Comparison of LPKF ProtoMat S103 and T-Tech QC-J5 Models

Highlighted explanations of Sole Source Part IB

Below is a comparison of the LPKF ProtoMat S103 and the T-Tech QC-J5 with a 100,000 rpm spindle, I have highlighted the most notable advantages provided with the ProtoMat S103. This document has been edited to provide an explanation of the highlighted required options found in the LPKF model.

**LPKF CircuitPro Software:**

-       Included with purchase of the ProtoMat E33, S43, S63 or S103 systems.

-       Allows for up to 10 downloads to allow data prep away from the machine

-       Includes Wizards to guide operator through application

-       The software will provide step by step procedure for creating the design with use of additional LPKF products (silver plating, lamination press for multilayer, solder mask stage, solder paste dispensing, reflow oven, etc.)

-       Help categories also included within CircuitPro for operations of the machine

(details are also included in the attached Sample Sole Source Spec document)

**Travel Speed:**

-       The LPKF ProtoMat S103 includes a 6” per second (360” per min) max travel speed which saves time on projects and is faster than non-LPKF systems; the QC-J5 notes only a 2.5” per second or 150”/min max travel.

* Description: Travel speed is necessary to combat the amount and size of projects being milled. Since the travel speed of the LPKF model is 2.4 times faster than the T-Tech model, we can expect the LPKF model to mill two times the amount of boards the T-Tech model can produce in the same amount of time.

-       The LPKF software algorithm for tool paths is also optimized to reduce movements of the head, keeping the tool in contact with the material whenever possible

**Resolution:**

-       LPKF ProtoMat S103 offers 0.02 mil resolution or 0.5µm. The QC-J5 notes only (0.00025”) or 0.25 mil resolution

* Description: Resolution applies to the size of traces that can be made on a board. With a better resolution, board designs can be minimized allowing students to print more boards per sheet of material.

**Z-Resolution:**

-       LPKF ProtoMat S103 offers a stepper motor control on the z-drive and 0.2 µm resolution; this is not provided for the QC-J5

**Repetition Accuracy:**

-       LPKF ProtoMat S103 offers 1µm control of the stepper motor z-drive; this figure is not provided for the QC-J5

* Description: Repetition Accuracy allows the placing and drilling of a component on a board to be more accurate. Due to the delicate size of traces and pads, accuracy of the motor and drill is necessary.

**Tool Change:**

-       LPKF ProtoMat S103 includes a 15 position tool exchange with stainless steel prongs for quick alignment of the entire tool bar. The included Fiducial Camera allows for registration of all 15 positions with one fiducial calibration. T-Tech also offers auto-tool change but with a collet design, the tool may need manually loaded within the head unit and then instructed to be places in the tool change positions. The LPKF prong systems allows for rapid manually insertion of the tools for rapid tool loading.

**Auto Tool Depth Sensing:**

-       With the LPKF ProtoMat S103, tools are touched to a point on the graduated ramp for auto-tool depth setting which corresponds with the copper weight. The tool can be set between 0.0mm and 1.8mm automatically based on the desired depth provided in the software by the operator. A second option allows for depth milling without this ramp; the tool can be touched to the surface of the material and then instructed to cut to a spec ific depth for deeper pocket milling or cutting.

-       The tool depth setting is different on the T-Tech QC-J5 models as a depth ramp is not provided so a contact foot may be used for cut depth control.

**Solder Paste Dispensing:**

-       With the LPKF ProtoMat S103, solder paste can be dispensed based on the design data with as small as 0.4mm pads. Compressed air would be needed to operate the dispensing feature; this feature is not offered on the QC-J5 models.

* Description: Solder Paste dispensing is used to create a pad for electrical components to be soldered onto. This feature is to reduce operator and user error. Without the feature, the operator/user would have to apply the paste to every needed pad. The accuracy is needed because pad sizes can be as small as a pinhead.

**Vacuum Table:**

-       With the LPKF ProtoMat S103, a replaceable porous but rigid insert with even distribution of the vacuum is applied to full 9” x 12” work surface. This allows the air to pull material flat and prevent shifting but also allows for the drill bits and router tools to enter the backing. Replacement inserts are available but many projects can be completed before flipping the insert or swapping it out.

-       The vacuum table on the QC-J5 includes holes in the aluminum surface and a backing material with holes to allow suction on the material. This may cause suction on soft PCB materials at a concentrate point and effect the tool cut depth negatively. The QC-J5 allows for 4 separate zones to be used but this LPKF Vacuum Table can be covered to focus suction on smaller sections of materials.

**Fiducial Camera:**

-       With the LPKF ProtoMat S103, a true Fiducial Alignment camera is included which relays the visual location of the camera which captures the outline of Fiducial holes or copper pads to the software to accept coordinates and align the material with the design data automatically. This can also be used for visual inspection as the viewing window allows measuring of spacing/traces or drill hole sizes.

-       The QC-J5 may only offer a vision camera for inspection of the cuts; manual fiducial recognition may be possible but may require the operator to “save” coordinates to instruct the software to adjust the position to match the board locations.

* Description: The fiducial camera is a necessary feature because it helps with the alignment process of the drill to the material. The camera also allows the operator to check for inconsistencies during the milling process.

LPKF originated PCB milling over 36 years ago and detailed above, our German engineered machines include a number of features which save time and money during R&D or prototype applications. These features allow for higher precision during the milling process (high quality spindle motors, faster travel speeds, fiducial alignment camera, auto tool change and auto tool depth setting (S63 and S103), etc.) and the new software is developed by LPKF in order to control the features and precision movements.