Hold and Drive solutions

Your pocket guide

A wide range of Saltus HAD solutions

This guide has been designed to help you explore the applications and principles of Hold and Drive (HAD) solutions from Saltus. You will find recommendations on how to select the best HAD solution for a specific application, using Atlas Copco power tools.

We go through what needs to be considered when selecting a standard HAD solution. If no standard solution is applicable, we will guide you on how to get a customized solution.

We will also describe the function of Atlas Copco´s additional range of reaction-free HAD power tools for a safer and more ergonomic setup.[1]

THIS DOCUMENT IS NOT A USER MANUAL OR SAFETY GUIDE. FOR QUESTIONS ON THE USE OR OPERATION OF SPECIFIC ATLAS COPCO TOOLS PLEASE CONSULT THE APPROPRIATE USER MANUAL. FOR QUESTIONS ON THE USE OR OPERATION OF SALTUS SOCKETS AND BITS PLEASE CONSULT YOUR LOCAL ATLAS COPCO SALES REPRESENTATIVE.

[1] In reality, reaction-free HAD power tools do cause a small reaction torque. This is caused by the motor driving the tool. However, the force is negligible and will not disturb the operator.

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01 Introduction

A Hold and Drive (HAD) power tool holds the screw while tightening the nut. HAD screws are used, for example, by truck manufacturers on the frame assembly line, making what used to be a two-man operation, a one-man task.

HAD systems are required in those cases where it is neither possible nor convenient to hold the screw from the opposite side of a threaded end while tightening. In the next part you will see an example of this when securing a shock absorber; here, assembly does not seem possible in any other way than with an HAD tool.

1.1 Examples of HAD applications

HAD is typically used in securing the shock absorber rod to the car body. During tightening, there is no other way of preventing the rod from rotating freely in the shock absorber cylinder than by gripping the threaded end through the hexagonal socket used for tightening. For this reason, the rod end is designed with a key grip of some kind.

Other HAD applications are in the area of ball joints and suspension parts. HAD tooling is especially prevalent in the aerospace sector.

1.2 Tightening principle

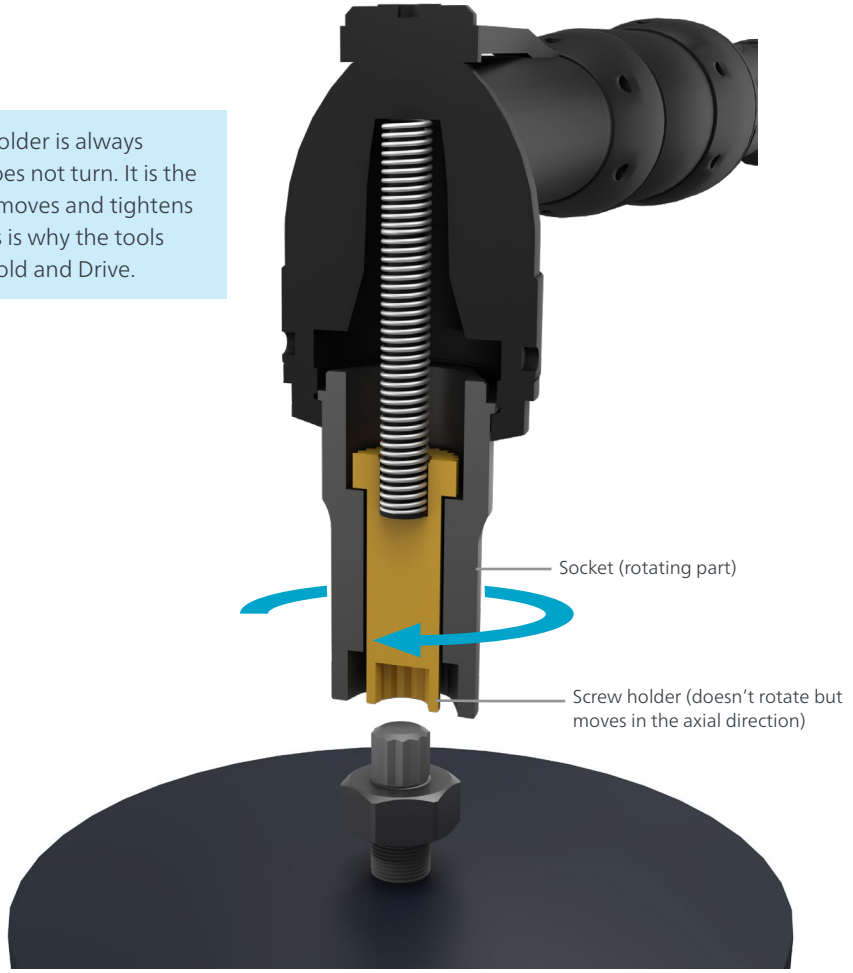
Manual tightening principle

You can use a hand wrench and key to tighten in cases where it is difficult or impossible to hold the screw/bolt from the opposite end. As shown in the picture to the right, you will need to manually hold the end of the screw with a key and tighten the nut with a hand wrench.

HAD tightening principle for angle head power tools

The HAD tightening principle explained below is used with an angle head power tool.

The screw holder is always fixed and does not turn. It is the socket that moves and tightens the nut. This is why the tools are called Hold and Drive.



If you want to use a power tool for the above operation, it calls for special tools which will allow a **screw holder** (see the yellow part above) inside the socket to hold the tip of the screw while tightening is being performed. The screw holder is always fixed. However, it is able to move axially to make room for the threaded part of the screw, while the socket follows the nut running down.

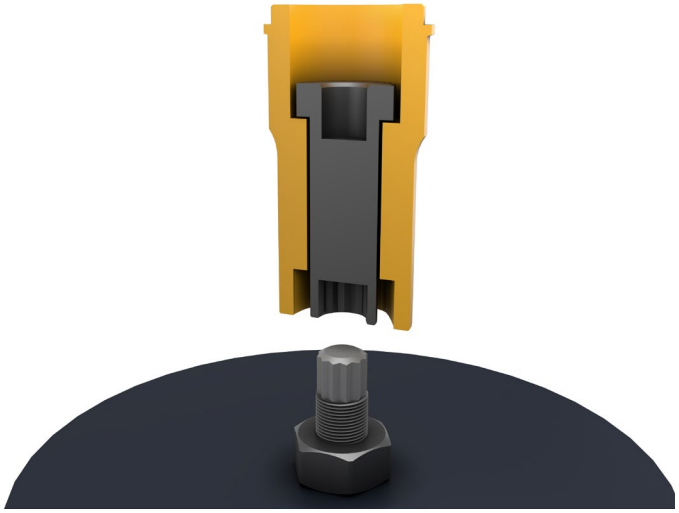
The **socket** (sometimes called drive socket or nut socket) is the part that turns and tightens the nut to the final torque. The socket is connected to the output gear of the tool.

02 Sockets, screw holders, bit holders and bits for HAD angle head power tools

Sockets, screw holders, bit holders and bits for HAD angle head power tools come in different sizes and models to meet the different specifications of the screw tip and the nut. You can find a standard range of sockets, screw holders and bit holders for HAD angle head power tools in the Atlas Copco catalog *Industrial Tools and Solutions* in the section "Optional Accessories for Hold and Drive tools".

2.1 Sockets for HAD angle head power tools

As explained in *Section 1.2*, the socket is the part that turns and tightens the nut to the final torque. The socket is connected to the output gear of the tool. HAD sockets come in different sizes and models to meet different nut specifications.



Socket outputs

HAD sockets can have different output profiles, such as Surface Drive (which is standard), Hex, Double Hex and Torx®. These can also be supplied on request.


Female Surface Drive


Female Hex


Female Double Hex


Female Torx®

NOTE: Torx®, Torx Plus® are registered trademarks of Acument Intellectual Properties. LLC.

Surface drive socket

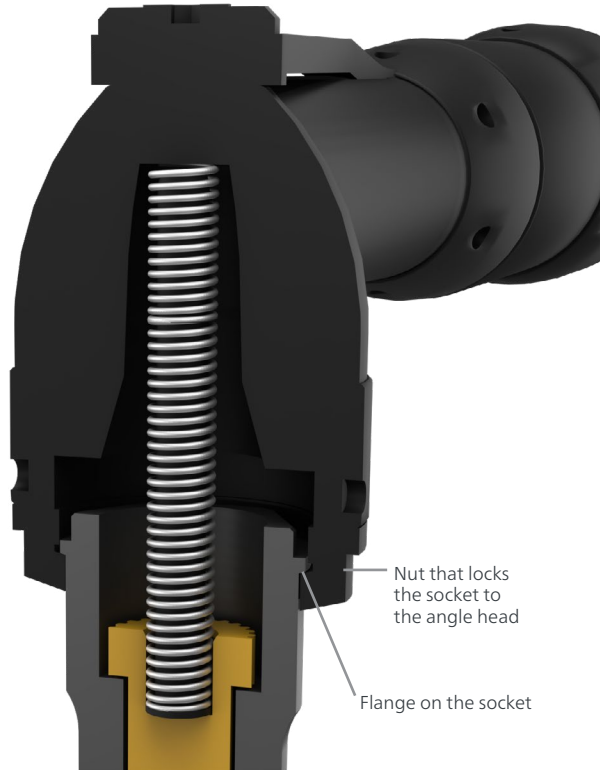
Generally, it is an advantage to select a surface drive socket for both the drive socket and the screw holder socket where applicable. The reason is that the surface socket offers easier engagement between socket and hexagon nut and screw tip. This is especially applicable to HAD applications where both drive socket and holder must mate before tightening begins.

Another advantage is that the surface drive socket reduces the risk of residual forces between socket and holder, that might lock the tool to the joint.


Female Surface Drive

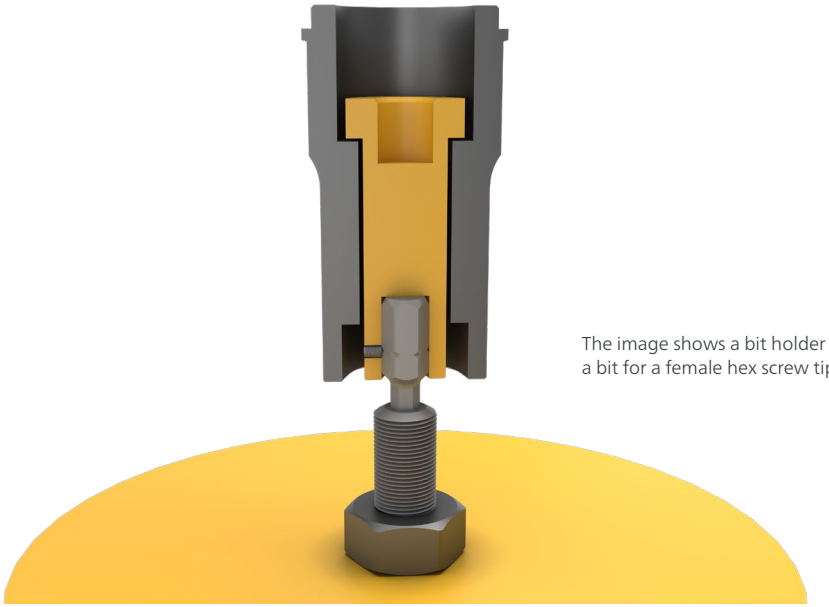
What holds it together

The sockets for HAD tools have a flange on the upper part of the socket and a nut which connects the socket to the power tool.



2.2 Bit holders for HAD angle head power tools

The bit holder with the bit, is the part that holds the tip of the screw while tightening.



The image shows a bit holder with a bit for a female hex screw tip

Bit holders for HAD can come with different output sizes to fit different inputs for bits. 1/4" and 5/6" Hex style C bits are the most common output sizes for bit holders. If you use a bit holder, then a bit must be used.

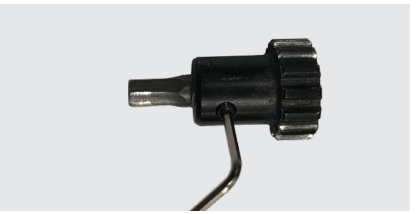
2.3 Bits for HAD

Bits can be delivered with different output profiles like male Hex and Torx® in different sizes. The most common input sizes for bits are ¼" (L=25.4 mm) and 5/16"(L=34-35 mm)Hex drive, style C. You can find a range of standard bits that can be used for HAD applications in the Saltus catalog, *Sockets and Bits for Industrial Power Tools*.

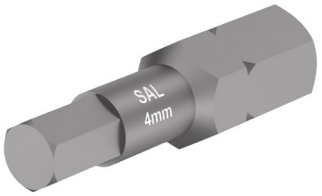
Male Hex

Male Torx®

Locking with spring pin



Locking with grub screw



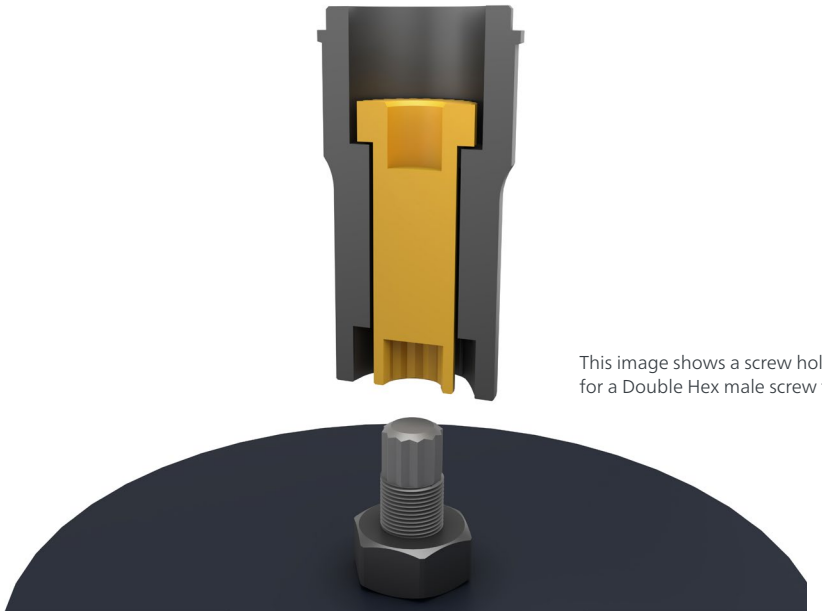
Fixing of bit to the bit holder

- Bits for our smallest range of HAD tools (50 Nm) are locked to the bit holder with a spring pin.
- Bits for all other HAD tools, e.g., 100 Nm, 200 Nm, 370 Nm and 600 Nm, are locked to the bit holder with a grub screw.

NOTE: Torx®, Torx Plus® are registered trademarks of Acument Intellectual Properties. LLC.

2.4 Screw holders for HAD angle head power tools

As explained in *Section 1.2*, the screw holder is the part that holds the tip of the screw while tightening.



This image shows a screw holder for a Double Hex male screw tip.

The **screw holder** can have different output profiles, including Hex, surface drive, Double Hex, Torx®, or Two Flat, depending on which screw tip needs to be held.

Female Hex

Female Surface Drive

Female Double Hex

Female Torx

Female Two flat

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2.5 Best practices for standard HAD power tools

Atlas Copco has standard HAD power tools up to 600 Nm. There are five different standard interfaces depending on the torque level and angle head. The different interfaces are defined based on the different maximum torque levels that the angle head can be used for.

The different HAD interfaces are: 50 Nm, 100 Nm, 200 Nm, 370 Nm, and 600 Nm. For example if you have a tool that is specified for a maximum torque of 30 Nm, then you should use interface 50 Nm. If you have a tool that is specified for a maximum torque of 180 Nm, then you should use interface 200 Nm.

The heads can be connected to both pneumatic and electric tools. In *Sections 2.5.1* to 2.5.3, we highlight the most important points to keep in mind when selecting a standard HAD solution from Saltus.

Example of HAD standard angle heads

50 Nm

100 Nm

200 Nm

370 Nm

600 Nm

Example of assembled HAD for power tools

2.5.1 Length of HAD sockets, screw holders and bit holders

HAD sockets, screw holders and bit holders are available in standard lengths and dimensions. You can find this standard range in the Atlas Copco catalog *Industrial Tools and Solutions*, under the heading "Optional Accessories for Hold and Drive tools".

There are **three different standard lengths available for HAD solutions: 33 mm, 53 mm and 73 mm**. This is how far the socket extends outside the angle head. The socket extension is measured from the bottom of the nut to the end of the socket.

Socket Extension A

Socket Extension B

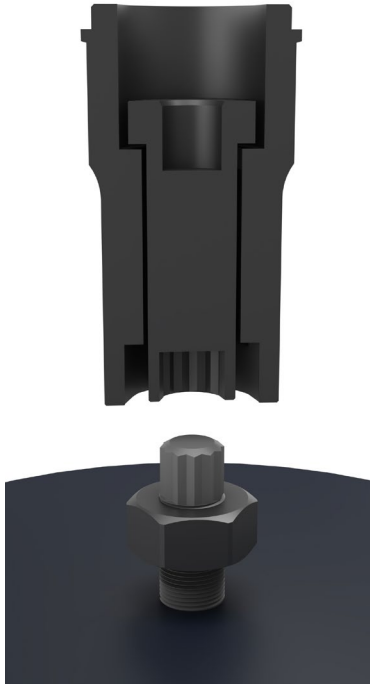
Socket Extension C

The Socket Extension length (A,B or C) is the most important measurement when configuring a standard HAD solution. Based on this length you can configure a complete HAD solution. HAD solutions can also be customized and supplied in special lengths on demand.

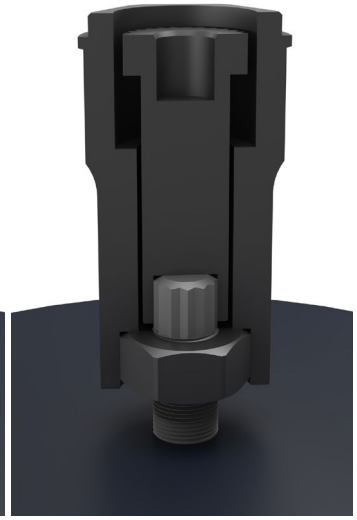
2.5.2 Travel for screw holder

The maximum travel for most HAD angle head power tools is 30 mm. Tools with 40 mm travel also exist.

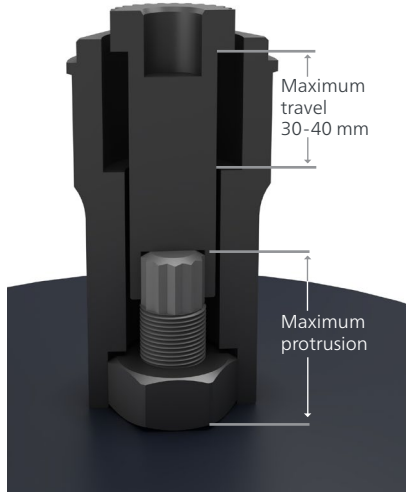
The necessary screw holder travel is determined by the screw's protrusion from the joint, after tightening. See the maximum protrusion in the end position picture below. If the protrusion is longer than the standard screw travel (30 mm or 40 mm) then a customized HAD solution will be needed.



Start position



Gripping screw holder and nut



End position

DID YOU KNOW?

In order to ensure full grip of the holder, it is important for the nut to be securely fastened on the screw before you start tightening with the HAD power tool.

NOTE: You will rarely need more than 30 mm travel. The maximum protrusion of the screw is measured from the base of the nut when it is completely tightened.

2.5.3 Extension of the screw holder[1]

The extension of the screw holder (E in the picture) refers to how much the screw holder extends from the HAD socket. A certain amount of extension of the screw holder from the HAD socket makes it easier to grip the tip of the screw; it allows the operator to see the screw holder and the tip of the screw.

Normally the screw holder protrudes in the range of 0-5 mm for Saltus standard HAD solutions.

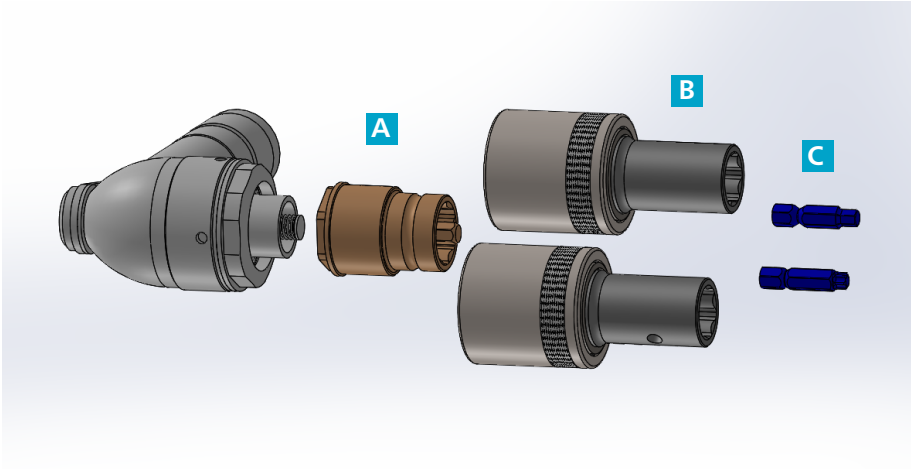
The extension of the screw holder has a negative impact on travel length. If travel is critical, the screw holder may have to be recessed (negative extension) in the socket.

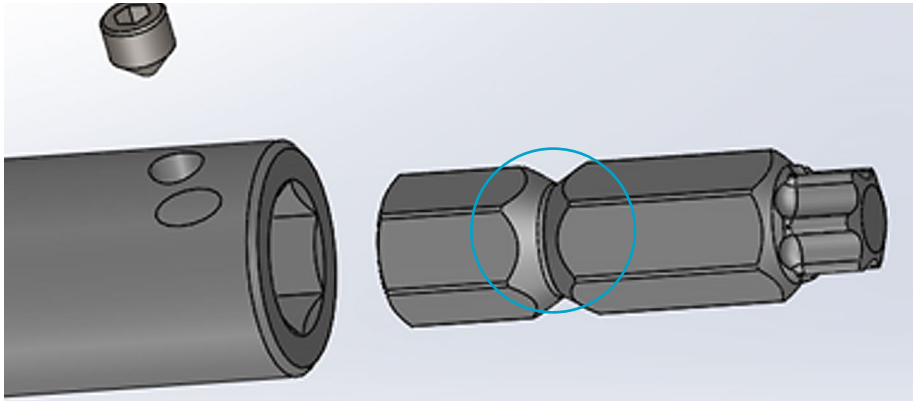
E = Extension of the screw holder

[1]The same applies if a bit is used to hold the tip of the screw

2.6 HAD Quick Change solutions for angle head power tools

For some assembly situations a specially designed or customized solution can further improve process efficiency. An example of this is Quick Change solutions for HAD socket/bit combinations. Quick Change solutions can serve two joints with different socket/bit combinations using only one power tool. A Quick Change base unit (A) is mounted permanently on an Atlas Copco ETV HAD tool. On top of this base unit, different change sockets (B) can be mounted. The change socket (B) has an integrated Quick Change coupling and can be fixed on and removed easily from the base unit. A bit holder which takes the bit (C) is integrated into the change socket as well.





Attention: Some applications require a bit with an extra groove. Quick Change solutions for HAD are an example of this.

2.7 Special HAD angle head power tools

If you cannot find a HAD solution in our standard range, then you need to have a customized solution which we can make on special request. For example you might need a longer socket, longer travel or another output profile for the holder or the socket. To get the best solution, you will need to share information about the tightening application. The pictures here show two typical screw joints. The first shows one with a **male screw tip** and the second with a **female screw tip**. A **few important measurements** are needed in order to define the special HAD solution:

1. Tool and tightening torque

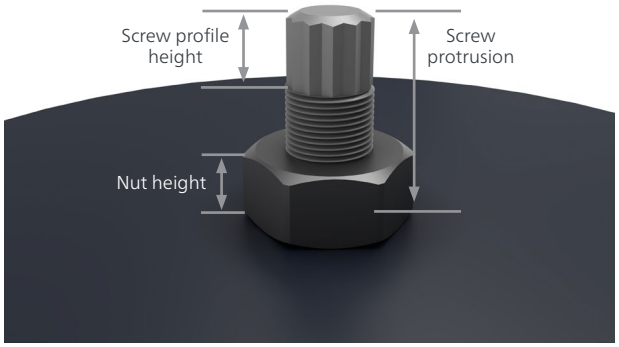
HAD torque: 50 Nm, 100 Nm, 200 Nm, 370 Nm or 600 Nm

2. The nut

- Nut size (for example: across flat 13 mm)
- Nut height

3. The screw

3a. Male screw tip



- Screw profile and size, for example: Double Hex 6 mm


Male Hex


Male Double Hexagon


Male Two Flats


Male Torx®

- Screw profile height, for example, 8 mm
- Screw protrusion, for example, 25 mm

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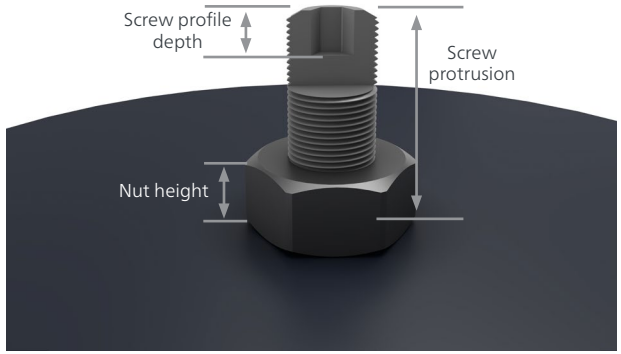
3b. Female screw tip



- Screw profile and size, for example, female Hex 5 mm


Female Hex

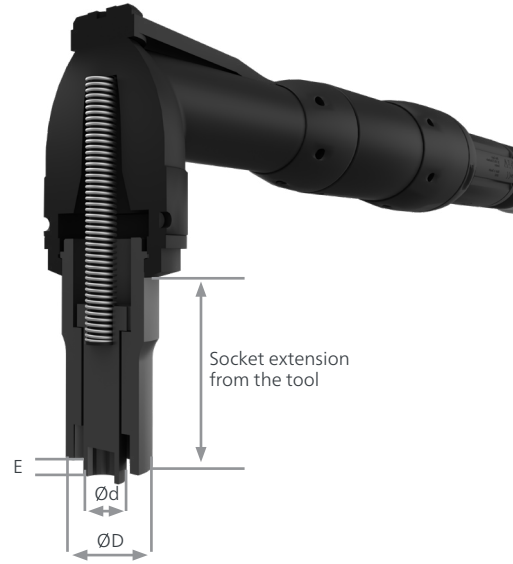

Female Torx®

- Screw profile depth, for example, 8 mm
- Screw protrusion, for example, 25 mm

Note: Make sure to define the measurements only when the screw-joint is fully tightened.

4. Socket and holder

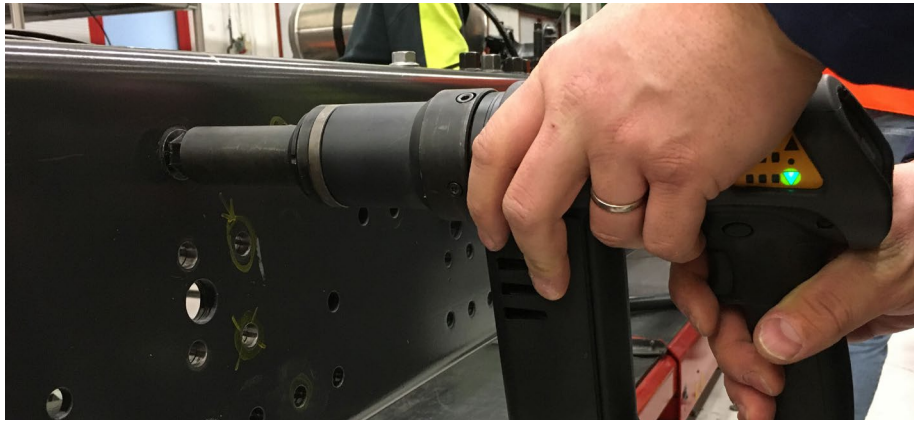
- Socket extension from tool
- Holder or bit extended/ recessed (E) from the socket (see *Section 2.5.3*)
- Socket outer diameter (D)
- Holder outer diameter (d)



NOTE: Torx®, Torx Plus® are registered trademarks of Acument Intellectual Properties. LLC.

03 Reaction-free HAD power tools[1]

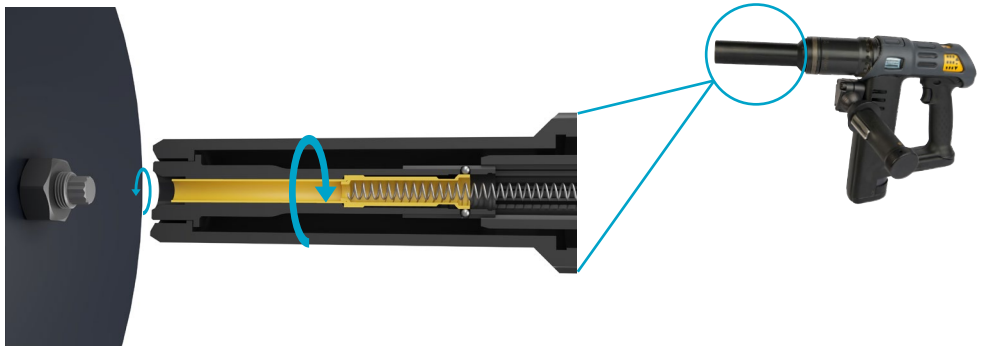
Atlas Copco has developed a new generation of reaction-free HAD power tools for a safer and more ergonomic work environment. These tools are commonly pistol type but can also be angle head tools. Saltus has matching HAD sockets, screw holders, bit holders and bits for reaction-free HAD power tools.



3.1 Tightening principle for reaction-free HAD power tools

In reaction-free HAD tools, both the screw holder and socket rotate. During the rundown phase, the screw holder rotates the screw counter clockwise, pulling it towards the tool, while the socket remains stationary.

When it has reached the tightening phase, the opposite is true; the socket rotates clockwise while the screw holder remains stationary, acting as the reaction arm.

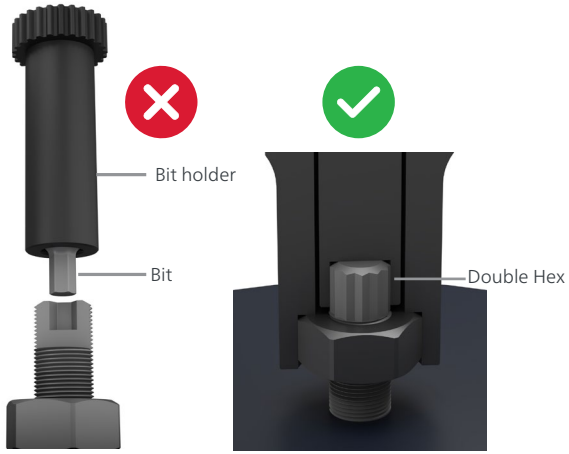


[1] In reality, reaction-free HAD power tools do cause a small reaction torque. This is caused by the motor driving the tool. However, the force is negligible and will not disturb the operator.

For reaction-free HAD power tools, the full reaction torque is taken internally by the screw holder and transferred to the screw tip. Therefore, both the screw tip and the screw holder must be designed to manage a high level of reaction torque.

For a durable reaction-free HAD tool solution, a male Torx® or Double Hex screw tip is needed. A male Two Flat is (most likely) not enough to manage this level of reaction torque. Neither is a bit or bit holder durable enough for reaction-free HAD applications.

A bit is not strong enough to hold the screw tip in applications where reaction free tools are used. A male Torx® or Double Hex screw tip will be required.



An example

Below you can see two examples of HAD screw tips: Two Flat and Double Hex. The Two Flat screw can only be used for HAD power tools where the reaction force is taken up by the tool and the operator (see *Section 2.1* through to *Section 2.7*). It must be noted that when you use a reaction-free HAD power tool you must use a screw with a more durable tip profile like a Torx® or Double Hex.

The advantages of this reaction-free HAD system become apparent when taking into consideration the ergonomic factors of high torque applications.

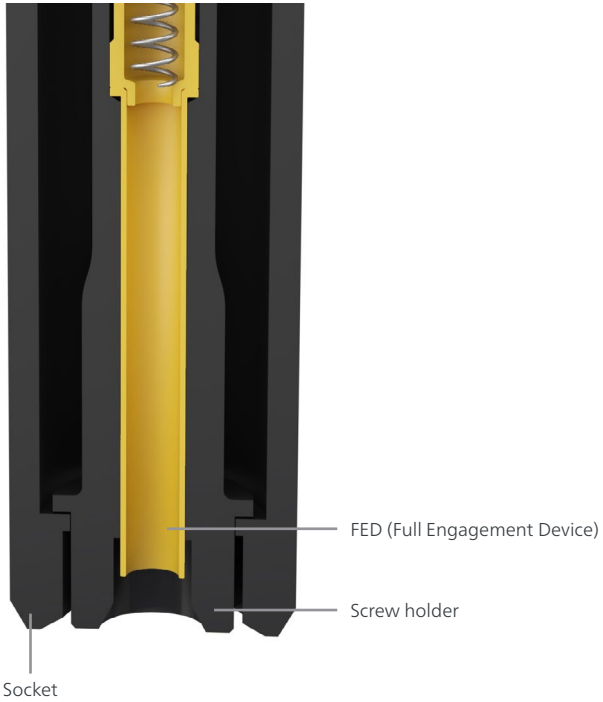
Two Flat screws should not be used for reaction-free HAD power tools

For reaction-free HAD power tools, use a screw tip that can better distribute the force, like a Torx® or Double Hex

3.2 Full Engagement Device (FED)

To improve the durability of the screw holder, all reaction-free HAD screw holders are equipped with an FED. This ensures that the screw holder fully grips the screw tip before tightening starts.

As stated previously, the full reaction force is applied to the screw holder. Without full grip of the screw tip, there is a high risk of screw holder or screw tip breakage.



The FED prevents the screw holder from moving more than a few mm axially until it has been pushed in by the screw tip. Only after the FED has been fully pushed in can the screw holder travel enough for the outer socket and nut to mate.

If the screw or screw holder breaks, the operator will not be subjected to any reaction force; the tool will just spin internally.

3.3 Examples of reaction-free HAD tools

Reaction-free HAD tools are available in pneumatic, electric, pistol and angle head versions of power tools.

Pistol grip tools

Pneumatic (LTP)

Electric (Revo)

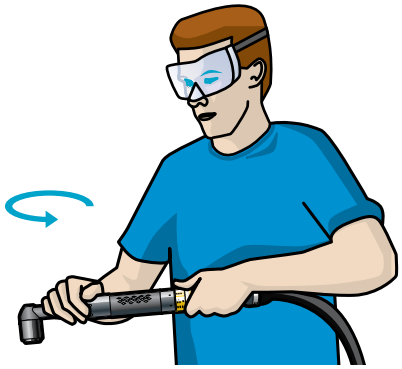
Angle head tools

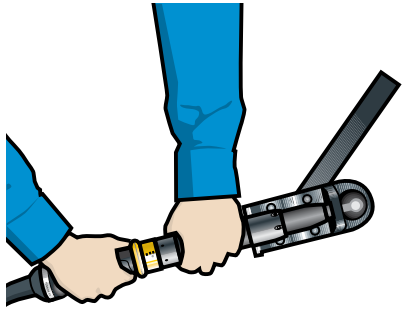
Pneumatic (LTV)

Electric (ETV)

04 Reaction torque

When using any power tool you have to contend with a counter reaction force. When the reaction force is manageable, it can be handled physically by the operator. When it is higher, a reaction bar will be needed to absorb the force. Also when using tools with HAD, this reaction force has to be handled in exactly the same way as you would do with any power tool.





DID YOU KNOW?

With HAD power tools, it is extra important to properly manage the reaction force. This is because when the full force of the torque travels through the screw tip and the screw holder, it could result in breakage of the screw tip or the screw holder. If you do not properly manage the reaction force with a reaction bar or manually, the screw tip and the screw holder will have to bear the entire reaction force.

Breakage of the screw tip or the screw holder is a matter of material consumption and also a safety risk.

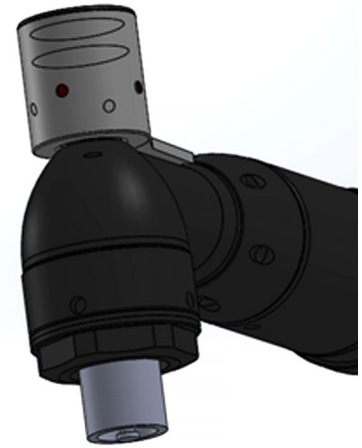
You should never let go of the tool during operation. This is because breakage of the screw tip or the holder could result in an immediate torque reaction which could cause injury unless the tool is safely secured from turning around.

These photos show an unused and a broken Two Flat screw tip

4.1 Friction clutch

For cases where the reaction force cannot be completely absorbed by a reaction bar or the operator, we have developed a friction clutch that will release the holder as soon as a certain applied torque value has been reached. This threshold torque value can be pre-adjusted in the clutch (normally between 15 Nm and 30 Nm). We can offer the friction clutch for HAD interfaces 100 Nm, 200 Nm and 370 Nm. The threshold torque value is normally set to between 10 Nm and 50 Nm depending on the HAD interface you are using.

This friction clutch device will decrease the risk of holder or bit breakage. Furthermore, it will reduce the risk to the operator from any unexpected reaction force in the event of breakage.



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