

NanoRapid

Precise selective Laser Soldering System with high Throughput



NanoRapid

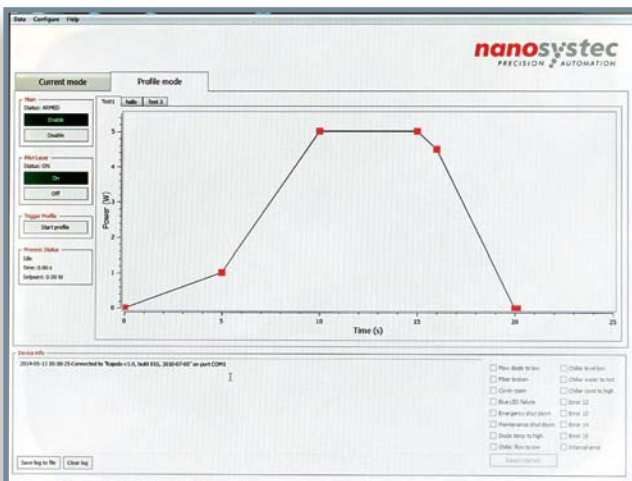
Selective Laser Soldering for Production

The production system NanoRapid is a combination of laser-based selective soldering, optical systems and mechanical transport of the work pieces.

The configuration of the work station depends on the specific soldering task and the production flow. The modular design assures an optimal cost-performance ratio.

Selective soldering is used when conventional oven reflow soldering fails. Examples are temperature sensitive components like optical elements or sensors, flex boards and already assembled products. For circuits which are designed with finer pitch, unwanted bridging is prevented by selective soldering, in particular laser soldering.

Laser System Rápido



The power profile is saved and a trigger signal starts its execution. The soldering process with pre-warming, soldering and cooling-down phases can be reproducibly executed.

The laser system Rápido delivers up to 400 W optical power at a wavelength of 980 nm. An armored fiber optic cable delivers the optical power to the lens assembly which forms the beam fitting the solder pad. The minimal focus can be as small as 100 μm . Temperature profiles stored in the electronics guarantee a reproducible soldering operation with the necessary heating and cooling ramps.

Rápido is integrated into the safety circuit of the production system NanoRapid taking all laser safety requirements into account for meeting laser class 1.

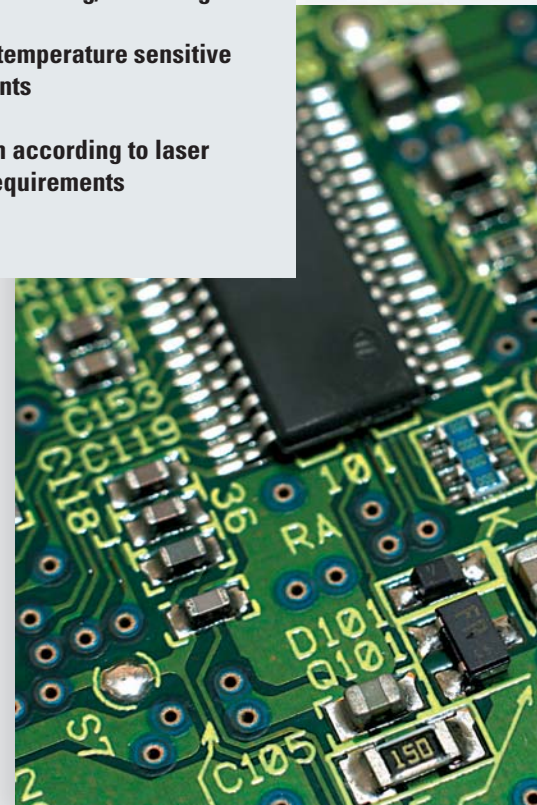
Further information is given in the data sheet Rápido.

Application of the soldering Material

NanoRapid utilizes a dispenser for the application of the soldering paste on the solder pad or processes PC boards on which the soldering paste has been printed in a separate station. Pre-forms, wire feeder and melted soldering material can be processed as well influencing the minimum size of the soldering point.

Benefits of NanoRapid

- Multi Beam Optics for high productivity
- Powerful image processing
- Process execution with software package TestMaster
- 0.1 mm focus diameter
- Manual, semi-automatic or automatic loading/unloading
- Ideal for temperature sensitive components
- Operation according to laser class 1 requirements



Selection of suitable soldering Optics

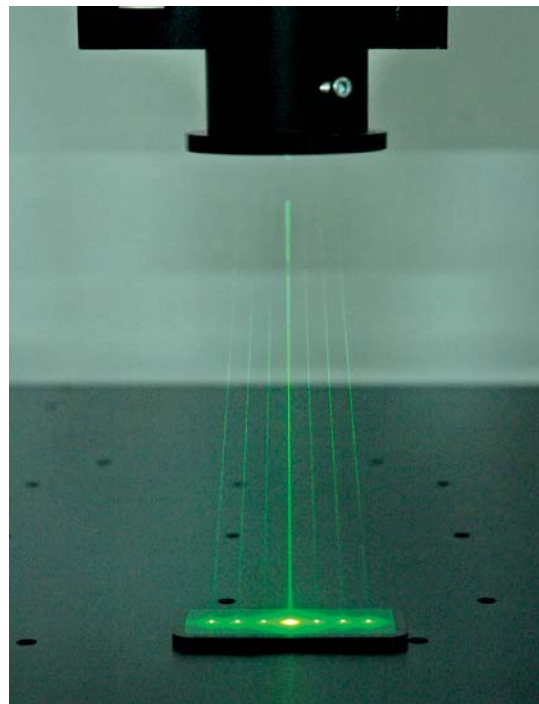
The soldering optics assembly forms the laser beam down to a minimal focus of 0.1 mm. In most instances a round focus is sufficient. However, a rectangular shape of the laser can be generated to fit the solder pad ideally. The stand-off between the last lens and the work-piece is typically 100 mm. This is sufficient to avoid contamination of the optics due to the vapors of the soldering process yet maintaining a sufficiently small heating zone. It also provides enough room for auxiliary equipment.

A typical single beam configuration has a fixed lens assembly. The work piece is moved with a XY translation stage. A CCD camera which is attached to the lens assembly and the image processing allow the automatic positioning of the work piece.

The use of a XY scanner instead of a single beam optics changes the mode of operation. Now the laser is deflected and the work piece stays fixed. The deflection of the laser is much faster than the movement of the work piece with a XY stage. However, the work area using a XY scanner is limited to approximately 100 mm x 100 mm.

Multi Beam Optics (MBO) for high Throughput

The Multi Beam Optics developed by nanosystec generates several laser beams simultaneously. The distance between the beams fits the pattern of the solder pads. All solder points are processed in parallel. Assuming 10 soldering points had to be soldered and the processing time per soldering point was 1.5 s,



A Multi Beam Optic reduces the process time as a number of soldering joints can be processed simultaneously.

the total time in sequential processing would be 15 s, transport time not included. With an appropriate MBO the total time will be only 1.5 s for all 10 soldering points.

The MBO is therefore ideal for operations involving high volumes with identical solder pad patterns.

Image Processing

Work piece and laser beam have to be positioned for an optimal fit of the laser beam on the target. The smaller the pads and the finer the pitch, precise image recognition becomes more and more important. NanoRapid is equipped with powerful image processing. Optical lenses of high quality and fast CCD cameras are combined with image processing software. This software is state of the art and capable of detecting fiducial errors under suboptimal circumstances. All pictures can be saved for quality and process control.

Process Software

The software package TestMaster is used for setting the system parameters and programming the process execution files. A powerful data base saves process and component-relevant data for further statistical process control. TestMaster has several access levels attributed to individual user rights for safe operation and easy maintenance. The interfaces for communication with other equipment are defined in TestMaster as well.

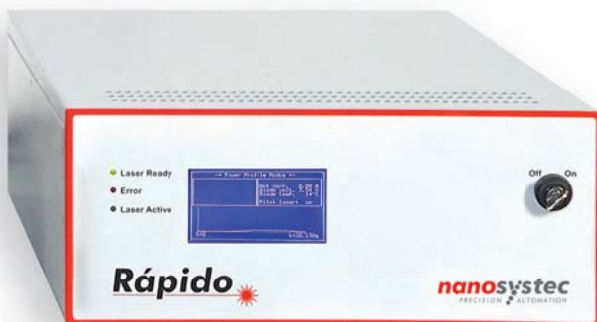
For more information, check out the data sheet TestMaster.

Manual or automatic Loading

NanoRapid can be loaded/unloaded either manually, semi-automatically or fully automatically. This depends on several factors like volume, complexity of the parts and the work-flow of the entire production line. NanoRapid is tailored exactly to the needs of the customer.

Technical Data

Optical output power	30 W, 50 W, 100 W, 150 W, 250 W, 400 W
Wavelength	980 nm
Pilot laser	650 nm, 1 mW (optional, not available for all modules)
Pulse width	2 ms to continuous emission, full power
Power profile	20 power values over 600 s
Electrical supply	120/230 V, 50/60 Hz
Cooling	Water (tap water or recirculating chiller)
Interfaces	SMEMA, Siemens, I/O and others



The laser system Rápido is a 19 in. rack mount unit.

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