

# VersaHybrid

High-Precision Micro-Assembly Station



# VersaHybrid

## Precision Assembly

The production station VersaHybrid works semi or fully automated for complex assemblies which require a precision in the low micrometer regime. Assembly techniques include micro laser welding, selective laser soldering and epoxy gluing with subsequent curing by UV radiation or temperature. Depending on the application, laser fine cutting can be added as well.

The customization of VersaHybrid makes the station ideal for the automation of manual processes with a high degree of complexity. The large work area accommodates several processing stations with different joining and ablation methods. In this way, a complete device can be built up step by step without operator intervention. Feeders, belts and robots facilitate full automation.



Multiple device trays and feeders increase the throughput and allow for the automated processing of large quantities. Alternatively, an inline configuration with conveyor belts provides a seamless production flow.

## Repeatable Positioning

Thorough design and continuous optimization of all functional groups lead to superior mechanical stability.

The motion system consists of high-precision stages with linear bearings, linear or brushless DC servo motors and optical position feedback. Rotary stages, curved rails and goniometers complement the linear motion and offer adjustment capability in all degrees of freedom. An optional gantry configuration provides superior repeatability over the entire work surface.

Camera systems with standard and telecentric lenses drive independently from the pick-and place motion stack. Laser optics, dispensers and curing equipment move into repeatable positions and ensure high-precision assembly in the micrometer regime.

Vibration isolation protects the platform from disturbing external influences. The platform consists of granite or honeycomb mounting plates.

## Device Handling with Grippers

Force measurement on the grippers avoids damage during pick-up and ensures high process stability. Interchangeable gripper assemblies provide maximum flexibility when different parts are processed within the same processing area.

The intelligent design of custom-shaped gripper jaws reduces the number of gripping tools to a minimum.

## Powerful Machine Vision Capability

The VersaHybrid Stations use automated machine vision algorithms. These include pattern recognition, object detection, edge detection and autofocus. Device-specific algorithms combine various functions in one command and ensure fast and reliable image processing.

### Benefits of VersaHybrid

- Combination of various micro production techniques
- Modular design
- High placement accuracies
- Powerful machine vision
- Roll-out to automated loading
- High productivity



Constant and automatic capture of new images over time improve the algorithm and make it more and more robust. In addition, intelligent cameras provide results of pre-programmed functions in shortest time.

## Advanced Camera Systems

Several CCD cameras determine the position and orientation of the parts to be joined. The image acquisition with pulsed LEDs eliminates the disturbing ambient influences. Cameras observing a large working area and parallel cameras with high resolution reduce the image acquisition time substantially.

## Adjustable Illumination in various Colors

Various brightness settings of the LED illumination provide ideal imaging conditions. Different colors help to identify even difficult surfaces and features which are hard to see. Standard illumination consists of coaxial lighting through the lens, a ring light from top and side-mounted LEDs with diffusers or spot lights.

## Assembly Processes

**Precision micro gluing** is a common method to hold small optical parts like lenses, mirrors, polarizers, beamsplitters and other units



Various assembly techniques can be combined in one station, such as laser welding, laser soldering and epoxy gluing. Exchangeable device trays improve the versatile micro assembly in various batch processes.



Different toolings can be changed during the process without operator intervention.

in place. Typical examples for mechanical parts are piezo stacks, small magnets, distance blocks, electrical contacts and other devices consisting of plastic, glass, ceramics or metal.

Different dispensers are used like time pressure, volumetric and jetting. Depending on the task, stamping or printing offer alternative application methods.

The subsequent curing is achieved with UV sources (with arc lamp or LED sources) and thermal heating processes (based on heat coils and/or air stream).

**Selective soldering with laser power.** The precise application of laser power in the joining area melts the solder in strictly localized areas – forming very reliable connections. These joints are insensitive to temperature over a very large range and have no out-gassing. They are not affected by radiation or vacuum.

VersaHybrid uses laser modules operating in the near infrared or blue spectral range with very long lifetime. The laser beam will be tailored exactly to the shape of the solder points.

**Laser micro welding** forms extremely strong connections between parts of suitable metals. VersaHybrid uses two types of lasers.

A pulsed Nd:YAG laser generates pulses with a duration of a few milliseconds and powers of a few kW. This is ideal for fixing parts with spot welding of 100  $\mu\text{m}$  spot size and more. For fine seam welding, a fiber laser forms laser seams of less than 50  $\mu\text{m}$  width and high speed.

**Fine Laser Cutting and Ablation** complement the assembly methods. One typical example for laser cutting is the removal of auxiliary frames which are no longer needed as soon as the parts have been joined.

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## Process Software

The automated processes run in the TestMaster process software. This software works with a direct user interface for teaching positions and adapting the process parameters.

The automated process flow is programmed in the sequence editor. The customer has full access rights to this programming and can modify the processes as required.

This structure provides a smooth and secure operation of the systems in high technology production environments.

## Process Monitoring

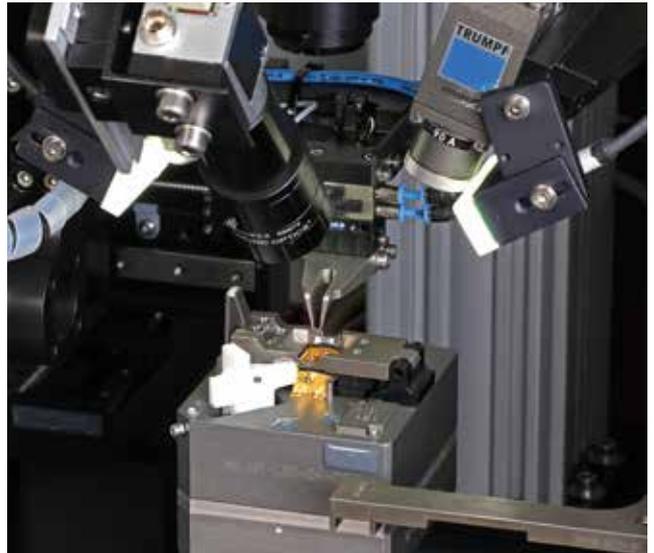
Digital inputs on the general machine control or on the motion controller are permanently monitored and can be displayed. Depending on the process, automated actions follow when an interlock or emergency function change the status. In addition, a possible power, pressure or vacuum outage can be detected followed by an automated shut-down depending on the conditions.

## Remote Access

The remote access software works over a secured internet connection. This fast and easy access saves time in case any support or trouble shooting needs to be performed on the system.

## Active Alignment with Feedback Signal

For high-precision placement in the submicron range and process development, an upgrade of VersaHybrid to active alignment is possible. In addition to machine vision, a feedback signal from the device is used for the final position optimization. The feedback signals can be current, voltage, beam properties or any other physical value which can be converted into an electrical signal.



Cameras mounted to the focusing lenses of the laser processing optics support the image data processing during laser soldering and laser welding. Furthermore, machine vision monitors the dispensing of resin or solder paste.

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PRECISION AUTOMATION

[www.nanosystec.com](http://www.nanosystec.com)

### EUROPE

nanosystec GmbH  
Phone: +49 (6078) 782 540  
e-mail: [europe@nanosystec.com](mailto:europe@nanosystec.com)

### USA/CANADA

nanosystec Inc.  
Phone +1 (510) 933 8354  
e-mail: [us@nanosystec.com](mailto:us@nanosystec.com)

### CHINA

nanosystec Limited  
Phone: +86 755 2660 3780  
e-mail: [china@nanosystec.com](mailto:china@nanosystec.com)