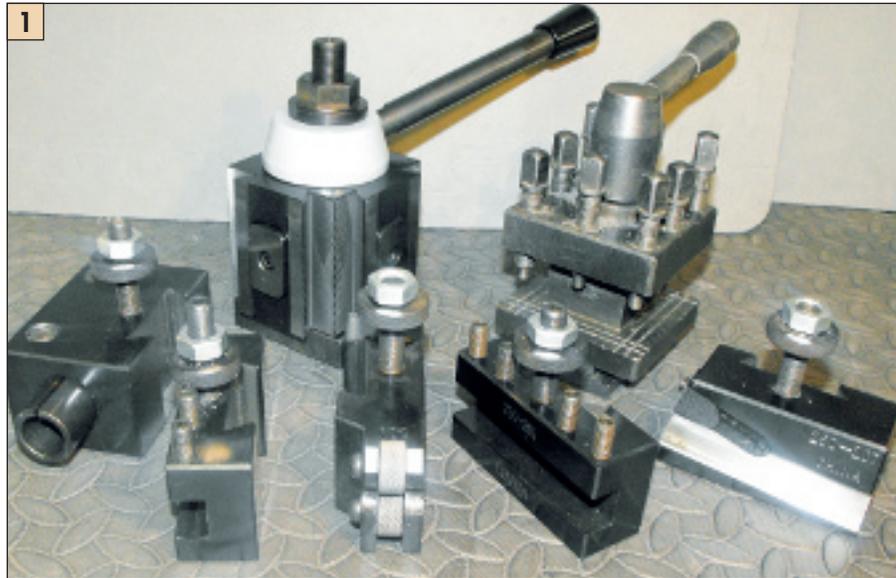


QUICK CHANGE TOOL POST

Mike Haughton describes his installation and use of a commercial Quick Change Tool Post on his Chester UK Craftsman 6in. (300mm or 12in. swing) lathe.



The typical starter pack comprising a tool post and five tool holders.

The import tool post system that I installed some time ago on my lathe is shown in **photo 1**. This is a typical starter pack comprising the tool post and five different tool holders. The four way tool post originally supplied with the Chester UK Craftsman lathe is shown at the back right, for size comparison. The starter pack of five different tool holders comprises, from the front left, a boring bar holder, a Vee tool holder, a knurling tool holder, a standard or square tool holder and finally a wedge type parting blade holder. The QCTP system described here came from Arc Euro Trade (**ref 1**) and is their size 200 and very clearly marked 'China'. Many of the other importers offer similar items in different sizes to match the lathe size (centre height). You may find these described as AXA, BXA, CXA, CA, DA etc., all names that come, originally, from the Aloris Tool Technology Company, USA. (**ref 2**). This company claims to have been the inventor of the QCTP in 1946.

Advantages of a QCTP System

Many readers will remember the Myford style, boat shaped tool quick setting system (**photo 2**). These are a couple of very old boats and tools with a shaped recess underneath. I found these at the back of my lathe tooling draw. My ML7 has long since gone. These tools were quick to adjust but lose their tool height setting once removed from the top slide. A similar boat shaped adjustment is used on some of the 'rocker' tool posts that can be fitted to some smaller import mini lathes from Sieg e.g. the C3.

As far as I'm aware the Myford boat seated tools were made from HSS butt welded to a carbon steel shank. Every time the tool is re-sharpened or indeed removed from the tool post, the boat has



The old Myford style boat shaped tool quick setting system.

to be reset. Once brazed carbide and insert tooling became more available, this boat style tooling seemed to fade away. Any sort of carbide tooling needs to be very precisely adjusted for height and the boat system isn't really up to it or the time setting is too long to get a good result. My Chester Craftsman, made in 1999, was delivered with the four way tool post as shown in photo 1. At first this seemed like a big improvement; it was very solid and indexed around quickly but in reality you can seldom deploy four tools as they get in each other's way and there is the need for sets of packing strips for each tool. Packing strips have to be adjusted when the tool is re-sharpened.

Having since abandoned the four way tool post and gone down the QCTP route I find that I now have around 25 tool holders to choose from, all with individually set tool heights that just drop into position in seconds. I now change the tool holder to get the best machining outcome, rather than compromise with a

OVERVIEW

This is a size of lathe that doesn't seem to get much attention in these pages; they are widely sold in large numbers so the author hopes this article will redress the balance a little. Even if your lathe is smaller, or bigger, the QCTP systems described here could improve the accuracy of your lathe work and save you a lot of time.

smaller number of tools. I certainly wouldn't want to go back to any of the other systems described above.

Of course, 25 tool holders and the tool post represent a considerable investment. In general a particular centre height tool post will only accept its designated tool holder and in addition there are a lot of QCTP systems available and many tool holders are not interchangeable between systems.

Which QCTP system to go for?

This is an interesting problem since the choice of system seems to be almost a nationality thing and can raise some heated debates. In the USA Aloris and Dorian Tool (**ref 3**) are well known but seldom appear in the UK. In the UK we see a lot of Dickson Quick Change and occasionally the 40 spline Swiss Multifix, the similar looking but not interchangeable German Drehblitz or the Swiss Tripan. There are also the Swiss Boni and the Italian Rapid. I'm sure there are, or were, more producers than that before the rise of Asian producers and the move of manufacture of many well known designs to Asia. Who can afford to make anything, other than luxury goods, in Switzerland at the current exchange rates and their cost of living? (I have a Daughter domiciled in Switzerland.)

The large UK supplier of Chucks and Tooling, Rotagrip (**ref 4**), has details of the Multifix and Dickson systems on their website. These have always been expensive systems from any source. If you can buy a used Dickson Quick Change tool post and tool holders that fit your lathe I'm sure you won't be disappointed, but you may be a good deal poorer. You might even pass them on to your grandchildren! Care is required with used Multifix systems I am told, because they can wear to cause alignment problems when the splines wear.

Dickson are now part of the 600 Group, along with Harrison, Colchester, Clausung, Pratt Burnerd, Gamet Bearings and Crawford Collets etc. Quite a line up! Good quality Dickson style tool holders have been made by other UK small manufacturers for many years. Polish Bison look-a-likes are also available from Rotagrip. Dickson-like systems are now imported from India and China. According to the www.lathes.co.uk website and chatter on the www.model-engineer.co.uk website and elsewhere on the internet, some of these imports can be a disappointment in terms of fit and hence movement under heavy cutting loads.



The Dickson Quick Change uses a piston to pull the tool post back onto the vertical shears. The Aloris wedge style utilises a dovetail and a sliding wedge driven by a multi-start helical screw. Type 'Aloris' into any search engine if you would like more details.

In the past, I made a QCTP following the design by Len Mason in *Model Engineer*, 2 January 1970, for my ML7 that worked well but isn't as slick as the systems described above. You will find many other self build QCTP designs on the internet if you search for them. The system I chose is a piston and dovetail style from Arc Euro Trade (ref 1). **Photograph 3** shows the internal construction. To get this tool post apart it is necessary to loosen the two pressure pads, rotate them through 90 degrees and pull the spring-loaded plungers outward with longer bolts. Once the springs are compressed the central eccentric cam can be withdrawn (the grey component in the photo). All the component parts were very nicely made. At this stage the mounting plate had not been machined to fit my lathe top slide. The tool post has only two tool positions, but I have never found this to be a problem in use because you can swivel the post around to any position and only one tool holder can be fitted at once. The M16 hex nut secures the tool post body in any position and the cam lever independently tightens the tool holder by forcing the pistons and pressure pads outward against the female dovetail in the tool holders.

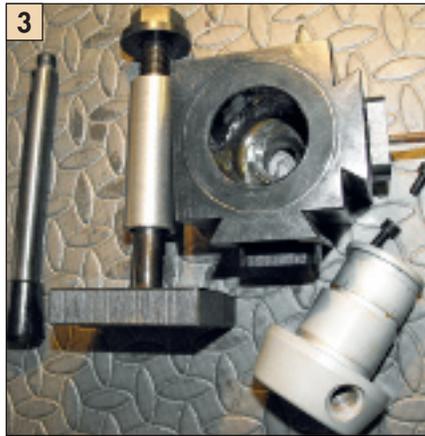
Machining the tool post mount

The four way tool post mount and the new one are shown in **photo 4**. The new post (right) is considerably taller than the original and it has no indexing slots; these can be seen on the base of the four way tool post on the left. The new universal mounting plate proved to be hardened steel and I milled the steps with a brazed insert carbide end mill to produce a tee nut that fitted the top slide slot. I have seen these machined round on a lathe but I decided the loss of contact area was a risk to the top slide casting. Whichever style to go for, you are aiming at a tap in fit with the top of the mounting plate just below the top slide surface (**photo 5**). The tee nut is held in position by two grub screws on my lathe. Your lathe and QCTP may dictate a different style of mounting post. In **photo 6** you can see a similar sized import lathe with the four way tool post replaced with a Dickson style QCTP that requires a stepped mounting post. Your mileage may vary, etc. Have a look at your lathe tool post mounting before purchasing. Notice that this post mounting has been turned round.

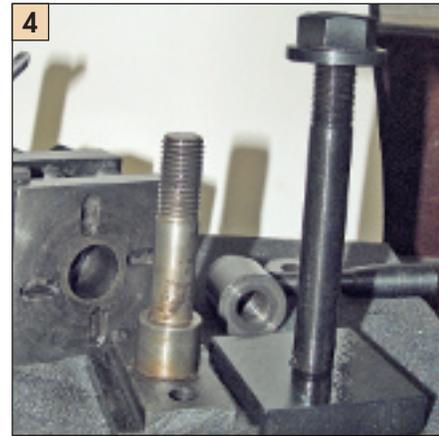
In Use

First impressions were that this was a very solid and versatile QCTP but quite a bit taller than the one it replaced. I could have gone with the smaller model 100, but this will only accept 1/2in. shank tools and I have a lot of 16mm (5/8in.) tooling. I have not found the two tool positions or the loss of indexing by 90 degrees a problem. The tool post is nicely machined, hardened and ground on most surfaces with all the edges chamfered where you might catch your hands.

Take advice from the supplier on the most suitable model for your lathe. I started with the starter pack shown in



The internal construction of my piston and dovetail type QCTP.



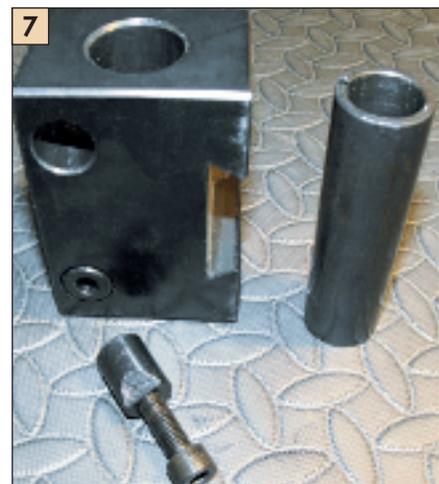
The four way tool post mount (left) and the new tool post (right).



The top of the mounting plate is just below the top slide surface.



The Dickson style QCTP requires a stepped mounting post.



Two split collets are used to mount the boring bar holder.

photo 1. What follows are a few comments about the usefulness of the five holders in this pack.

i) The boring bar holder

The boring bar holder looked, at first, a monstrous size but has actually proved itself many times when I need to bore deep holes. It is surprisingly rigid. **Photograph 7** shows the method of mounting the boring bar with a sleeve and two split collets. As supplied the boring bar holder has a capacity of 1in. or 3/4in. diameter bars but it is a simple matter to make a new split sleeve to accommodate another diameter, e.g. a metric bar. The 1in. diameter is big enough and long enough to take a Morse taper socket adaptor. Arc Euro Trade sell 1in. OD ones

with numbers 1 and 2 Morse tapers and a number 3MT looks possible should you want to make one. With care, this gives the possibility of power drilling or reaming from the tool post rather than manually from the tailstock.

ii) The Knurling tool

The knurling tool is a strange device; I notice Arc Euro Trade don't sell it as a separate item. You will see very similar designs on the Aloris website. The original gave poor results, the knurl pivots not being concentric. The supplier replaced it without quibble. The replacement works but I don't like the style as it stresses the lathe bearings more than the clamp type I often use. These are knurls that deform the workpiece and shouldn't be confused





8 This knurling tool has a slot which will accommodate an additional tool.

with the commercial types fitted to many automatics that cut the knurled pattern.

You will notice that the knurling tool shown in **photo 8** has a slot for another tool and this has proved useful for working close to the tailstock centre or for a smaller boring bar. The slot will take a 16mm or smaller tool shank.

iii) The Parting off Tool

Again, this is a slightly unusual style with the clamping force supplied by a screw driven sledge on an incline (**photo 9**). The clamping screw is left hand from one direction and right hand from the other! Care is needed to make sure the front of the adjustment screw doesn't protrude beyond the block's front face. The blade holder ramp is at an angle of four degrees.

The HSS parting off blades supplied by Arc are marked $\frac{3}{32}$ in. thick, $\frac{5}{16}$ in. high and 5in. long and are not wedge shaped (they are parallel sided with flat tops and bottoms). As supplied these blades didn't part off very well but I found that re-grinding just the front face on a diamond wheel at the supplied angle of 10 degrees gave a big improvement and I could power part off softer steels up to about 30mm diameter at 300 rpm with a strong soluble oil (1 to 8 dilution). The blade shown in photo 9 has been modified at the cutting edge for reasons given later. The parting off tool holder can be used to grind these blades in situ. The holder has nice square faces that can be securely held in one of the 2in. three way vices I use on my Clarkson tool and cutter grinder. Using this set-up, accurate angles can be set and, if a No. 200 diamond wheel is used, mirror like cutting surfaces can be produced. For parting off difficult materials or larger diameters I still prefer inserted carbide tips in a spring blade. Unfortunately the one I use is 25.4mm high and won't fit into this holder. 16mm blades are now available but I have yet to try one. In theory this parting off tool holder should be able to clamp any blade with parallel top and bottom edges. I have a J.J.Churchill P3-N Emprite (12% Cobalt HSS) Tee shaped and hollow ground parting off blade that fits the tool holder. After sharpening on the diamond wheel it seems to cut really well under power. This blade is only 1.5mm wide so side cutting is inadvisable.

Modified parting off blades

In a number of attempts to 'improve' the cutting of these $\frac{3}{32}$ in. (2.4mm) wide



9 Re-grinding the parting off blade gave a considerable improvement.

Arc Euro Trade blades I sharpened one to a Vee point and found it to cut rather better, but it left a pip on both parts when it broke through. However, I then found that the Vee provided an excellent tool for adding the small left and right-handed chamfers that you often add at the end of machining a component to 'break the edges'. **Photograph 10** shows a three way vice set up with the tool holder in the jaws. Hidden behind the tool block is the digital angle indicator I use to set the vice angle to six degrees before mounting the tool holder block. I used a square mounted in the vice to set the jaws at right angles to the face of the cup wheel. Despite the side thrust on the blade when chamfering, causing the blade to bend slightly, the side force has never caused the blade to come out of the holder, or to break. The chamfer surface finish is usually very good.

Screwcutting with parting off blades

Faced with a difficult threading operation on a component with very limited access due to the chuck jaws on one side and a large shoulder on the other, I ground up one of these parting off tools to a 60 degree point and gingerly cut a thread by feeding the tool in at 90 degrees to the work. After several passes I had a very good finish thread that just required a fine file to round over the thread peaks. Since that experiment I have cut a number of 60 and 55 degree threads in a number of materials with excellent results. The thread pitches have all been 'fine', say 20tpi or 1mm pitch or finer. I find the system works best with the tool fairly well extended which is necessary for my limited access trial. There is a slight bending due to the side pressure on the tool and it cuts mostly on the leading edge. **Photograph 11** shows a component screwcut by this method. The thread to the left is 40 x 1mm pitch and the one to the right 1.230in. x 20tpi. Try it and see how you get along - it works for me.

iv) and v) The standard and Vee tool holders

There is very little difference between these two, the Vee having a small Vee in the bottom of the tool slot that securely holds any round tool such as a boring bar. All of these tool holders have four M8 x 30mm dog point hex socket set screws which may annoy traditionalists who might



10 A three way vice with tool holder in the jaws.

prefer square heads. About the only quality issue I have found with these tool holders is the poorly made socket hexagons on two or three out of the 100 or so that I have. Adjusting the tool height with any of these holders is a dream with the knurled nut spring washer and hex nut supplied as standard. There is sufficient height in the tool post to let me use insert tooling upside down at the back of a large bore for boring and heavy thread cutting. As supplied, these tool holders will not accept tools with a shank greater than 17mm high. Even a 16mm tool will be at the bottom of the dovetail slide to be at centre height on my lathe. On odd occasions I have had to reduce the shank height by skimming a small amount off the tool base. This is probably a 'feature' of my lathe rather than the QCTP. Smaller tooling, either HSS or insert, is absolutely no problem as there is a lot of vertical adjustment in the dovetails to accept smaller tools. For some tool sharpening in the tool holders on the Clarkson I have to remove the 10mm height adjustment screw and remember to screw it in tightly afterwards. If the screw isn't tight the vertical adjustment can occasionally unscrew the screw.

I have read comments that these piston dovetail QCTP holders don't reset with the highest accuracy. This could be a problem with CNC lathes carrying out a lot of



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The parting off tool has cut this otherwise fairly inaccessible thread.

repeat machining of identical components; but most of these machines don't use this type of tool holder or tool post anyway. For a manual lathe doing model engineering and hobby type tasks the re-setability issue isn't a real concern.

A DTI holder

Photograph 12 shows a simple DTI holder I constructed that has proved to be very rigid and quick to use. I find it's more rigid and convenient than a magnetic base indicator and I have used it to estimate the re-setability of the QCTP on my lathe.

Using a plunger type clock with a resolution of 1 micron I can raise or lower the tool holder, with the piston lightly pressed against the dovetail to find the centre height of the part, lock the piston, note the DTI measurement, release the tool post piston, remove the tool holder and DTI and then replace it and relock and note the new reading on the DTI. If I do this with the carriage and cross slide locked, repeatability is around 10 microns or 0.0004 inch. I think this level of repeatability is acceptable with a manual, non tool room quality lathe. Details of the DTI holder I made are shown in **fig 1**. The only critical component is the split clamp, which follows the style championed by George Thomas in many of his designs. The clamp needs to be firm but not damage the delicate DTI stem. Although not shown here, there is no reason why you should not change the dimensions to suit other plunger and lever type DTIs. A quick look at my collection shows that 8mm or $\frac{5}{16}$ in. is

quite a common size with a few around $\frac{3}{16}$ in. and some lever types are 4mm or $\frac{1}{4}$ inch. I have used an overlap of the bores at right angles of 1mm, it doesn't sound a lot but it clamps the DTI firmly. I drilled the two holes undersize then opened them up and finally reamed them to size. If you use a round file to start the clamping surfaces on the brass/bronze clamping pads, it should be possible to complete them with a reamer in the other bore.

Other Tool Holders

Photograph 13 shows a small Coventry Die Head adapted to a Dickson type QCTP. It belongs to a friend who uses it under power, the gearbox being set to the pitch of the thread being cut by the die/chaser. (Incidentally, it's not as rusty as the photo suggests!) The user has convinced me that this is something I should be making. Internet searches will probably provide you with a host of other tool holders, both commercial and homemade. Once you have a good QCTP system the possibilities are endless.

Conclusions

A QCTP will save you a lot of time and give superior turning results with HSS or Carbide tooling. To get the most value from any system you should be prepared to buy a considerable number of tool

holders and adjust them to the centre height of individual tools. If you are setting off down the QCTP route, get a system that's the right size for your lathe's centre height, remembering that the tool post and tool holders are unlikely to be transferable to another QCTP system or lathe with a different centre height.

I have found the system described above to be well made and capable of taking very heavy cuts if required. It's been a good investment and I can return the lathe to its original four way tool post should I ever decide to sell it and move to a better lathe.

Because a QCTP system is a long term investment, you should consider who you are going to buy the system from. Are they likely to be around and willing to support their product should quality or spares issues arise?

If you would like to comment on the material I have covered in this article please consider writing to *Scribe a Line* or email me at mikehaughton@btinternet.com ■

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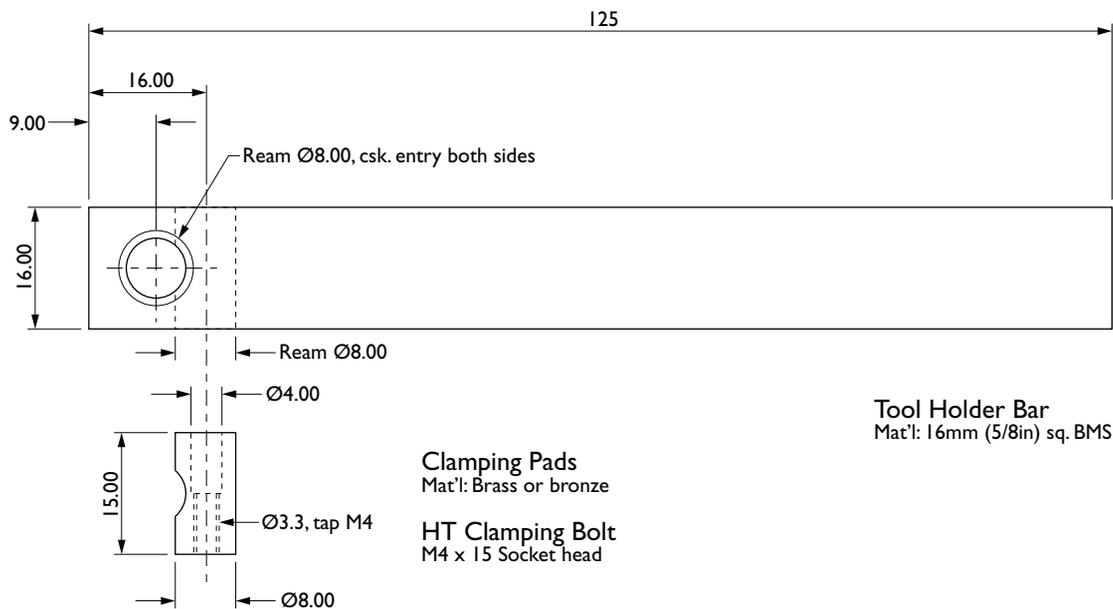


The rigid and easy to use DTI holder in use.



A Coventry diehead with a Dickson type holder, a possible future project?

Fig. 1



DTI Holder For QCTP