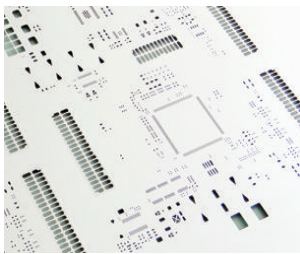


DCT DirectLaser M series

Laser Cutting System for Precise Processing of SMT Stencils M3/M6

M3- SMT professional stencil cutting equipment, Outstanding performance of software, hardware and operation

M6- Universal machine can help you to expand your business in various fields. combining both high quality and high efficiency.



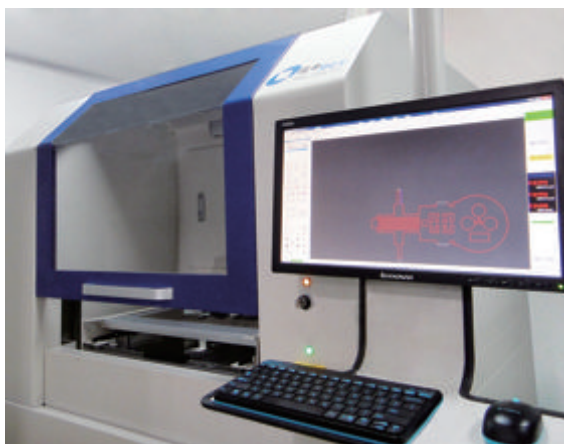
- Solid and ingenious design provides stable and reliable results, high speeds and high quality.
- Unrivalled software provides best in class data processing with functions newly upgraded to a higher level.
- Outstanding laser source. On demand processing - an ideal tool for producing first-class products.
- Easy operation. Wonderful user experience is a pleasure to use.
- Cost effective, high performance - the solution to all supply and processing difficulties
- Reliable after-sales service. Technical support and training provided.

It is said that the mold is the mother of industrial product. In the electronics industry, the SMT stencil is the mold for PCB assembly. The SMT stencil determines solder paste position, shape, quantity and to a large extent determines soldering quality. For this reason the SMT stencil is the most critical technology in the SMT industry. However, for quite a long time, SMT stencil manufacturing equipment could not meet demands of the market due not only to the high price of stencils, but also the lack of process improvements. One improvement which disappointed the industry most was that the software had not been updated after more than a decade.

With LKSoftWare GmbH, a shareholder of DCT, CircuitCAM7 is used with the DirectLaser M3 and has created an achievement of the perfect combination of software, application experience, and laser precision equipment technology. This dream machine of the industry, the DirectLaser M3 with the help of the state-of-the-art data processing capabilities of CircuitCam7 features incomparable quality and speed in SMT stencil cutting. Furthermore, the DirectLaser M6 can also efficiently cut ceramics and metal materials with high precision and quality. DCT equipment is easy to operate, while the reasonable price ensures you a low investment. The DirectLaser M series enjoys prominent performance and price advantages wherever it is used for SMT stencil manufacturing, or as a universal machine for structuring metals or ceramics.

Classic and solid design integrating high speed and quality

Machine design plays a key role in machine performance, especially for SMT stencil laser precise processing, machine structure has particular impact on machine performance.



SMT stencils are stainless steel sheets with thickness from a few tens of microns to a couple of hundred microns, in which openings are cut out so that soldering paste can be applied to solder pads on PCBs with screen printing technology.

In screen printing, the holes in stencils have basically two functions: one is that the soldering paste is passed through these holes and applied to the PCB pads beneath. This requires that the side walls of these holes must be smooth. Additionally, these holes require a certain taper, requiring that the top opening be smaller than the bottom opening so that the soldering paste can be easily released from the stencil.

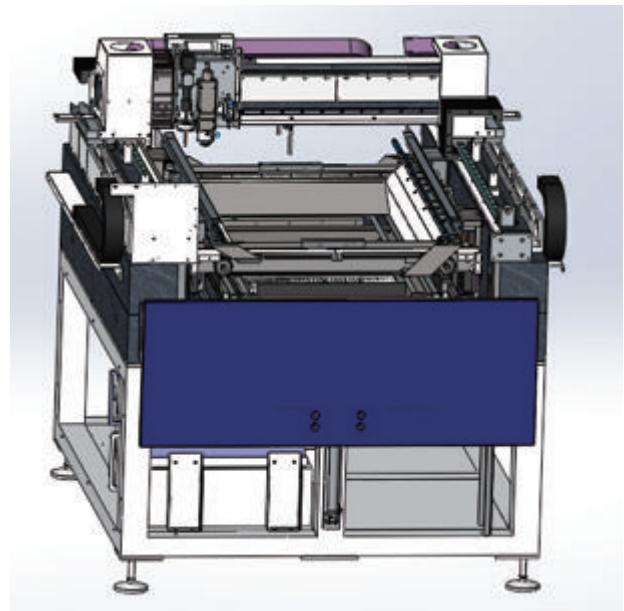
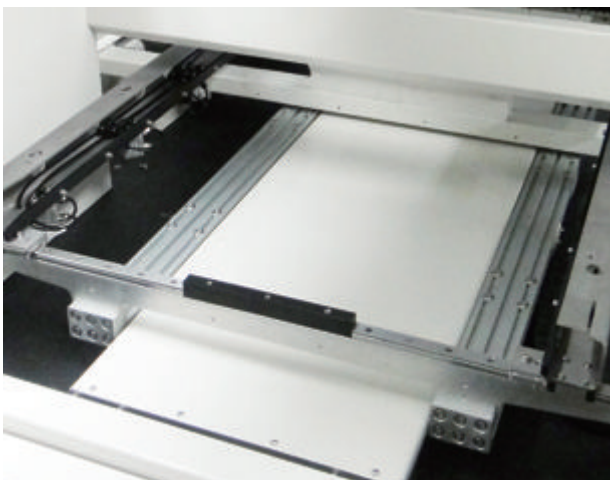
The second function is to locate the soldering paste precisely onto the solder pads on PCB. This demands high accuracy of the hole positions and the hole shapes. The number of solder pads on PCBs is increasing as pad sizes continue to get smaller.

Corresponding to the pads on PCB, Typical stencils require hundreds of holes to be cut out while some complicated ones may have thousands. At the same time, the size of these holes and the distance between the holes are very small. Holes with apertures of a couple of hundred micron are becoming more common. Moreover, these holes are in various shapes, such as round, rectangular, rectangular with a special geometry removed from or added to them.

The above mentioned characteristics of holes and the hole sizes makes SMT stencil manufacturing technology different from ordinary hole drilling and cutting processes and requires a special motion control system between the laser processing head and the work piece that works with high speed, high dynamic performance and high precision.

When a laser beam with high energy density is focused on the surface of a work piece the moment the laser contacts the stainless steel sheet light energy is quickly transformed into heat which, with the help of an auxiliary gas, makes the material melt, vaporize and then is exhausted with the auxiliary gas.

After the stencil material is penetrated, the starting point of cutting begins. At almost the same time as the laser beam penetrates the material, the laser beam starts to move in relative motion against the work piece along a planned route. With the help of the auxiliary gas,



combustion is supported and waste is exhausted using compressed air. The material continues to melt, vaporize and be taken away via the exhaust and as a result a cutting line is formed.

The laser beam moves continuously against the work piece in a very short time until the cutting line finishes the outline aperture shape and finally a hole with planned size and shape on the stencil is opened as required by screen printing.

Since the holes on stencil are very small in size, and a lot of them are not in round shape, the holes are cut out along the hole's inner envelope by using laser beam, which has a finer diameter, instead of by drilling out or rushing out. For this reason the machine is called a precise laser cutting machine and not a drilling machine.

Furthermore, due to the small size and large number of holes to be opened, the relative movement of the laser beam against the work piece has to constantly change direction during the cutting process, which requires the motion control system to have excellent instantaneous dynamic responses such as frequent start, acceleration, deceleration, and stop activities at high speed. All of these characteristics of the motion control system make it different from the systems used for common laser metal cutting or welding devices.

Additionally, SMT stencils used for screen printing requires high accuracy of hole positions and geometric shape, as well as high quality of the hole's three-dimensional shape and its side walls. This requires the use of auxiliary gas. Laser galvanometers are not suitable for this process and all the relative movement has to be realized by the physical movement of the laser head and the work piece.

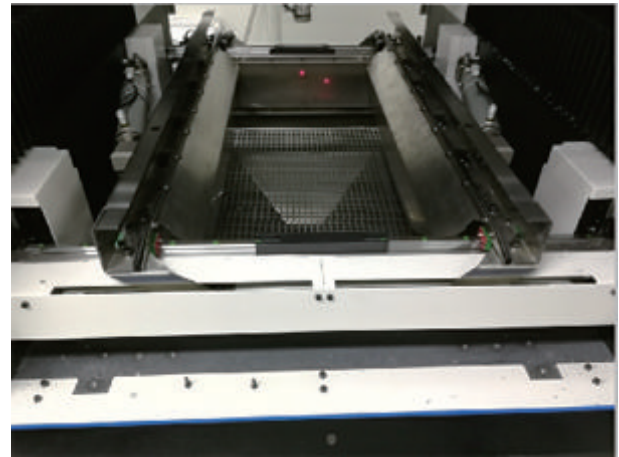
For a stencil laser cutting machine the relative movement between the laser beam and the work piece, the speed and accuracy of the laser beam determines the machine's processing speed and quality and to a large extent is the critical criteria in evaluating a machine's performance.

Granite materials, naturally existed for hundreds of millions of years, have no internal stress, are stable in structure and not sensitive to temperature, have good vibration absorption, and can maintain precision for a long time. All equipment of DirectLaser M are made of high quality granite materials which gives this DCT machine a solid and reliable foundation with high stability and no deformation. An extra value in comparison to other machines.

DirectLaser M6 use a design that separates the movement in X and Y axis directions. The laser head moves along the X axis on the fixed bridge, and the clamping table moves along the Y axis, two independent systems without interference from each other. This design improves the positioning accuracy and speed fundamentally. The workpiece from DirectLaser M3 is fixed by clamping table, the laser head moves on the gantry along the X axis, and the gantry moves back and forth along the Y axis.

The movement power of DirectLaser M is provided by a linear motor and linear guide. Linear motors generate high precision, with low friction, and exhibit long service life and low maintenance costs. Although the holes on stencils are very small in size, large in number and with complicated shapes, DCT engineers found the optimal solution after a great number of systematic experiments. By focusing on the optimization of the relative movement between the laser beam and the work piece they

achieved the best processing quality, speed, and dynamic performance, in concert with the machine's software and hardware.



DirectLaser M3 adopts U-form linear motor, which is a coreless linear motor with no impact force, extremely high-speed stability and excellent dynamic characteristics, which improves the cutting speed and fundamentally improves the positioning accuracy and speed. With help of high-end fiber laser, professional exquisite optical devices, the cutting quality could easily meet or even exceed the industry standard requirements. High degree of automation, such as automatic frame width adjustment, automatic clamping and positioning, automatic leveling ensures simple operation and high performance. In addition, the structure of DirectLaser M3 makes good use of space, which makes the equipment more compact. The working area is large, but the footprint is small. It can be installed in a small production site, which is very convenient to add to the existing space.

DirectLaser M3 machine is equipped with a vision system, which supports repositioning, making it easy and accurate for stencil repair.

DirectLaser M3 easy to operate, the operation of the machine only needs a few simple steps: The software interface is intuitive, select the corresponding frame from the size library, load the frame, select the data, press the start button, and all operations will be automatically completed. Any operator, after a simple training, can operate the equipment and cut out high-quality SMT stencils.

The installation of DirectLaser M3 is relatively simple. The equipment can be put into production almost like Plug and Play. Using the air-cooled long-life fiber laser with the highest life span, there is no need to replace the lamp tube regularly as in the past, which reduces the operating cost.

Through long and persistent research, DCT has mastered a method of machine accuracy calibration - the DCT Accuracy Calibration Process which integrates the mechanical technology, electrical technology, processing results analysis and software technology to provide the utmost in accuracy.

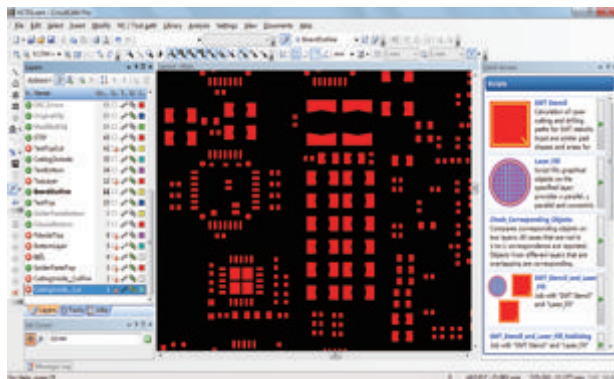
This process, which has been applied to the DirectLaser M, has gone through rigorous tests both theoretically and practically, and is proven effective and functional.

This process, which has been applied to the DirectLaser M, has gone through rigorous tests both theoretically and practically, and is proven effective and functional.

Under the support of highly precise measuring instruments and grating ruler-on-line position feedback, each DCT machine after precise assembly of the mechanical design is calibrated by a strict application of the DCT Precision Calibration Process, in order to insure that the machine is delivered to the customer in the best state of quality, speed, and accuracy.

Standard software CircuitCAM7 Pro unrivaled in SMT Stencil data processing

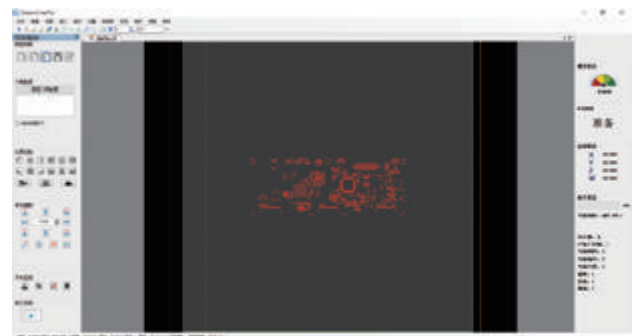
SMT stencil is a silk screen template characteristic with function to form shapes in 3 dimension, it is a kind of mold and called solder paste leak printing stencil.



During screen printing, the soldering paste under pressure by a squeegee scraper is pushed into the holes. When the stencil is removed from the PCB board after printing, the solder paste leaves the stencil holes and stays on the solder pads of PCB in the shape of the correspondent holes on the stencil.

In most cases, the hole describing data created by PCB design software cannot be used directly to produce SMT stencil, since the size and the shape of the holes on stencil must meet the requirement of SMT soldering process, and therefore the hole size, area and the shape need to be designed again according to specific SMT technologies.

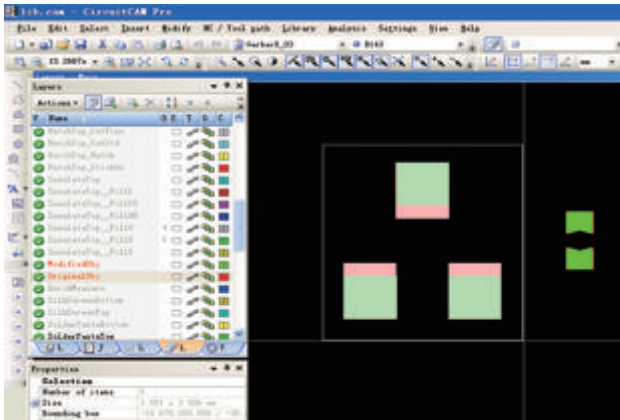
CircuitCAM software has a worldwide reputation for stencil data processing. As the only software that designs the size and shape of stencil leaks, it has been more than 30 years since its core source board CAD software ColorCAM.



Today, the vast majority of commercial SMT stencil designs in the world are almost exclusively done by CircuitCAM. However, for commercial reasons, most SMT stencil design workstations run the second generation version of CircuitCAM 4.0. There is very little opportunity to use the third generation version of CircuitCAM 6.0. Unfortunately, the release of CircuitCAM6.0 is almost a decade ago, with few effective upgrades and didn't match the rapid development of the electronic information industry.

Thanks to Mr. Lothar Klein of LKSoftWare GmbH, the designer of ColorCAM and CircuitCAM software, and who joined DCT as a shareholder with his European team and CircuitCAM ownership, CircuitCAM has become more powerful with a combination of both first-class software technology and first-class application technology - a new peak for the software. CircuitCAM7 Pro is the standard data processing software of DirectLaser M.

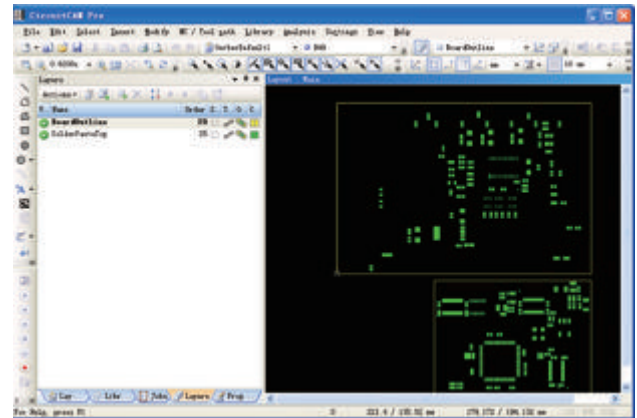
The new CircuitCAM7 Pro has powerful and practical library functions, especially functions to hierarchically process the physical patterns, conveniently build and manage the database of physical patterns, electronic package types and package pattern libraries. It can also create and edit higher level physical patterns based on the existing physical patterns, identify and compare the package patterns and serve customers with special library functions if needed.



The latest version CircuitCAM7 Pro, combines powerful library functions, better geometry operations, and a friendly GUI. For example, different types of files can be output by clicking a hot key without consideration if any layer is active or not. Geometry can be imported directly from the CAD window with multiplication or division greatly improving efficiency.

The ability to process integrated circuit and other packaging patterns in a compound way allows the user to modify patterns conveniently by application of the preset geometries in a single step, no matter how complicated the patterns are. Automatic detection of holes, omissions or additions by mistake can be detected to help avoid wrong or missed operations.

Based on Design Rules Check (DRC) results, the cutting data is added automatically without manual modification or addition. With memory of coordinate movement and rotation activities as well as the area, repeated input is unnecessary. Many other convenient and practical functions are available, such as free hot keys configuration, data browsing, searching, positioning, etc.



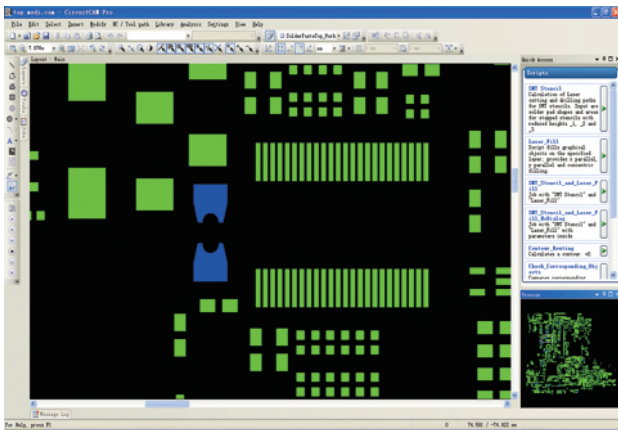
DCT CircuitCAM7 Pro uses a powerful kernel of electronic CAD and uses new algorithms making data processing simple, fast, and reliable. Have no doubt, all these features of automatic data processing greatly reduce the technical barriers, improve work efficiency and quality.

CircuitCAM7 Pro is not only suitable for data processing engineers of stencil manufacturers who can now give up the old version software and enjoy the new version with smooth working, but also suitable for vast numbers of SMT process engineers to run the software on his own computers to design the stencils by himself, or to understand, control and follow the stencil outsourcing works.

[DreamCreaTor, the machine driver software that creates harmonious smooth and coordinated operation](#)

DreamCreaTor is the machine driver operating system software that controls that machine's hardware and is used by CircuitCam7 Pro . The driver is a key part of the overall software quality and is of critical importance to the performance of the machine. DreamCreaTor ensures that CircuitCam7 Pro is able to work efficiently and at the highest speeds and accuracy.

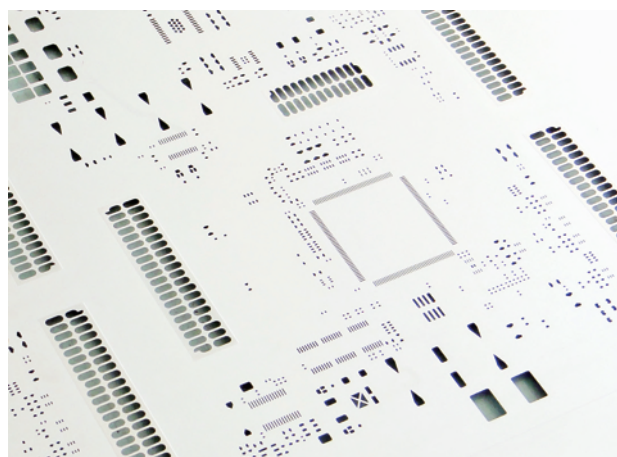
DCT CircuitCAM7 Pro uses a powerful kernel of electronic CAD and uses new algorithms making data processing simple, fast, and reliable. Have no doubt, all these features of automatic data processing greatly reduce the technical barriers, improve work efficiency and quality.



DreamCreaTor works as the interface between bottom hardware and the user, through which the operator sets up and controls each subsystems of the machine, and experiences the machine operation.

DreamCreaTor, the operating system of DirectLaser M, is developed by the joint effort of DCT's Chinese and German teams together, using modular design with rigorous, efficient and reliable core system, and is easy to be simplified or expanded. The system has the following characteristics:

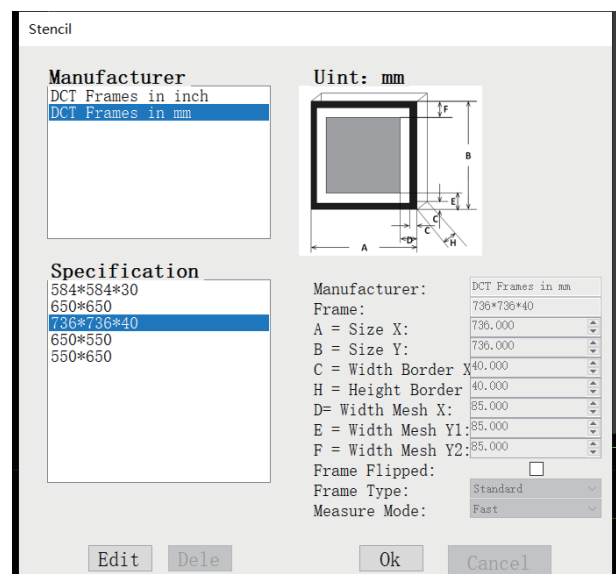
1. Software and hardware resources are fully integrated, so that all the software and hardware resources are matched to each other, optimized to the maximal efficiency. This software manages and controls every part of the machine, processing data, work piece, laser, and other subsystems match perfectly to each other, achieving efficient and precise laser processing.



2. All work is saved for future use and industry mature experiences are collected in the software. A variety of possible technical know-how and expertise in processing SMT stencil, ceramics, and metal materials are preset in DreamCreaTor through the parameters library, default values, operation guides, options, optimization schemes, etc., which can be applied by the operator as required.

It gives DreamCreaTor a very high practical value. By applying large amount of optimized parameters, materials, and tools options, the operator can easily use the DCT machine to finish various difficult and complex processing works step by step without the need to have any professional background.

3. Emphasis is given to the operating experience. In order to provide users with a simple, intuitive, and beautiful interface, and to create a fast, easy and smooth work process.



DreamCreaTor uses a graphical interface for human-computer interaction, and its menus, dialog boxes, especially the toolbar, on which the settings can be changed, and the intuitive Graphical User Interface, provide the operator comfortable and beautiful visual experiences. Graphical and visualized operation can help users to overcome the understanding difficulties, make the operation intuitive, smooth, simple and fast, and create a pleasant working atmosphere. Even a beginner can by teaching himself master the software and operate the machine.

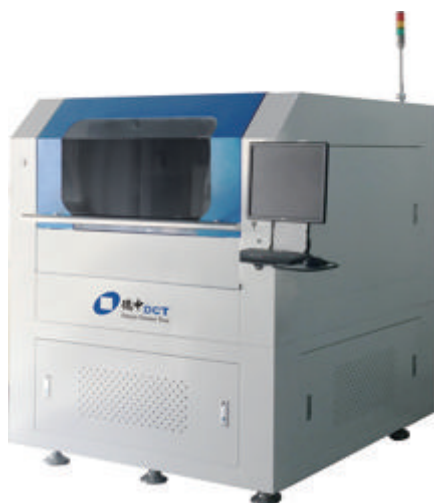
Top lasers at the core, achieving both first - class processing capacity and long-term stability and reliability

DCT machine's high processing quality and speed are based on long-term stable and reliable operation. The industry proven laser units equipped on DirectLaser M are among the world's top products manufactured by professional manufacturers, featuring long service life and a maintenance cost which is almost zero greatly reducing your daily operation costs.

According to the characteristics of cutting equipment and after repeated experiments and tests, DCT's laser and control engineers take the full advantage of the laser's performance through selection, combination and optimization of laser parameters and make them intuitively available through software.

In this way the operator can make full use of the high performance laser as a tool to complete professional processing work without the needing to have any relevant technical background.

DirectLaser M3 is the professional SMT stencil cutting machine used to create products that have sharp cutting edges, smooth side walls, as well as neat and clean micro structures. This machine works in a simple support environment, featuring easy configuration, low investment, and fast cost-recovery. It is suitable not only for SMT assembly plants and PCB manufacturers to produce stencils by themselves, but also for professional stencil service providers and other electronic service outsourcing agents to upgrade equipment or expand capacities.

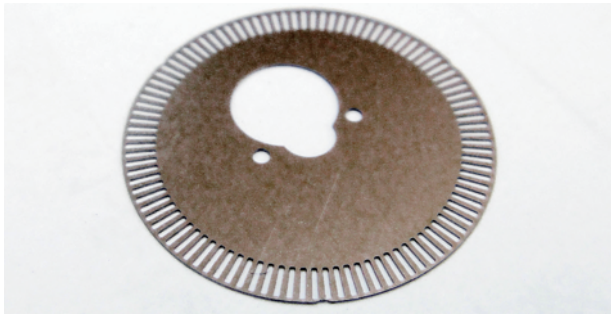


DirectLaser M6 is equipped with a more powerful laser unit, and the power density focused on the material surface is hundreds of times higher than the traditional laser. Therefore, in addition to stencil cutting, this machine can also cut stainless steel parts with thickness up to 5000um, drill holes in ceramics, or cut ceramics. With features of high precision, high quality and high speed, this machine is definitely a multi- functional piece of equipment with high performance suitable not only for professional service providers to process stencil, metal parts, or ceramic outsourcing services, but also for various institutions to complete the complex works in the advanced fields of research.



Involving detailed-orientation and professional knowledge in the machine, presenting advantages of simple operation by non- professionals

As a mold that is repeatedly used upwards of thousands of times SMT stencils have a considerable impact on the final product the value of which is often hundreds of times higher than the stencil itself. The holes on stencil of different sizes, shapes and positions are key to achieving the distribution and correct application of solder paste onto the solder pads of PCBs through the stencil by screen printing.



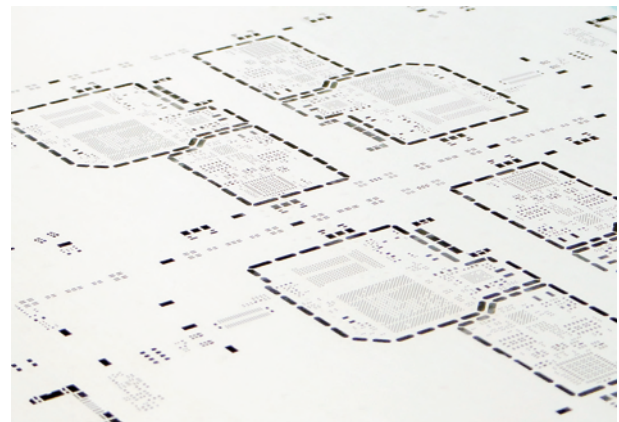
The transfer process of solder paste that enters and leaves the stencil holes, as well as the positions and the three-dimensional shapes of the solder paste on the pads hang on the micro structures of the hole's shapes and side walls comprise the key factor that influences the soldering result and provides the evidence to evaluate stencils quality.

With the usual stencil laser cutting machines, due to the reasons of laser quality, auxiliary gas, relative motion matching or other factors, these problems can be detected under the magnifying glass. Problems such as the high roughness of the hole walls, or even scraps hanging on side walls, saws, burrs and knobs at hole's opening, lack of taper, over cutting, or cutting deficiencies, etc.

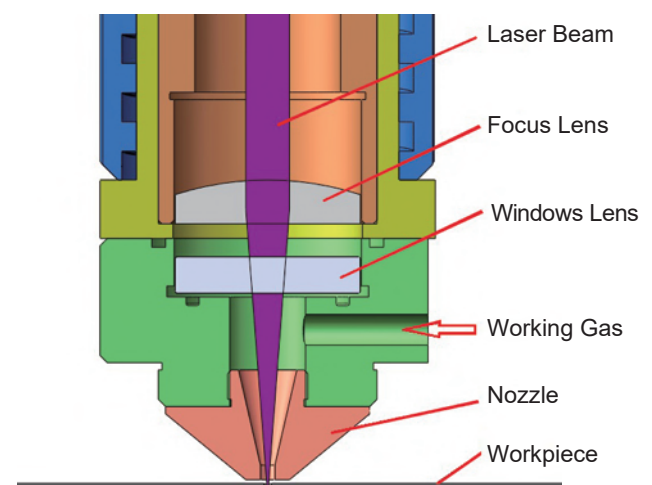
In order to improve the performance and the appearance, the stencils created using the usual cutting machine are often treated additionally with mechanical polishing and electrochemical polishing, which not only cost a lot of time but also requires the use of harsh chemicals.

On the DCT DirectLaser M, through the optical design, the laser beam quality and shape are optimized, and by taking a series of measures such as a more reasonable cutting nozzle design, the dynamic matching of the relative movement between laser and the work piece, dynamic adjustment of the auxiliary gas, the satisfactory cutting results are achieved.

The holes opened by DirectLaser M have smooth side walls and ideal taper shapes which can best support the separation of the soldering paste. Even under a magnifying glass, the micro structure can be found neat and clean, and the cutting lines clear and sharp. In most cases, the stencils can be used directly after a simple mechanical grinding and/or chemical polishing.



On the basis of DirectLaser M3, a visual inspection system can be added. Inspection items: hole deviation, hole accuracy, shape, hole quantity, area error, edge quality and other hole defects detection. After the integration of automatic stencil inspection, the DirectLaser M3 becomes an all-in-one machine, which greatly reduce the acquisition cost and the area occupied.

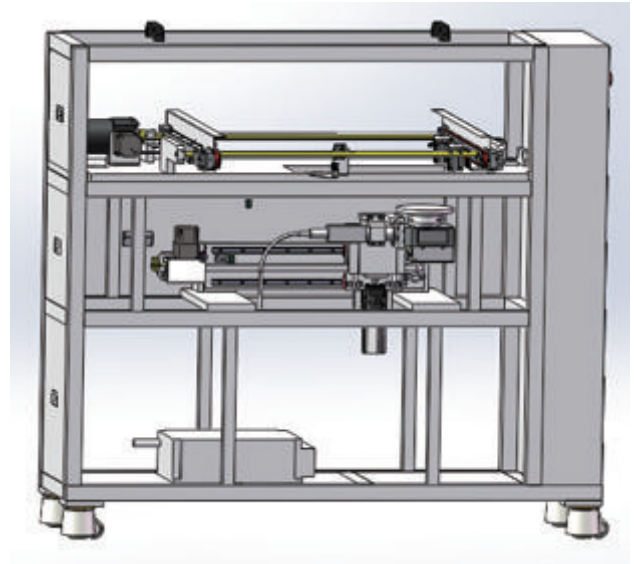


It is through a dedication to professional pursuit of the details that created another great advantage of DCT's DirectLaser M: the simple operation by non-professionals which means stencils are produced by a single machine by a single operator.

The final products can be produced directly with a single machine without other supporting equipment. Little training is needed, the machine can be operated without need for any background knowledge - as easy as operating a point-and-shoot camera. It allows the intelligent and flexible manufacturing on demand at any time and anywhere.

Comprehensive advantage formed naturally out of overall accumulation of micro improvements

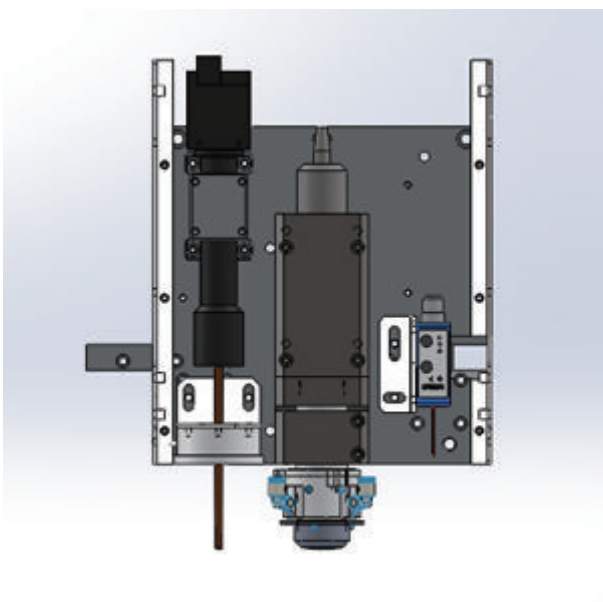
With high performance of machine design, motion control systems, data processing and machine operating software, laser unit and processing head the DirectLaser M is already outstanding, but this does not stop DCT from making further efforts, because our goal is to create comprehensive advantages and to provide the industry dream machine as demanded.

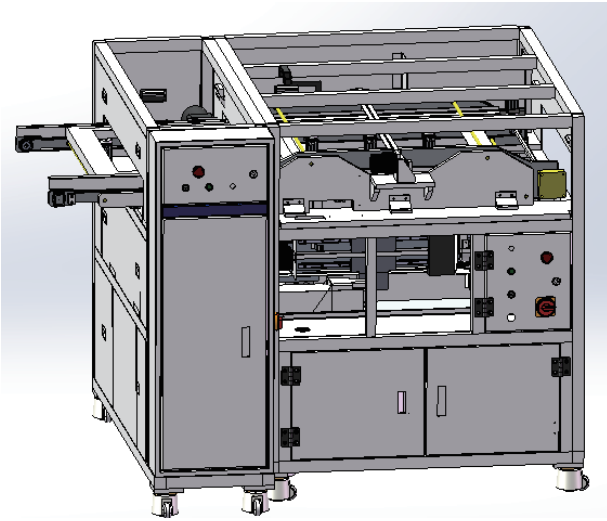


The work piece clamping device on DirectLaser M can clamp metal foils or sheets fast and easily suitable for rapid loading and unloading. Stencil frames with fine stretched stainless-steel sheets are also easily loaded and unloaded and can be used directly after cutting.

This makes stencil production very convenient, especially for SMT manufacturers producing stencils in house for internal applications, or for one-person-workshops where there is no frame stretching processes. Additionally, as an optional item for the DirectLaser M a special fixture for ceramic substrates can be added or if necessary, a honeycomb vacuum table which can automatically fix the material.

Similar to other DCT laser machines the DirectLaser M can also be connected with an automatic feeding system specially designed for producing SMT stencils. The cabinet can contain more than ten pieces of stencils or stencil frames of different sizes or types, and the automatic loading system can load and unload the materials automatically to greatly improve production efficiency, and reduce labor intensity and labor costs.





As a mold for screen printing of solder paste, the price of the final products may be hundreds of times or thousands of times higher than the stencil itself. Therefore, the continuous checking and confirmation of the stencil quality is indispensable in SMT production. Based on the data processing software CircuitCAM 7 Pro and the machine operating software DreamCreaTor, DCT supplies customers with a cost-effective, simple and supplies customers with high performance and cost-effective stencil checking option, it is a practical choice. that compatible with the machine hardware.

DCT is a software and hardware development company with the aim to solve the problems in the PCB manufacturing industry. The company puts premium on product safety constantly and gives priority to operator safety in the pursuit of high performance.

The DirectLaser M takes a variety of security measures to prevent the accidents caused by operator mistakes, operator omissions or other reasons. Additionally, the DirectLaser M is designed with Ergonomics, and operator habits considered in all machine details. With a focus on structure and sequence, as well as intuitive, direct, smooth and convenient operation, the machine makes the operator experience smooth in all aspects of software and hardware.

With many years of experience DCT's engineering and service teams are fully aware of our responsibilities upon your purchase of our machine and it's our duty to meet your demand on urgent service and guarantee issues.

The DirectLaser M from the data processing software and the machine operating software to the motion control system and the laser processing head is developed and manufactured by DCT itself who completely own the intellectual properties. DCT has confidence and the ability to support our customers who manufacture first-class products with our world-class service.

we have professional service engineers and application engineers for both new and old customers. We provide pre-sale consultation and training, as well as after-sales technical support. DCT is willing to share with customers our unique application experiences accumulated over years in the SMT stencil industry, and provide support to both new and old customers who have requirements in connection with projects, processes, or projects supports.



Laser Cutting System for Precise Processing of SMT Stencils M3/M6

Technical data	DirectLaser M3	DirectLaser M6
Working area	800mm x 600mm	600mm x 600mm
X/Y Positioning	$\leq \pm 2\mu\text{m}$	$\leq \pm 2\mu\text{m}$
X/Y Repeatability	$\leq \pm 2\mu\text{m}$	$\leq \pm 2\mu\text{m}$
X/Y Resolution	$\leq 0.1\mu\text{m}$	$\leq 0.5\mu\text{m}$
Laser wavelength	1,070nm	1,070nm
X/Y movement system	Linear motor and the grating ruler	Linear motor and the grating ruler
Average laser power	$\geq 100\text{W}$	$\geq 150\text{W}$
Cutting thickness	20 μm ~ 300 μm	20 μm ~ 500 μm *
Platform	Granitic base table, bridge design	Granitic base table, bridge design
Dimensions (W x H x D)	1,480mm x 1,585mm x 1,713mm	1,250mm x 1,915mm x 1,560mm
Weight	Approx. 1900kg	Approx. 1,500kg

Options	DirectLaser M3	DirectLaser M6
Data Processing Software	CircuitCAM 7 Pro	CircuitCAM 7 Pro
Machine Operation Software	DreamCreaTor	DreamCreaTor
Automatic up-down material	optional	optional
camera target counterpoint	Standard	Standard
Industrial dust collection	Standard	Standard

Working amient	DirectLaser M3	DirectLaser M6
power supply	3 x 380V+N+PE,50Hz,3.0kW	3 x 380V+N+PE,50Hz,3.0kW
temperature	22°C \pm 2°C	22°C \pm 2°C

*depend on processed materials

Parameters change without prior notice



DCT Co.,Ltd.

Address: Plaza C, No.11 Haitai HuaKe 1st Road, Xiqing District,Tianjin,300392,China.

Phone: 0086 22 83726901 Fax: 0086 22 83726903 [http:// www.dct-china.cn](http://www.dct-china.cn)

German sales office

Address: Anna-Turgonska-Anger 1,30453, Hannover Germany.

Phone: +49 176 5557 5033 Email: q.ma@dct-china.cn