

Limits to OMAX accuracy

The nature of the abrasive jet limits the accuracy you can achieve from OMAX. The X-Y table can move the abrasive jet extremely precisely, but the final accuracy you achieve is limited by the abrasive jet itself.

As the abrasive jet pierces the material and moves, the shape of the jet changes. The OMAX software compensates for many of these changes in shape, but there are some areas where it cannot compensate.

The three main factors affecting the part accuracy are:

- Abrasive jet nozzle standoff
- Tool offset
- Abrasive jet stream

The abrasive jet nozzle standoff primarily affects the taper in the part caused by the abrasive jet stream. For best accuracy, the nozzle standoff should be 0.040" (1 mm) or less.

The tool offset can be measured and adjusted for in the OMAX control software. This is explained in the following section.

The characteristics of the abrasive jet stream, particularly taper and lack of perfect roundness in the stream, cannot be compensated for. They can, however, be measured and, where excessive, corrected by replacing the abrasive jet nozzle.

The shape of the cut surface is also affected by the jet motion. The major effect is that the jet forms a backwards curve as it moves through the material being cut. The OMAX software compensates for this curvature by slowing down for arcs and corners, thereby allowing the jet to assume a more vertical position.

Cutting at a low Quality of 1 allows a considerable bend in the jet even on an arc; in this case, it's assumed that you just want a severance cut and you will either machine that surface later or use it as is for a noncritical application.

A second effect of jet motion occurs at low speeds when the jet has more time to erode the material and, in turn, cuts a slightly wider path. For this reason, areas of fine detail and Quality 5 areas will have slightly more material removed, resulting in oversize holes and undersize parts. The experienced operator will use these areas for the kerf check measurement if they are critical to the part, then allow the rest of the part to be slightly oversize.

The following sections discuss the various factors that influence the accuracy of the OMAX.

The tool offset is one-half the kerf width of a part made with OMAX. Checking your tool offset regularly will help you get maximum precision from the OMAX Precision Jet.



For maximum precision in a particular part, you should measure the tool offset for the same thickness, material, and quality as the final part.

1. From the Make software, select KERCK3.ORD as the part to make.

2. Set the machinability and thickness for the material you will be using.

3. Change the tool offset to zero.

4. Make the part as you normally would.

5. Measure the kerf check part along each side.

EXAMPLE:

Part should have been	1.000"	2.540 cm
You Measure and get	0.970"	2.464 cm
Kerf Width therefore is	0.030"	0.076 cm
Tool Offset = ½ Kerf width =	0.015"	0.038 cm

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Monitor the tool offset as you work

You can monitor the condition of our nozzle and from time to time adjust the tool offset to keep your OMAX at maximum precision. Measure the parts that you are making in both the X direction and the Y direction. Record the error in these 2 directions. You will notice that as the nozzle wears, the jet gets larger and the parts get smaller. If the error is different in the 2 directions, your jet is developing an out of round condition (see the following section). After the error grows to where it makes a .002" undersize part, it is practical to reduce it by increasing the offset by .001". If the error is different in the 2 directions because of an out of round jet, you can choose to correct it in the most important direction or adjust for the average error, thereby making one dimension slightly oversize and the other slightly undersize.

Tips for ultimate precision:

- Cut your kerf check part out of the material you intend to machine.
- Choose the kerf check part that is the quality you intend to cut your final part from. The kerf check parts in the DEMOFILE directory are labeled KERFCHKX where x is the quality the kerf check was drawn in.
- If your part has many tiny details that require precision, measure the kerf at the little .1" (2.5 mm) tab at the end of the kerf check part.
- Choose to measure your kerf check either from the top of the cut, on the exit side of the cut, or in the middle of the cut depending on which dimension is most important on your final piece.
- You may find variance when you measure the kerf in different places. Some variance is normal. Decide if you want to just take the average value, the highest value, or the lowest value depending on your application.
- Measure the parts being made to check for gradual changes in the kerf width. Adjust the tool offset accordingly. For example, if your part is 0.002" (0.05 mm) undersize, increase the tool offset by 0.001" (0.025 mm).

Sometimes you need clearance:

- If you are cutting materials to be inlaid and you measure your kerf perfectly, you will find that you have a press fit. You may want to enter a smaller tool offset to over cut your part to create clearance. Similarly, if you enter a larger tool offset, you will leave extra material on your part for finishing.

As a rule of thumb: The bigger the offset, the bigger your part will be, and the smaller your holes will be.

Limits to precision

The kerf increases whenever the movement of the abrasive jet nozzle slows down. This is why there is a different tool offset depending on the

quality you select; the higher the quality, the slower the abrasive jet nozzle moves and the wider the kerf.

Even within a part, however, there can be changes in the kerf. OMAX slows down the abrasive jet nozzle when it encounters a corner in the part to ensure that the abrasive jet stream remains perpendicular to the material. This may result in a slight increase in the kerf, particularly with softer materials such as aluminum.

If you have a large run with many identical parts that require high precision, you may want to adjust the tool path to compensate for this slight increase in kerf. You will need to make the part and adjust the tool path on a trial and error basis.