounted steel washers of 15 mm or 36 mm.

Product Features

- A 0.157" shank diameter for high performance in both tension and shear applications
- Unique knurling design offering higher pullout strength and anchorage in concrete and steel
- Full range of fasteners in single or collated configurations to maximize productivity
- No requirement for unique drive pistons or special equipment
- Recognized for horizontal wood deck diaphragms subjected to wind or seismic forces (Reference ICC-ES ESR-2269)

Listings/Approvals

ICC-ES (International Code Council)
ESR-2269

COLA (City of Los Angeles)
RR 25675

3.2.3.2 Material Specifications

Fastener Designation	Fastener Material	Fastener Plating	Fastener Hardness
X-U	Carbon Steel	5 µm Zinc[1]	58 HRC

1 ASTM B633, SC 1, Type III. Refer to Section 2.3.3.1 for more information.

3.2.3.3 Technical Data

Allowable Loads in Normal Weight Concrete[1]

Fastener	Shank Diameter in. (mm)	Minimum Embedment in. (mm)	Concrete Compressive Strength							
			2000 psi		4000 psi		6000 psi			
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)		
X-U	**0.157** (4.0)	**3/4** (19)	**100** (0.44)	**125** (0.57)	**100** (0.44)	**125** (0.57)	**105** (0.47)	**205** (0.91)		
		1 (25)	**165** (0.73)	**190** (0.85)	**170** (0.76)	**225** (1.00)	**110** (0.49)	**280** (1.25)		
		1-1/4 (32)	**240** (1.07)	**310** (1.38)	**280** (1.25)	**310** (1.38)	**180** (0.80)	**425** (1.89)		
		1-1/2 (38)	**275** (1.22)	**420** (1.87)	**325** (1.45)	**420** (1.87)	–	–		

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

Allowable Loads in Normal Weight Concrete Using DX-Kwik[1,2]

Fastener	Shank Diameter in. (mm)	Minimum Embedment in. (mm)	Concrete Compressive Strength			
			4000 psi		6000 psi	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-U 47 P8 w/DX-KWIK	**0.157** (4.0)	**1-1/2** (38)	**395** (1.76)	**405** (1.80)	**360** (1.60)	**570** (2.54)

1 X-U Fastener is installed using the DX-KWIK drilled pilot hole installation procedure shown in Section 3.2.1.1.10.

2 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

X-U Universal Knurled Shank Fasteners 3.2.3

Allowable Loads in Minimum f'_c = 3000 psi Structural Lightweight Concrete[1,4]

Fastener	Shank Dia. in. (mm)	Minimum Embed. in. (mm)	Fastener Location							
			Installed into Concrete		Installed Through Metal Deck into Concrete					
					3 Inch Deep Composite Floor Deck[2]			1-1/2 Inch Deep Composite Floor Deck[3]		
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)		Shear lb (kN)	Tension lb (kN)		Shear lb (kN)
					Upper Flute	Lower Flute		Upper Flute	Lower Flute	
X-U	0.157 (4.0)	3/4 (19)	125 (0.56)	115 (0.51)	130 (0.58)	95 (0.42)	245 (1.09)	95 (0.42)	95 (0.42)	370 (1.65)
		1 (25)	205 (0.91)	260 (1.16)	215 (0.96)	155 (0.69)	330 (1.47)	125 (0.56)	125 (0.56)	415 (1.85)
		1-1/4 (32)	315 (1.40)	435 (1.93)	295 (1.31)	200 (0.89)	375 (1.67)	–	–	–
		1-1/2 (38)	425 (1.89)	475 (2.11)	400 (1.78)	260 (1.16)	430 (1.91)	–	–	–

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

2 The steel deck profile for the 3" deep composite floor deck has a minimum thickness of 20 gauge (0.0358") and a minimum F_y of 33 ksi. Lower and upper flute width must be a minimum of 4-1/2". Figure 1 in Section 3.2.1.1.6 shows the nominal flute dimensions, fastener locations and load orientations for the deck profile. Structural lightweight concrete fill above top of steel deck must be minimum 3-1/4".

3 The steel deck profile for the 1-1/2" deep composite floor deck has a minimum thickness of 20 gauge (0.0358") and a minimum F_y of 33 ksi. Lower flute and upper flute widths must be a minimum of 1-3/4" and 3-1/2", respectively. This deck may also be inverted as shown in Figure 3 in Section 3.2.1.1.6. Figures 2 and 3 in Section 3.2.1.1.6 show the nominal flute dimensions, fastener locations and load orientations for the deck profile. Structural lightweight concrete fill above top of steel deck must be minimum 2-1/2".

4 Multiple fasteners are recommended for any attachment.

Allowable Loads in Concrete Masonry Units[1,2,3,4,5,10]

Fastener	Shank Dia. in. (mm)	Minimum Embed. in. (mm)	Hollow CMU				Grout-Filled CMU					
			Face Shell[6]		Mortar Joint[6]		Face Shell[6]		Mortar Joint[6]		Top of Grouted Cell[8]	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear[7] lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear[7] lb (kN)	Tension lb (kN)	Shear[9] lb (kN)
X-U	0.157 (4.0)	1 (25)	70 (0.31)	85 (0.38)	25 (0.11)	70 (0.31)	225 (1.00)	220 (0.98)	150 (0.67)	190 (0.85)	165 (0.73)	240 (1.07)

1 The tabulated allowable load values are for the low-velocity fastener into concrete masonry units only, using a safety factor equal to or greater than 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

2 The tabulated allowable load values are for low-velocity fasteners installed in normal weight or lightweight concrete masonry units conforming to ASTM C90.

3 The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with mortar conforming to ASTM C270, Type S.

4 The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with grout conforming to ASTM C476.

5 The tabulated allowable load values are for one low-velocity fastener installed in an individual masonry unit cell and at least 4" from the edge of the wall.

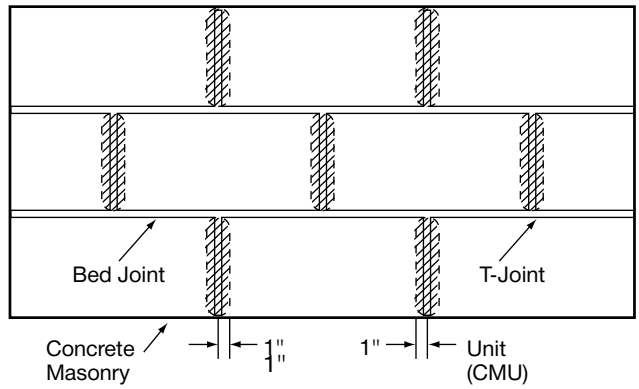
6 Fastener can be located anywhere on the face shell or mortar joints as shown in the figure to the right.

7 Shear load direction can be horizontal or vertical (Bed Joint or T-Joint) along the CMU wall plane.

8 Fastener located in center of grouted cell installed vertically.

9 Shear load can be in any direction in top of grouted cell application.

10 Multiple fasteners are recommended for any attachment.



Acceptable Locations (NON-SHADED AREAS) for X-U Universal Knurled Shank Fasteners in CMU Walls

Allowable Loads in Minimum ASTM A36 ($F_y \geq 36$ ksi; $F_u \geq 58$ ksi) Steel[1,2,4]

Fastener	Shank Dia. in. (mm)	Steel Thickness in.									
		3/16		1/4		3/8		1/2		≥3/4[3]	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
X-U	0.157 (4.0)	535 (2.38)	720 (3.20)	775 (3.45)	720 (3.20)	935 (4.16)	720 (3.20)	900 (4.00)	720 (3.20)	350 (1.56)	375 (1.67)

1 The tabulated allowable load values are for the low-velocity fasteners only, using a safety factor that is greater than or equal to 5.0, calculated in accordance with ICC-ES AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.

2 Low-velocity fasteners shall be driven to where the point of the fastener penetrates the steel base material, except as noted.

3 Tabulated allowable load values provided for ≥ 3/4" steel are based upon minimum point penetration of 1/2". If 1/2" point penetration is not achieved, but a point penetration of at least 3/8" is obtained, the tabulated tension value should be reduced by 20 percent and the tabulated shear load should be reduced by 8 percent.

4 Multiple fasteners are recommended for any attachment.

3.2.3 X-U Universal Knurled Shank Fasteners

Allowable Tensile Pullover and Shear Bearing Load Capacities for Steel Framing with X-U Powder-Actuated Fasteners[1,2,3,4]

Fastener Description	Fastener	Head Dia. in. (mm)	Sheet Steel Thickness													
			14 ga.		16 ga.		18 ga.		20 ga.		22 ga.		24 ga.		25/26 ga	
			Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
0.157" shank with or w/o plastic washers or MX collation	X-U	**0.322** (8.2)	**825** (3.67)	**1,085** (4.83)	**685** (3.05)	**720** (3.20)	**490** (2.18)	**525** (2.34)	**360** (1.60)	**445** (1.98)	**300** (1.33)	**330** (1.47)	**205** (0.91)	**255** (1.13)	**120** (0.53)	**145** (0.64)

1 Allowable load values are based on a safety factor of 3.0 in accordance with the AISI S100.

2 Allowable pullover capacities of sheet steel should be compared to allowable fastener tensile load capacities in concrete, steel, or masonry to determine controlling resistance load.

3 Allowable shear load bearing capacities of sheet steel should be compared to allowable fastener shear capacities in concrete, steel or masonry to determine controlling resistance load.

4 Data is based on the following minimum sheet steel properties, F_y = 33 ksi, F_u = 45 ksi (ASTM A653 material).

3.2.3.4 Ordering Information

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 16	**5/8** (16)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 19	**3/4** (19)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 22	**7/8** (22)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 27	**1** (27)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 32	**1-1/4** (32)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 37	**1-1/2** (37)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 42	**1-5/8** (42)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 47	**1-7/8** (47)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 52	**2** (52)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 57	**2-1/4** (57)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 62	**2-1/2** (62)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box
X-U 72	**2-7/8** (72)	**0.157** (4.0)	Plastic 8 mm or collated	100 pcs / box

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 22 P8 S15	**7/8** (22)	**0.157** (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 27 P8 S15	**1** (27)	**0.157** (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 32 P8 S15	**1-1/4** (32)	**0.157** (4.0)	Plastic 8 mm & Steel 15 mm	100 pcs / box
X-U 32 P8 S36	**1-1/4** (32)	**0.157** (4.0)	Plastic 8 mm & Steel 36 mm	100 pcs / box
X-U 72 P8 S36	**2-7/8** (72)	**0.157** (4.0)	Plastic 8 mm & Steel 36 mm	100 pcs / box

Fastener Description	Shank Length in. (mm)	Shank Ø in. (mm)	Washer Ø	Packaging Qty
X-U 16 P8 TH	**5/8** (16)	**0.157** (4.0)	8 mm plastic & metal “tophat"	100 pcs / box
X-U 19 P8 TH	**3/4** (19)	**0.157** (4.0)	8 mm plastic & metal “tophat"	100 pcs / box
X-U 27 P8 TH	**1** (27)	**0.157** (4.0)	8 mm plastic & metal “tophat"	100 pcs / box