

## Installation tools for self-drilling fasteners

The majority of fastener-related problems encountered on site are caused by the use of incorrect installation tools. With higher tensile (harder) grades of steel increasingly used, the correct choice of tool has become even more essential in avoiding additional costs and increased installation from increased burn-out rates

### **The issues**

#### *Steel is getting harder*

The typical tensile strength of light section purlins, rails and spacer bars has increased considerably in recent years, with minimum tensile grades of 390N/mm<sup>2</sup>, 450N/mm<sup>2</sup> now commonplace, although allowable tolerances mean that the maximum could be nearer 600N/mm<sup>2</sup>.

#### *Avoid high-speed drilling*

Given the increase in the hardness of steel, it might be assumed that fixing self-drilling fasteners might be completed at very high speeds. However, drill points do not actually perform well and once an attempt at drilling holes has failed, case hardening of the support steel makes subsequent attempts even more difficult. Therefore, the NFRC recommends a maximum of 2000 rpm. This may seem counter-productive, but the burn-out rate, as shown in Fig. 1, will be substantially less.



Figure 1

#### *Avoid use excessive bodyweight*

In addition, applying excessive bodyweight (end-load) while the fastener is drilling could also be counterproductive and increase the risk of the fastener burning out. This is, perhaps naturally, more common on thicker hot rolled/heavy section steel supports.

## **Always use a screw gun**

Precision-engineered fasteners require compatible tools to optimise the installation time and ensure the quality of the attachment, while avoiding increasing the cost associated with high levels of fastener burn-out. Screw guns are therefore an essential piece of equipment when working in roofing and cladding construction, ensuring that the optimum mechanical performance of a self-drilling fastener is obtained and so guaranteeing the integrity of the building envelope.

### *Screw gun features*

Use a 110v or battery-powered cordless screw gun with a compatible socket/bit and fitted with a depth-locating nose piece, unless the fastener design incorporates features to prevent overdriving. This nose piece should ideally have tapered sides allowing the installer to check the EDPM washer compression during installation (see Figure 2).



Figure 2

### *External drive fasteners*

For bi-hexagonal (nylon moulded heads), hexagonal and other external drive fasteners, the socket must be deep enough so that the drive is on the flange at the base of the fastener head (see Figure 3).



Fig 3

This will make drilling more efficient, as well as preventing damage to the fastener head, which particularly relevant to magnetic sockets where on some designs the magnet is very shallow and could damage the coating on the fastener head. Figure 4 illustrates the difference between the two sockets. This issue is made worse because the magnet naturally attracts a build-up of swarf during the installation of the fasteners.

Note: The recess on a socket must be deep enough to clear the top of the fastener head.



Fig. 4

#### *Screw gun speed selection*

Below is guidance from the leading fastener manufacturers for a screw gun speed selection when installing self-drilling fasteners into the different types of steel encountered on site:

- Installing fasteners into Light Section Rail: 1800-2000 rpm
- Installing fasteners into Heavy Section Rail: 1800 rpm max
- Installing stitcher's into two layers of 0.7mm thick steel 1800-2000 rpm

#### **Installation tools to avoid**

##### *Impact drivers*

The repetitive impact action of impact drivers can lead to drilling failures, reduce the fastener pull out performance, and damage the fastener's coating or strip its moulded head. Evidence of their risks invalidating any warranty provided by manufacturers.

##### *Drywall screw guns*

Drywall screw guns (4000 rpm) and other screw guns which run at well over the 2000 rpm limit should never be used.

#### **Summary**

##### *Do*

- Install self-drilling fasteners using a 110v or battery-powered screw gun, ideally with a nose piece tapered at the sides
- Fit a screw gun with a depth-locating nose piece, unless the fastener has features to prevent overdriving
- Use correct sockets and drive bits. Any magnet must be recessed deep enough to clear the fastener head

- External sockets must drive on the flange at the base of the fastener head
- Install roofing and cladding fasteners at speeds less than 2000 rpm
- Always use the correct PPE to avoid personal injury

*Do not*

- Install roofing and cladding fasteners with either an impact driver or a dry wall screw gun
- Apply excessive bodyweight force while the fastener is drilling, particularly on thicker hot rolled/heavy section steel supports.

*Note: If in doubt, always seek guidance from the manufacturer of the fastener.*

This article will be produced as a Guidance Note, which can be downloaded as a PDF.