



The following pages are an excerpt from the North American Product Technical Guide, Volume 1: Direct Fastening Technical Guide, Edition 24.

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

[Direct Fastening Technical Guide, Edition 24](#)

To consult directly with a team member regarding our direct fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am - 5:00pm CST.

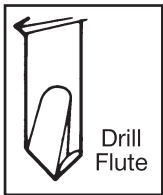
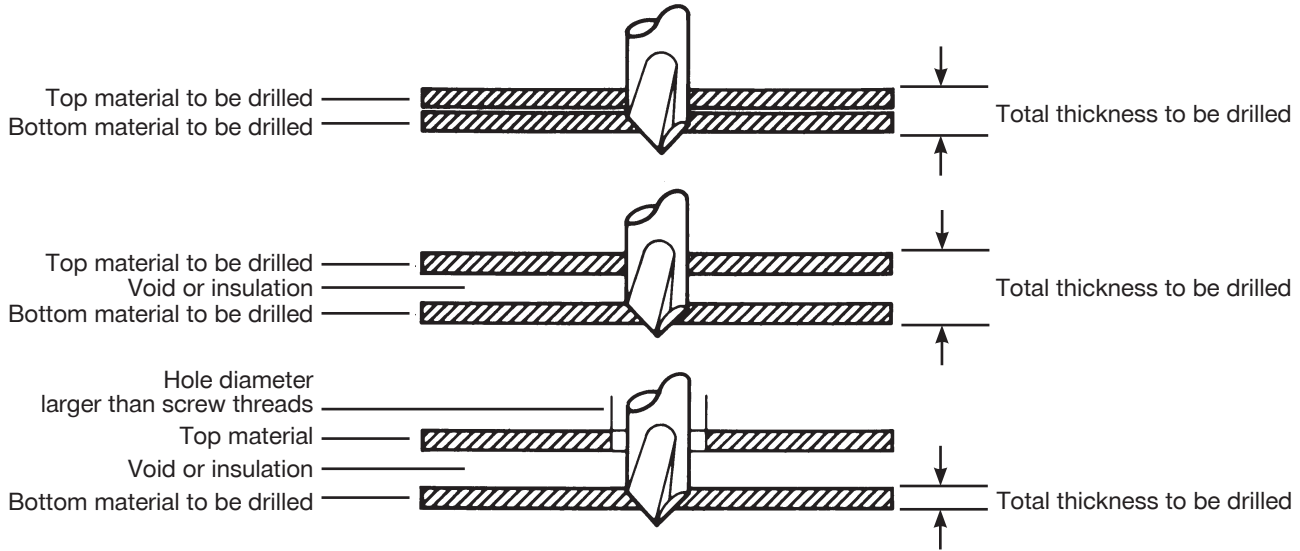
US: 877-749-6337 or [HNATechnicalServices@hilti.com](mailto:HNATechnicalServices@hilti.com)

CA: 1-800-363-4458 ext. 6 or [CATechnicalServices@hilti.com](mailto:CATechnicalServices@hilti.com)

## 3.6 SCREW FASTENING SYSTEMS

### 3.6.1 SELF-DRILLING SCREW FASTENER SELECTION AND DESIGN

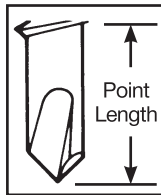
#### 3.6.1.1 DRILL POINT SELECTION



#### Drill Flute

The length of the drill flute determines the metal thickness that can be drilled. The flute itself provides a channel for chip removal during

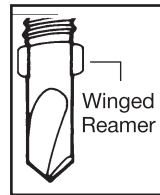
drilling action. If it becomes completely embedded in material, drill chips will be trapped in the flute and cutting action will cease. This will cause the point to burn up or break.



#### Point Length

The unthreaded section from the point to the first thread should be long enough to help assure the drilling action is complete before the

first thread engages the drilled metal. Screw threads advance at a rate of up to ten times faster than the drill flute can remove metal. All drilling therefore should be complete before threads begin to form.



#### Drilling through wood to metal

If your application calls for drilling through wood over 1/2" thick, a clearance hole is required. Select a fastener with

breakaway wings for this type of job. The wings will ream a clearance hole and break-off when they contact metal surface (minimum metal thickness 0.06") to be drilled.

#### Drilling capacity — material thickness recommendations (steel to steel)

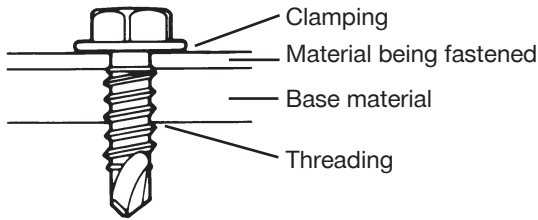
| Thickness of material to be drilled (in.) | #2 Point |       | #3 Point |       |       |       | #4 Point |       | #5 Point |
|---|----------|-------|----------|-------|-------|-------|----------|-------|----------|
|   |          |       |          |       |       |       |          |       | 0.500    |
| 0.500                                     |          |       |          |       |       |       |          |       |          |
| 0.400                                     |          |       |          |       |       |       |          |       |          |
| 0.300                                     |          |       |          |       |       |       |          |       |          |
| 0.200                                     |          |       |          |       | 0.210 | 0.220 | 0.250    | 0.250 | 0.250    |
| 0.100                                     | 0.100    | 0.110 | 0.140    | 0.175 |       |       | 0.175    | 0.175 |          |
| 0.035                                     |          |       | 0.100    | 0.110 | 0.110 | 0.110 |          |       |          |
| Screw Diameter                            | #6, #8   | #10   | #8       | #10   | #12   | #14   | #12      | #14   | #12      |

Note: Meets or exceeds ASTM C1513. Gray or black areas represent total thickness of all steel including any void spaces between layers.

### 3.6.1.2 THREAD SELECTION

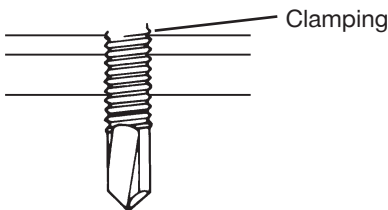
#### Thread length

Always choose a fastener with sufficient threads to fully engage in the base metal. For attachments to 1/4" base steel, a self-drilling screw should have at least 1/4" of threads. It is helpful, but not critical, that the threads also engage in the material being fastened. The head of the fastener provides the bearing force for the material being fastened, while the threads provide the clamping force in the base material.

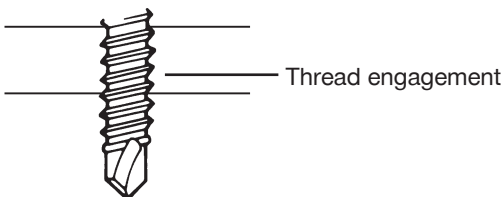


#### Thread pitch

The thickness of material being fastened and diameter of the screw determine the type of thread pitch to be used. In general, the thinner the fastened materials, the fewer the number of threads. The thicker the material, the greater the number of threads. This principle is due to two primary methods of thread engagement/holding power: **Clamping** and **Threading**. In light gauge metal, the materials are actually being clamped together by the upper and lower threads.



Thinner base material requires a coarser thread pitch to assure proper clamping. The thicker the material, the finer the threads must be. In very thick metal (3/8" to 1/2" thick), a fine thread is advisable. This will allow the thread to tap into the base material with less installation torque than a coarse thread.



#### Metal gauge

| Gauge | Aluminum metal                                  | Sheet  |
|-------|---|--------|
|       | (Approx. thickness in decimal parts of an inch) |        |
| 8     | 0.1285  | 0.1644 |
| 9     | 0.1144  | 0.1495 |
| 10    | 0.1019  | 0.1345 |
| 11    | 0.0907  | 0.1196 |
| 12    | 0.0808  | 0.1046 |
| 13    | 0.0720  | 0.0897 |
| 14    | 0.0641  | 0.0747 |
| 15    | 0.0571  | 0.0673 |
| 16    | 0.0508  | 0.0598 |
| 17    | 0.0493  | 0.0538 |
| 18    | 0.0403  | 0.0474 |
| 19    | 0.0359  | 0.0418 |
| 20    | 0.0320  | 0.0358 |
| 21    | 0.0285  | 0.0329 |
| 22    | 0.0253  | 0.0295 |
| 23    | 0.0226  | 0.0269 |
| 24    | 0.0201  | 0.0239 |
| 25    | 0.0179  | 0.0209 |
| 26    | 0.0159  | 0.0179 |
| 27    | 0.0142  | 0.0164 |
| 28    | 0.0126  | 0.0149 |

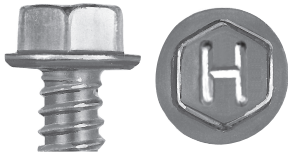
#### Fraction to decimal

| Fraction (in.) | Decimal equivalent (in.) |
|----------------|--------------------------|
| 1/64           | 0.015                    |
| 1/32           | 0.031                    |
| 3/64           | 0.046                    |
| 1/16           | 0.062                    |
| 5/64           | 0.078                    |
| 3/32           | 0.093                    |
| 7/64           | 0.109                    |
| 1/8            | 0.125                    |
| 9/64           | 0.140                    |
| 5/32           | 0.156                    |
| 11/64          | 0.171                    |
| 3/16           | 0.187                    |
| 13/64          | 0.203                    |
| 7/32           | 0.218                    |
| 15/64          | 0.234                    |
| 1/4            | 0.250                    |

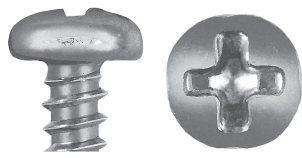
#### Screw diameter

| Number | Decimal equivalent (in.) |
|--------|--------------------------|
| #6     | 0.1380                   |
| #7     | 0.1510                   |
| #8     | 0.1640                   |
| #10    | 0.1900                   |
| #12    | 0.2160                   |
| 1/4    | 0.2500                   |
| 5/16   | 0.3125                   |

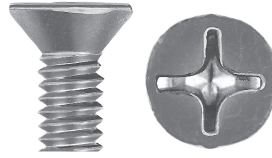
### 3.6.1.3 HEAD STYLE SELECTION



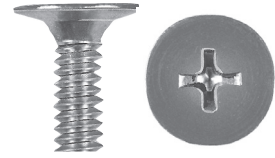
**HWH (HHWH)**  
 (High) Hex Washer Head  
 : Washer face provides a bearing surface for the driving sockets.



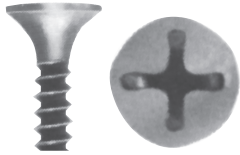
**PPH (PPFH)**  
 Phillips Pan (Framing) Head:  
 Conventional head for general applications and provides low profile fastening.



**PFH**  
 Phillips Flat Head:  
 Used primarily in wood to countersink and seat flush without splintering the wood.



**PWH**  
 Phillips Wafer Head:  
 Large head provides the bearing surface necessary to seat flush in soft materials.



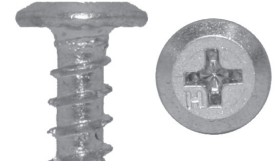
**PBH**  
 Phillips Bugle Head:  
 Used primarily for fastening drywall, plywood or insulation board to steel studs.



**PTH (MPTH)**  
 (Modified) Phillips Truss Head:  
 Large head and low profile provides surface area needed to attach wire lath to metal stud.



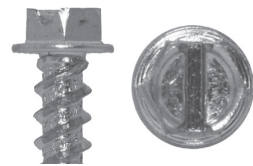
**PPCH**  
 Phillips Pancake Conventional Head:  
 Head for general applications and provides low and flat profile.



**PFTH**  
 Phillips Flat Truss Head:  
 Lowest profile head available for attaching metal to metal.



**PFHUC**  
 Pancake Framing Head Undercut:  
 Used for countersinking where a full head taper would cause stand-off of the screw.



**SHWH**  
 Slotted Hex Washer Head:  
 Hex washer head with slot in center to provide additional drive connection.



**TPCH**  
 Torx Pancake Head:  
 Pancake head with a star drive to prevent strip during installation and provide a decorative drive finish.

### 3.6.1.4 SEALING CRITERIA

Sealing washer screws offer greater weather resistant fastenings where moisture or condensation is a factor. The washer helps seal the hole to better prevent moisture from dripping into the fastener threads from the fastened material side, reducing corrosive build-up. As added protection against corrosion, all sealing washer screws come standard with Kwik-Cote coating. The torque control or depth gauge of the electric screwdrivers help ensure that the optimal seal is applied (Reference Section 3.6.1.7).

### 3.6.1.5 LENGTH SELECTION

#### Length of the screw (L)

Depending on the screwhead, there are two different ways to measure the overall length of a screw.

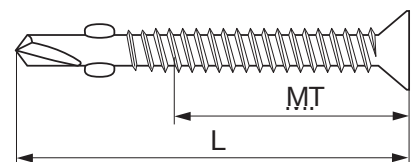
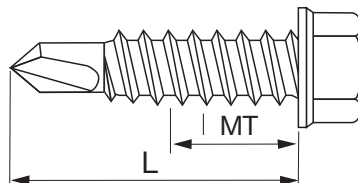
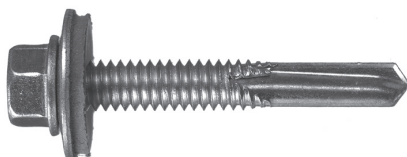
For HWH/HHWH, PPH, PTH, PFTH, SHWH and PPCH screws, the overall length is measured from the bottom of the washer under the head to the point of the screw.

For PWH, PFH, PBH and PFHUC screws, the overall length is measured from the top of the head to the point of the screw.

#### Maximum total thickness (MT)

The maximum total thickness (MT) for all screws is the length of the threads reduced by the first three threads (protruding past the back-side of the base material). See drawings above and below.

The maximum total thickness (MT) describes the maximum thickness of all attachments to be fastened plus the base material.



### 3.6.1.6 CORROSION RESISTANCE GUIDELINES

**Self-drilling screw fastener selection guidelines<sup>1,2,3,6,7</sup>**

| Environment                     | Low indoor - dry:<br>no moisture exposure   |   | Medium indoor and exterior - dry:<br>minimal moisture exposure                                 |   | High indoor and exterior - wet:<br>Heavy industrial or coastal areas with high prolonged moisture levels but no direct exposure to chlorides, and average temperatures below 86 °F (30 °C). |   |
|---------------------------------|---|---|--|---|---|---|
|                                 | Connection type   | Pressure-treated <sup>4</sup> or fire-retardant lumber-to-steel; aluminum-to-steel; dissimilar metals | Untreated lumber-to-steel, steel-to-steel, gypsum-to-steel applications; cement board-to-steel | Pressure-treated <sup>4</sup> or fire-retardant lumber-to-steel; aluminum-to-steel; dissimilar metals | Untreated lumber-to-steel, steel-to-steel, gypsum-to-steel applications   | Pressure-treated <sup>4</sup> or fire-retardant lumber-to-steel; aluminum-to-steel; dissimilar metals |
| Screw fastener descriptions     | Hardened carbon steel fasteners with electro-galvanized (min. 5 - 13 microns), black or grey phosphate coatings | Carbon steel, two-step heat treated fasteners with Kwik-Cote coating                                  | Hardened carbon steel fasteners with Kwik-Cote or Duplex coating                               | Carbon steel, two-step heat treated fasteners with Kwik-Cote coating                                  | 300 series <sup>5</sup> stainless steel fastener  |   |
| Screw fastener designation      | Hilti Zinc Plated Screws, Hilti Dark Grey Phosphate (DGP)   | Hilti Kwik-Flex   | Hilti Self-Drilling Screws with Kwik-Cote, CRC, or Kwik-Seal designation                       | Hilti Kwik-Flex   | Hilti Bi-Metal Kwik-Flex  |   |
| Product technical guide section | Section 3.6.2 or 3.6.3  | Section 3.6.4   | Section 3.6.2  | Section 3.6.4   | Section 3.6.5   |   |

1 If the moisture content of Pressure-Treated Lumber is high (> 18%) or unknown, stainless steel fasteners are recommended. Select appropriate stainless steel grade for your application.  
 2 Guidelines based on fastener coating / material resistance to environmental corrosion (commonly called rusting) and fastener hardening process / resistance to hydrogen assisted stress corrosion cracking (HASCC). Evaluate site conditions which may affect these guidelines, such as: corrosive agents other than those listed; expected service life; other (non-environmental) types of corrosion, etc.  
 3 In highly corrosive environments (such as direct exposure to chlorides with average temperatures above 86 °F (30 °C)) it is generally recommended that a Highly Corrosive Resistant (HCR) fastener be used. Contact Hilti Technical Support at 877-749-6337 for more information.  
 4 Pressure treated lumber refers to lumber such as SBX/DOT, Zinc borated ACQ, CA-B, CBA-A treated lumber.  
 5 300 series recommended. Most 400 series stainless steels, such as 410 stainless steel, 410 super-passivated stainless steel and 400 modified stainless steel are generally considered susceptible to HASCC. Moreover, these grades of stainless steel are 18/0 – they contain chromium but no nickel which reduces corrosion resistance significantly when compared to 18/8 grades (302, 304) or 18/8/2 grade (316).  
 6 The decision as to which fastener optimally meets the demands of a specific application is ultimately the judgment of the Engineer of Record or other responsible person for the project.  
 7 Reference Section 2.3.3.1 for more information on corrosion resistance.

### 3.6.1.7 HILTI SCREW FASTENER INSTALLATION INSTRUCTIONS\*

It is essential that proper rpm, setting depth and torque be utilized when installing Hilti screws.

Install self-drilling screws perpendicular to the work surface. The self-drilling feature of the screw will drill a hole completely through the base material before tapping the threads. Do not apply excessive pressure. Too much pressure will slow the speed of the screwdriver, increasing the installation time and possibly leading to drill tip failure. The variable speed motors of Hilti screwdrivers help enable the operator to start the screw in a precise position and drive it at the speed best suited for the application. The tables below provide additional suggested tools as well as common socket and bit sizes.

#### Common socket and bit sizes

| Screw size | Magnetic nut setter size | Phillips bit size |
|------------|--------------------------|-------------------|
| #8         | 1/4"                     | 2                 |
| #10        | 5/16"                    | 2                 |
| #12        | 5/16"                    | 3                 |
| 1/4"       | 3/8"                     | 3                 |

fastening self-drilling screws in steel up to 1/4" (6 mm) thick. There is a depth gauge on the front of the tool for correct depth setting of screws.

The Hilti ST 1800 heavy duty torque adjustable screwdriver features a 1,800 rpm for fastening self-drilling screws in steel up to 1/2" (12 mm) thick. There is a depth gauge on the front of the tool for correct depth setting of screws. There is also an 18 position adjustable torque clutch for correct torque release setting of screws. By avoiding overdriving, proper torque adjustment will deliver more consistent fastening quality.

The ST 1800 may also be operated with the SDT 9 for a stand-up decking system to fasten steel deck.

Please reference the table on torque considerations below for more information on proper installation of Hilti screw fasteners.

\* These are abbreviated instructions which may vary by application. **ALWAYS** review/follow the instructions accompanying the product.

#### Torque Considerations for Screw Fastening Applications<sup>3</sup>

|                               | Soft joint applications   | Hard joint applications  |
|-------------------------------|---|--|
| Applications                  | These include, but are not limited to, typical applications involving interior drywall fastening, exterior sheathing, metal framing, HVAC duct and plywood to metal.  | These include, but are not limited to, typical applications involving metal decking (both frame and sidelap), metal siding (both frame and sidelap), exterior façade and window glazing as well as any application where stripping of the base material may occur.<br><br>Any application involving sealing washers requires a depth gauge or torque clutch to help ensure that an optimal seal is achieved.   |
| Considerations <sup>1,2</sup> | Ideally, these applications should be carried out with a corded or cordless screwdriver that features either an adjustable torque clutch or a properly adjusted depth gauge. However, a tool without these features can often be used in soft joint applications.<br><br>This is because the applications are considered non-structural and/or possess sufficient redundancy in fastening points that any impact of over-driving may be sufficiently mitigated. | These applications must utilize a corded or cordless screwdriver that features either an adjustable torque clutch, speed settings that have been verified for use in the specific application or a properly adjusted depth gauge in order to help ensure consistent fastening and achieve published connection capacities.<br><br>This is because the applications are considered structural elements of the design. Over-driving may cause connection failures or fastener failures that possibly compromise the integrity of the connection. |

<sup>1</sup> Whether an application requires a depth gauge or torque clutch is the judgment of the person responsible for the project. If conditions are unknown or in doubt, use a screwdriver that features either an adjustable torque clutch or a properly adjusted depth gauge.

<sup>2</sup> All screw fastening connection capacities published in this manual were developed using corded or cordless screwdriver tools with adjustable torque clutches. Over-driving a screw fastener can cause a connection failure in lighter gauge and lower strength steel base materials (the threads tapping the base material are stripped by excessive torque) or a fastener failure in heavier gauge and higher strength steel base materials (the screw is damaged or sheared by excessive torque). This type of damage is not always visually detectable. Regardless of the tool or its torque setting, test fastenings should always be performed to verify the appropriate torque is being applied.

<sup>3</sup> For additional information, contact Hilti Technical Services at 877-749-6337.