

RapiTrim™ -C-IR

Laser Resistor Trimming System with
Flying Probe Measurement and 1.06 μm Laser

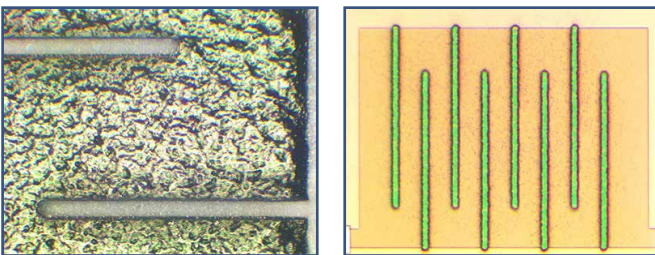


The RapiTrim Fixtureless Advantages

RapiTrim-C systems enable volume production trim and test using flying probe technology for components and hybrid circuits.

Using proprietary fixtureless technology, probe cards and their inherent limitations are eliminated. Restrictions on design layout are lifted, and operational delays waiting for probe cards are removed.

- Circuits can be as large as the substrate itself.
- Probing of dense designs is effortless. This avoids many passes with multiple probe cards.
- Four independent flying probes - any component location, size, orientation and layout can be accommodated.
- Fast job changeover for high-mix quick-turn production.
- Programming is not required for normal job setup (but scripting is available directly within the job editor for custom sequencing if required).



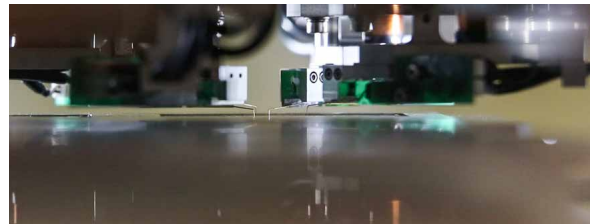
Serpentine legs in thin film on Si with 10 μm kerf (R)
and thick film on alumina (L) with the IR laser.

True turnkey systems

PPI provides turnkey solutions for all trimming needs, from standard component and circuit trim to complex active trim scenarios with custom fixturing.

RapiTrim-C with IR (1.06 μm) Laser

Long-life, low-maintenance air-cooled fiber laser producing short pulses with high peak power for rapid ablation of resistor material while minimizing damage to the substrate. Suitable for both thick and thin film materials. Configurable for a range of spot sizes.



The four independent flying probes allow probing of any pads without shadowing the resistor.

Key RapiTrim Benefits

- Full process control for optimization of approach-to-target.
- Process accuracy from advanced beam positioning and laser pulse control.
- Real-time measurement system prevents trim overshoot.
- Process integrity provided by high accuracy measurement system and auto-calibration functions.
- Fast, automated job setup through extensive support of DXF import.
- Efficient operation and job setup through clear, intuitive touchscreen user interface.

RapiTrim - The Future of Resistor Trimming™

ProSys™ Software - Your Key to Process Control and Efficiency

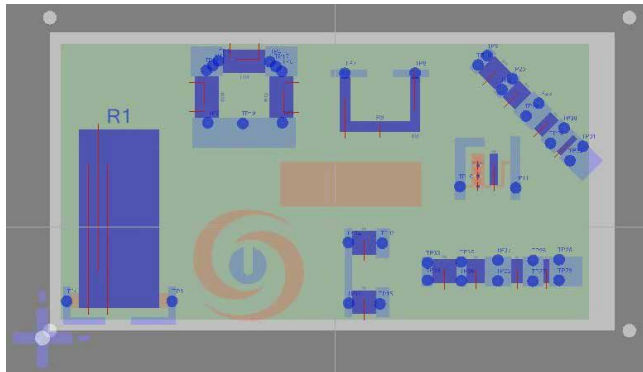
User Interface

The ProSys user interface is a modern solution to allow customers the control they want without the need to be software programmers. The resulting efficiency in job creation and operation turns into improved profitability.

Simple. All control and status screens are laid out for optimum visibility.

Intuitive. With the touchscreen panel, interaction is more like a mobile device and less like a computer.

Powerful. The simplicity masks the power available to create jobs quickly, optimize processing, rapidly change jobs, monitor results, receive maintenance prompts, and seamlessly interact with external devices.



Map view showing resistors, test points and trim cut locations.

Job Creation

Set up jobs directly from CAD. Extensive DXF file import support automates and speeds job creation.

Manual job creation, or editing of an existing job, is done through an interactive graphical map of components, circuit features, alignment targets and trims.

Trim and measurement tools can be shared by resistors of different sizes and orientations, minimizing setup steps.

Use the standard trim tools or create your own with the custom cut editor.

Interactive graphical process library editor; no programming required. Process sequence customization is available when needed through scripting support directly in the job editor.

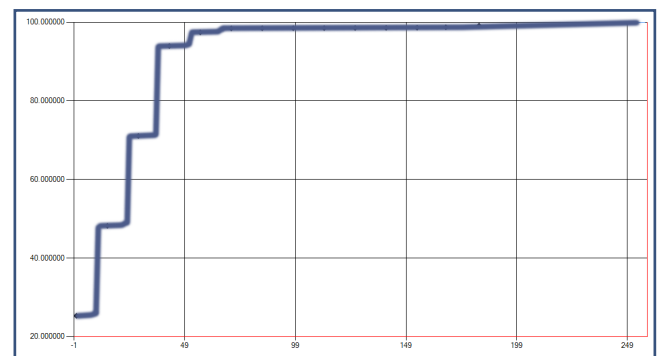
Optional active circuit trimming using standard internal or external instruments.

Process Control and Optimization

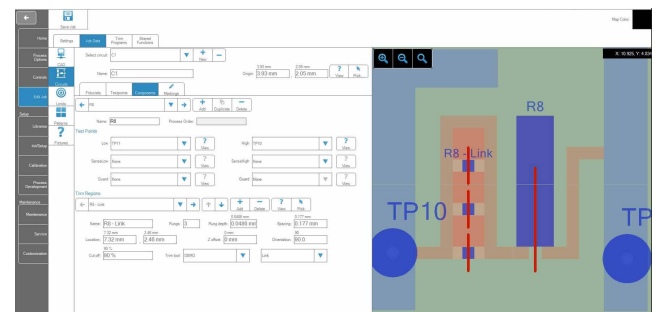
The resistance change of each laser pulse is monitored using PPI's proprietary, real-time measurement system. This allows the resistance data to be output as the Trim Profile, invaluable during process development.

In addition, any trim cut can be segmented, with different laser parameters applied to each segment.

The combination of pulse-by-pulse measurement and cut-to-cut control allows process engineers unprecedented management of the approach to target, optimizing both speed and accuracy.



Trim profile of ladder cuts followed by a plunge to target.



Screen capture showing ladder and plunge trim setup.

External Instrument Support

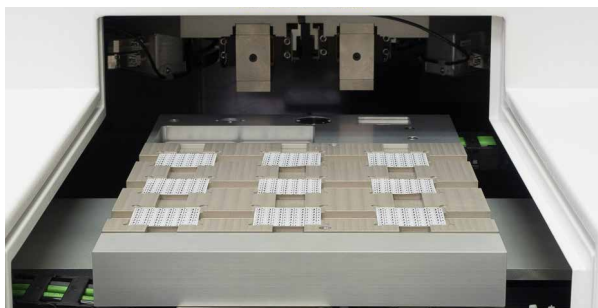
The trim controller can interface to external instrumentation for passive and active trim operations using standard LAN (LXI) or GPIB interfaces. Such instrumentation can be digital multimeters, source-measure units, signal generators, power supplies or external loads.

The control of and reporting from these external instruments is integrated within the ProSys user interface. Space is provided within the RapiTrim enclosure for a standard 19-inch rack to mount such equipment.

Part Loading and Fixturing

Manual Load, Multi-up and Custom Fixturing

Vacuum hold-down is used on flat or pocketed (multi-up) chuck tops. Custom fixture plates and advanced functions such as temperature control and backlighting can also be provided.



Automation Options

- Stack loader, internal to the RapiTrim enclosure
- Magazine load / unload compatibility with SMEMA standard interfaces / turnkey solutions.

Both capable of unattended high volume operation.



Probing and Measurement

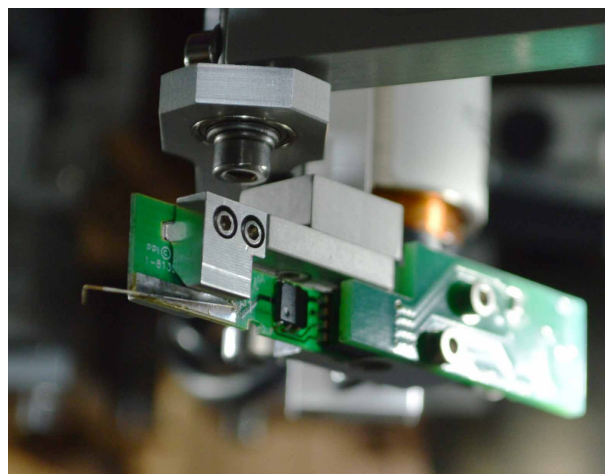
Flying Probes

The four flying probes are separately connected to the four independent source-measure units, each capable of providing Force, Sense, and Guard signals.

Full Kelvin measurement using all four probes.

Since the probe tips are calibrated separately for X, Y and Z, probe overtravel is better managed, extending probe tip lifetime over traditional probe card systems.

No need to change probe tips with each job. Change probe tips only when needed.



Switch Matrix

The standard switch matrix provides the following functionality:

- Mapping of the four source-measure unit channels to four independent matrix card channels
- Switching of external instrument signals into the matrix card channels
- Two independent banks of precision low-TCR decade resistors for bridge-like nulling applications
- Switchable ground reference nodes
- A 1A precision current source for low Ohm applications, controlled by the source-measure units

RapiTrim Specifications¹

Trim Types and Accuracy

- Single-plunge, double-plunge, L, L-Vernier, scan, serpentine and custom multi-leg cut types
- Advanced laser pulse control optimizes cut quality and trim tolerances per cut.

Optical System

- High reliability fiber laser. Air cooled, long lifetime with IR wavelength
- Spot size: 10 - 60 μm
- Automated laser power calibration with integrated power meter
- Automated vision system for precision alignment
- Low mag camera field: 20 mm (diag)
- High mag camera field: <3 mm (diag)
- Colinear and low angle illumination
- Beam scanning field: 50 x 50 mm (spot size dependent)
- Beam placement accuracy 12 μm (3 sigma) over whole process area
- Beam position resolution <0.5 μm
- Telecentric scan optics on precision z-axis focus stage with 0.5 μm resolution

Mechanical System

- Precision linear motor XY stages with linear optical encoder feedback
- Process area: 300 mm x 300 mm
- XY Travel: 300 mm x 450 mm
- XY Accuracy: <5 μm
- XY Resolution: 0.1 μm
- XY Repeatability: 1 μm

Flying Probes

- Number of flying probes: 4
- Range of tip sizes and materials for different pad sizes and materials
- Automated probe tip calibration
- Z travel: 6 mm
- Probe positioning accuracy: <25 μm
- Probe XYZ resolution: 0.5 μm
- Probe repeatability XYZ: <10 μm
- Servo controlled tip contact

Measurement System

- Fully programmable force voltage or force current
- Switching matrix (32 or 64 ch standard, up to 512 ch)
- Resistor range: 0.1 Ω to 1 G Ω
- Ratio trim and guard functions
- Resistance measurement accuracy:

Low Range (<10 Ω) $\pm 0.05\%$ ($\pm 0.05\%$ / R)*
 Mid- Range: (10 Ω to 1 M Ω) $\pm 0.05\%$ *
 High Range (>1 M Ω): $\pm 0.05\% \pm 0.02\%$ per M Ω *

- Voltage Source Ranges and Measurement Accuracy:

Range	Resolution	Accuracy (% FSR)*
$\pm 20\text{V}$	80 μV	$\pm 0.01\%$
$\pm 2\text{V}$	8 μV	$\pm 0.01\%$

- Current Source Ranges and Measurement Accuracy

Range	Resolution	Accuracy (% FSR)*
4 μA	30 pA	$\pm 0.1\%$
40 μA	300 pA	$\pm 0.05\%$
400 μA	3 nA	$\pm 0.01\%$
4mA	30 nA	$\pm 0.01\%$
25mA	200 nA	$\pm 0.01\%$
250mA	2 μA	$\pm 0.05\%$

*after standard calibration, full Kelvin.

FSR = full scale range.

Part Handling

- Part handling up to 300x300 mm on system vacuum chuck.
- Easy access sliding doors with two-hand safety operation for manual-load systems.

Software

- Auto-import and job creation from DXF
- Full process control for optimization of approach-to-target
- Configurable part marking and serialization
- Automatic system run-time calibration
- All measurement data logged as part of normal operation
- Real-time system diagnostics and health logging
- Internet connection allows factory personnel to provide remote support

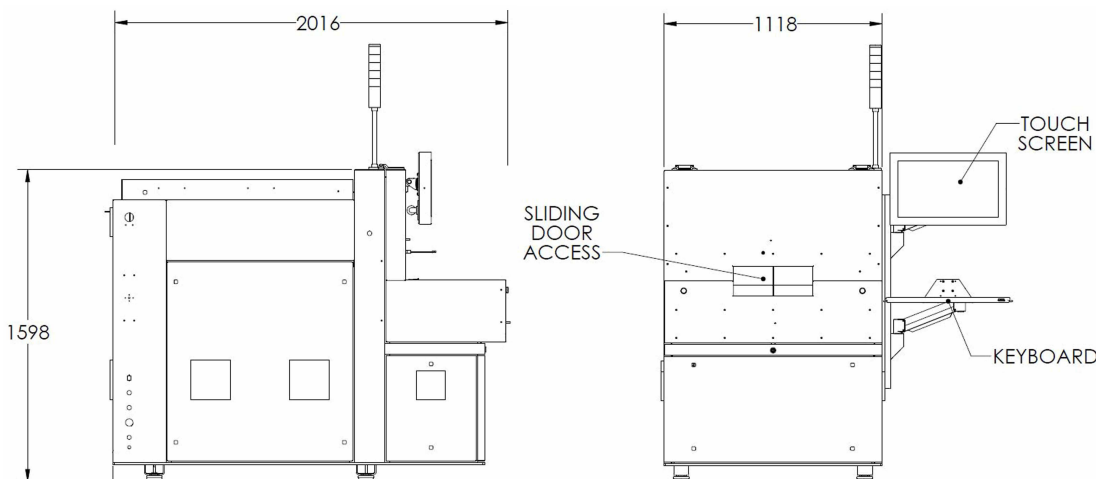
Options

- Automatic part loader/unloader
- Optional network interface customization
- Automated barcode reading functions and job creation/loading
- Custom fixturing
- External instrument support

Facilities Requirements

- Electrical: 200-240 VAC, 1ph, 30A, 50/60Hz
- Exhaust: ablation debris removal through 38 mm diameter duct.
- Compressed air: 6 bar, 56 l/min, dry and oil free

¹ Specifications are subject to revision



Turnkey Systems

Industry 4.0, IIoT

DXF Auto Import

SMEMA Compatible