

THREAD CUTTING



They are two different types of threads, an INTERNAL thread and an EXTERNAL thread.

On a working drawing a hole to be drilled will be shown as $\varnothing 4$ or $\varnothing 5$ but a thread will read as M4 or M5

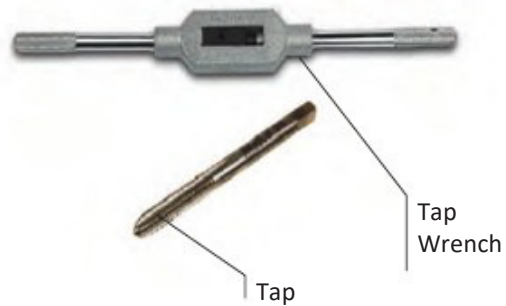
INTERNAL THREADS




Internal threads are found on the inside of a nut.

For cutting an internal thread we use a tap and tap wrench.

There are three different types of taps we use:

- 1) Taper Tap
- 2) Second Tap
- 3) Plug Tap



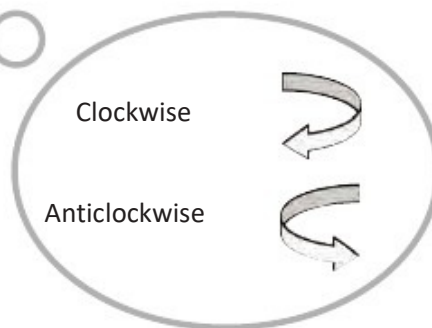
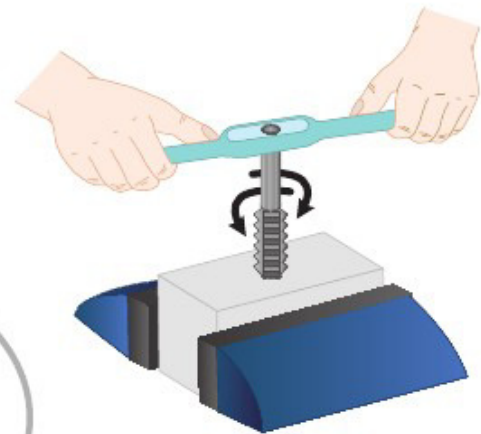
Taper Tap	Second Tap	Plug Tap
		
Since it is tapered at the top it allows us to start cutting the thread gradually	Less of a taper at the end so it cuts more of a thread	Used for finishing the cutting of a thread or for threading blind holes

Can you remember the chart for drilling sizes for tapping holes in the drilling chapter?



Steps for tapping a hole

- Drill the hole needed for the thread to be cut (remember holes are drilled smaller than the size needed to be threaded)
- Start with the taper tap and place it into the tap wrench
- Put the tap into the hole and make sure it is perpendicular to the piece
- Start turning the wrench until you feel it cutting into the piece
- Once this happens turn the wrench half a turn (180°) clockwise
- Then turn it back quarter of a turn (90°) anticlockwise
- By doing this, the waste is removed and the tap is prevented from breaking
- Continue this until the tap has gone down through the hole
- Repeat this with the second tap and plug tap



EXTERNAL THREADS

External threads are found on screws and bolts.

For cutting an external thread we use a stock and die.



Steps for threading a bar

- Unlike internal threading, if we need to cut an M5 thread on a bar then we use a $\varnothing 5$ mm bar
- Put the die into the stock
- File a small chamfer on the bar to help the die to grab the bar
- After that, the process is the exact same as cutting an internal thread
- Make sure the stock and die is perpendicular to the bar
- Start turning the stock until it cuts into the piece
- Once this happens turn the stock half a turn (180°) clockwise
- Then turn it back quarter of a turn (90°) anticlockwise
- By doing this, the waste is removed and the die is prevented from breaking
- Repeat this until is cut the amount of thread needed

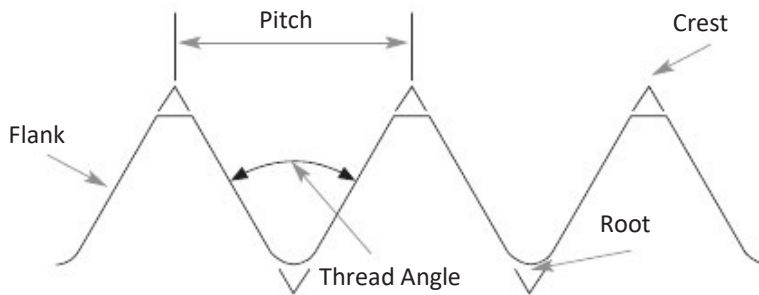


There are a number of different types of threads used worldwide.

The most commonly used thread is the ISO METRIC thread.
The angle of this thread is 60°



THREAD TERMINOLOGY



- Flank - Straight part of the thread between the root and crest
- Pitch - The distance between two equal point
- Crest - the highest point on the tread
- Root - the lowest point of a thread
- Thread Angle - the angle the thread makes

TYPES OF THREADS

Thread Type	Thread Angle	Use	Diagram
Isometric	60°	Most common thread used internationally	
Buttress	45 °	Used in woodwork bench vices	
Square	90°	Used in screw jacks	
Acme	29 °	Leadscrew on a lathe	

QUESTION TIME



- 1) From a working drawing drawing, how is it decided whether to drill a hole or to cut a thread?
- 2) What is a plug tap used for?
- 3) In your own words, describe how to cut an internal thread
- 4) Why is it important to turn the tap or die back a quarter turn when threading?
- 5) In your copy:
 - a. draw the shape of the thread and label each part
 - b. Explain what each part is
- 6) For each of the following, name the size of the thread angle and a use for the thread:
 - a. Acme thread
 - b. Square thread
 - c. Buttress thread
- 7) On an A3 sheet, design a poster that shows the different types of threads.
- 8) On an A3 sheet, design a poster to compare internal and external threads.

JOINING MATERIALS

Words you might not know

Expands - Makes bigger



When joining material we can temporarily join them with nuts and bolts or screws, or else permanently join them by welding, riveting, brazing, or gluing them.

Screws

Screws are used for joining parts together. They do not need a nut to hold the pieces together but a nut can be used if needed. Below are some examples:

Hex Head Screw	Grub Screw	Cheese Head Screw	Round Head Screw
			

Nuts and Bolts

Unlike a screw, a bolt needs a nut if it is being used to join two pieces together



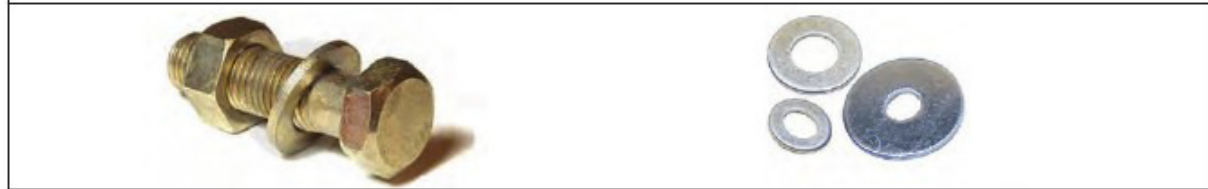
Nuts

Nuts are used with screws and bolts to hold pieces together. Below are some examples:

Wing Nut	Lock Nut	Castle Nut and Pin	Plain Hex Nut
			

Washers

Washers are put on before a nut to stop the piece getting scratched when tightening the nut.



We have looked at the most common ways of temporarily joining parts together.

Now let us have a look at some ways we can permanently join parts together.



RIVETING

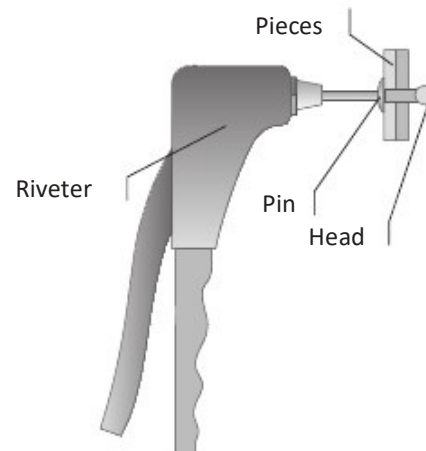
Riveting is a permanent way to join parts together.

The most common form of riveting is pop riveting.

Pop rivets are useful for joining light materials.

The pop rivet fits in to the riveter and when the handles are squeezed together the head of the rivet expands.

After one or two squeezes the head snaps off the pin and the pieces are then held together.





Roll of solder

Electric Soldering Iron

Copper Tip


SOLDERING

Soldering is joining two pieces of metal together with an alloy called solder.


Both joining pieces are heated up with the electric solder iron or gas torch. Once hot enough, solder is fed onto the hot pieces.

The solder melts and when it cools it turns hard again which joins the metals together.

Solder can also be used to join wires together, for this a light soldering iron can be used.



Great care must be taken when using the soldering iron as it gets very hot and you could burn yourself or others with it.




Can you remember what metals make up the alloy solder?

Why do you think copper is used for the tip

How to solder two pieces together

- Make sure both pieces are clean
- Place the two pieces together with no gaps
- Dip the tip into flux to stop the solder from oxidising
- Place the tip of the hot soldering iron onto the joint of the two pieces and leave it there for them to heat up
Once hot, feed in the solder into the joint
Wait for the solder to melt and spread onto the joint
- Take away the iron and allow the solder to cool and turn solid again
- The pieces are now soldered together
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In rugby, did you ever hear the referee shout “crouch, touch, pause, engage” before a scrum?

This can be used when you are soldering.



Crouch = lean in over the pieces

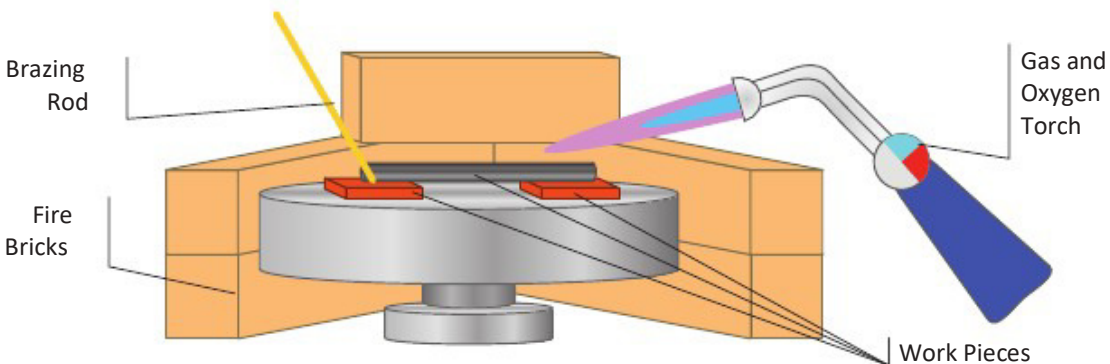
Touch = touch the hot iron off the pieces

Pause = leave the metal heat

Engage = feed in the solder

BRAZING

Brazing is where two pieces of metal are joined with brass. The work pieces are heated with an oxygen and gas flame. Once hot enough, a brass rod is touched off the joint, it melts and then cools to make the joint.



Great care must be taken when brazing as it gets very hot and you could burn yourself or others with it.



Can you remember what metals make up the alloy Brass?



How to braze two pieces together

- Make sure both pieces are clean
- Build up fire bricks (as shown in the above picture) in the hearth as they will reflect the heat
- Place the pieces to be brazed in the middle of the firebricks
- Heat up the metals with the torch
- Heat the rod and dip it into the flux
- Feed the rod into the joint where the metals are to be joined
- Once the brass spreads over the joint let it cool down
- When the brass has turned solid again the pieces will be joined

You might need to dip the metals in water to help cool them down. Be careful not to burn yourself on the metal and the steam that will come from dipping the metals in water.



QUESTION TIME

- 1) Why would somebody want to temporarily join something together?
- 2) What is the difference between a screw and a bolt?
- 3) What is the function of a washer?
- 4) In your own words, describe how riveting works
- 5) Describe how to solder two pieces together in your own words
- 6) Describe how to braze two pieces together in your own words
- 7) What is the purpose of the fire bricks?
- 8) Why is care needed when dipping the hot metal in water to cool it down after brazing?
- 9) Make a list of health and safety rules that could be used when soldering or brazing
- 10) How can "crouch, touch, pause, engage" be applied to soldering?

