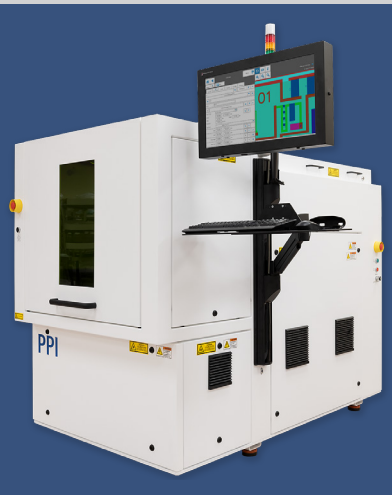
RapiTrim™-S

Laser Resistor Trimming System for Semiconductor Substrates



The RapiTrim-S

High-performance, turnkey laser trimming system for processing of semiconductor wafers in high volume production.

- *Compatible with industry-standard probe cards and custom test fixtures*
- *High-accuracy beam positioner*
- *Advanced die alignment options*
- *High performance 4-axis prober with precision step-and-repeat substrate handler*
- *300x300 mm process area handles up to 300mm substrates*
- *Automatic run-time calibration for optimum process integrity*
- *Industry-standard wafer loader / unloader options*

Designed for Next-Generation Wafer Trim & Test

Incorporating the industry's highest performance probe card handler, high-accuracy beam positioner, ultra-rigid and high resolution XY motion stages, advanced die alignment options and modern user interface with automated run-time calibration, RapiTrim delivers the reliable 24x7 production solution you need. Trimming your next-generation products shouldn't be trusted to equipment designed decades ago.

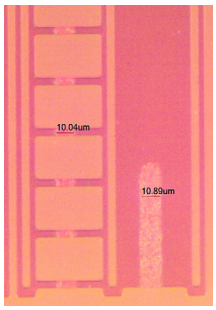
Advanced ProSys™ Control Software

ProSys software allows for automated file conversion and job generation and provides a graphic display of the job features and process status. All machine setup calibration controls, job and process settings, vision and process map, status and diagnostic information are easily accessible on the intuitive touchscreen user interface.

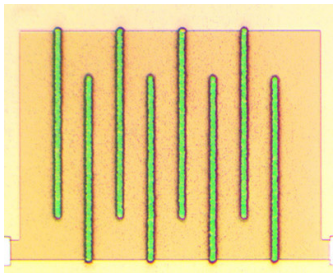
Process tools allow precise control over laser energy, bite size, cut direction and trim limits.

Some Key Features

- Precision spot placement and sub-micron vision alignment.
- Advanced, high-accuracy prober assembly.
- High-reliability, maintenance-free, long-life lasers.
- Measurements by integrated 4-channel measurement system or industry standard or custom external mixed-signal testers. All provide real-time cut control.
- Optional integrated wafer handling for FOUP, SMIF, open cassettes.
- Intuitive graphical job setup with automated DXF import and process sequence customization.
- OCR and ID Matrix reading at handler or chuck.



Example of 10 µm kerf on Si.



Example of 7 µm kerf on Si.

RapiTrim - *The Future of Resistor Trimming™*

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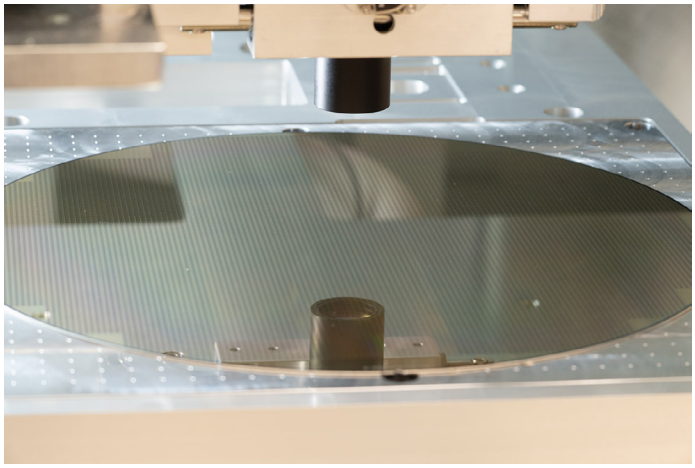
The RapiTrim Wafer Trimming Solution ~ *Setting the new standard*™

The RapiTrim Probing Solution

RapiTrim systems configured with probe card fixtures are ideally suited to volume applications. Standard probe card formats are supported, allowing portability of fixtures from existing equipment.

PPI's advanced probe handler with 4 axis digital servo control provides the industry's highest speed step-and-repeat performance for ultimate throughput. Accuracy and repeatability are guaranteed through high resolution optical feedback on all axes. Profiled motion trajectory control improves probe tip placement and contact precision.

Systems can also be configured with custom probe fixtures for unique applications in both passive (simple resistor) trim and active (or functional) trim situations.

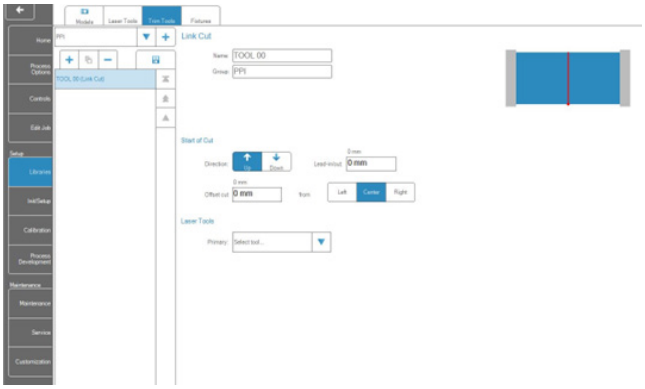


Part fixturing

The RapiTrim-S uses 150mm, 200mm and 300mm round chucks with vacuum hold-down. If adaptability for different wafer sizes is needed PPI can supply custom quick-change fixture plates located by tooling pins.

Other options include independent vacuum zones for these sizes, temperature monitoring and control, part clamping rather than vacuum hold-down and alternate chuck material (non-ferrous, ceramic or custom).

Standard Features



Intuitive graphical user interface with ProSys operating software.

Advanced beam positioning, probe handler, and laser pulse control provides high throughput, accuracy, and process stability.

High accuracy optional integrated measurement system with 4 channel real-time current and voltage simultaneous sampling.

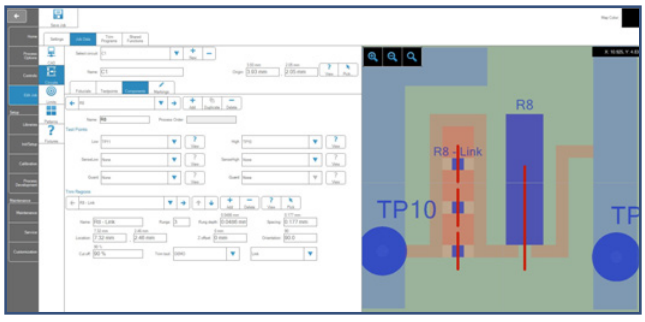
Auto-calibration functions for beam position, probe position and laser power ensure accuracy and repeatable quality.

Automated probe needle cleaning / scrubbing operation.

Extensive system diagnostics continuously monitor all critical components and machine performance.

Sealed beam delivery protects optics from process debris, extending component lifetimes.

Touch screen operation (full HD size).



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Software Features

Simplified operator interface - load substrates and job, then just press Start.

Process map - visualize all job components in map or camera. Clearly see immediately what and where the process is, in real time, including pass / fail indication.

Visualize trims and markings in the map or camera overlay on actual resistors.

Laser scribed marking for serialization and circuit pass / fail status.

Intuitive cut tool editors speed trim library setup.

Engineering / technician process development aided by visual cut testing interface

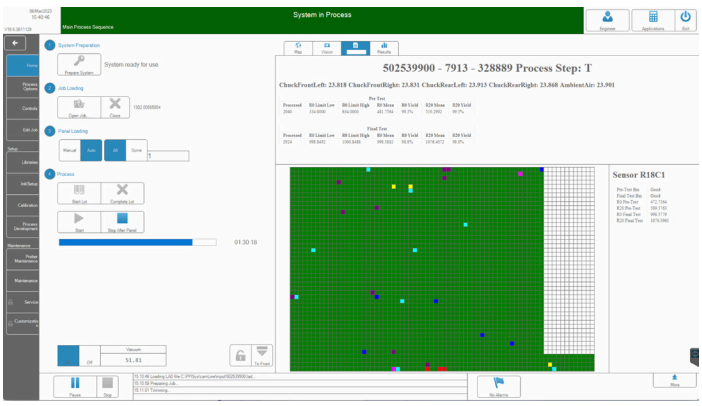
Trim profile graphing for detailed process analysis.

Multi-user, multi-role configurable password protected access to parameters, maintenance, and advanced functions

Maintenance Tracker keeps log of all system maintenance and history and provides prompts at maintenance intervals.

Full system diagnostics and data logging for enhanced product support and predictive maintenance.

Remote access through the internet allows rapid factory support without the cost of a service visit.



Trim and Test Results

Easily view detailed results for each component.

Data logged by substrate serial number, providing off-line historical data review and tracking and statistical data report generation.

Job Creation

Create jobs through an interactive graphical map of components, circuit features, alignment targets, and trims.

Extensive DXF file import support automates and speeds job creation.

Resistor location, orientation, values, and limits are auto defined.

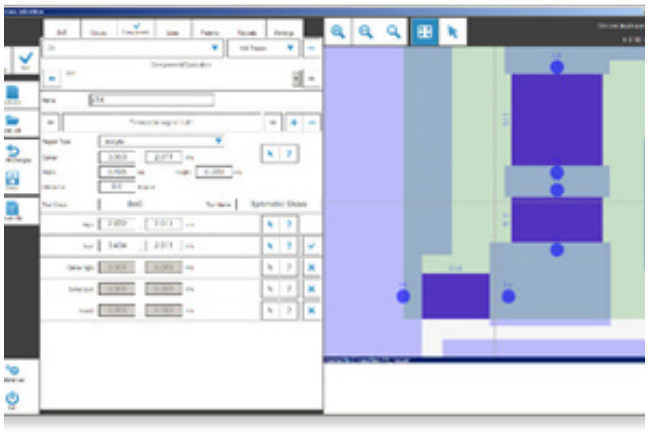
Probe test points can be automatically defined from DXF metallization information.

Interactive graphical process library editor - no programming required.

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

Full trim program with settable min / max cut length limits.

Independent control of laser pulse energy, repetition rate and bite size.



Tester Support

The RapiTrim has an integrated proprietary high-speed four-channel SMU optimized for resistor trim. In addition, the system software and trim controller interface to mixed signal external testers through Trimmer logic. High-speed signal and messaging communication is configurable for setup, trim and test program control and synchronization for industry standard as well as custom testers.

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RapiTrim Specifications[1]

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 long-life fiber and solid state lasers at 1060nm or 1300nm
- Spot size: 6-12 µm
- Automated laser power calibration with integrated power meter
- Automated wafer and die alignment
- Through-lens vision for probe alignment
- Beam scanning field: up to 16 mm
- Beam placement accuracy 1.5 µm (3 sigma) with local alignment
- Beam placement repeatability 1 µm (3 sigma) over 10mm circuit area
- Beam position resolution <0.1 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: 400 mm x 900 mm
- XY Accuracy: <3 µm over 300mm process area
- XY Resolution: 0.1 µm
- XY Repeatability: 1 µm

Part Handling

- Part handling up to 300x300mm on system vacuum chuck

Probing

- Industry standard probe cards, other formats optional
- Z travel: 15 mm
- Z resolution: 0.5 µm
- Servo controlled Z velocity and acceleration
- Roll and pitch adjustment: ± 1°
- Roll and pitch resolution: <5 µRad
- Rotation: ± 5°
- Rotation resolution: <5 µRad
- Automated roll, pitch, Z and rotation calibration
- Automated probe cleaning / scrubbing operation

Measurement System (Optional)

- Fully programmable force voltage or force current
- Resistor range: 0.1 Ω to 1 GΩ
- Ratio trim and guard functions
- Resistance measurement accuracy:

Low Range (<10 Ω) ±0.05% (±0.05% / R)*
Mid- Range: (10 Ω to 1 MΩ) ± 0.02%*
High Range (>1 MΩ): ± 0.02% ± 0.02% per MΩ*

- Voltage Source Ranges and Measurement Accuracy:

Range	Resolution	Accuracy (% FSR)*
±20V	80 µV	± 0.01%
±2V	8 µV	± 0.01%

- Current Source Ranges and Measurement Accuracy

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

*after standard calibration, full Kelvin.
FSR = full scale range.

Wafer Handler (Optional)

- Compatible with bare wafer and film frames up to 300mm
- ADO load port, SEMI compliant
- 6", 8" and 12" wafer compatibility
- FOUP, SMIF, open cassette with adapters
- Vacuum / edge grip end effectors
- Optional pre-aligner

Software

- Auto-import and job creation from DXF
- Automatic substrate alignment
- Configurable part marking and serialization
- Configurable process data transfer in and out
- Automatic system run-time calibration
- Windows®-based user interface with multi-level password protection
- 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
- MES factory integration

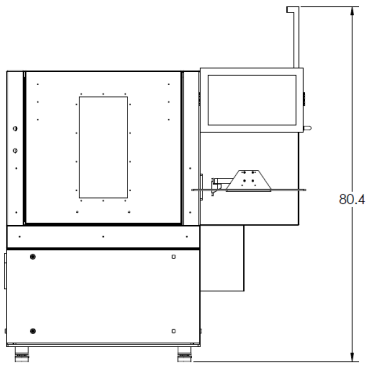
Options

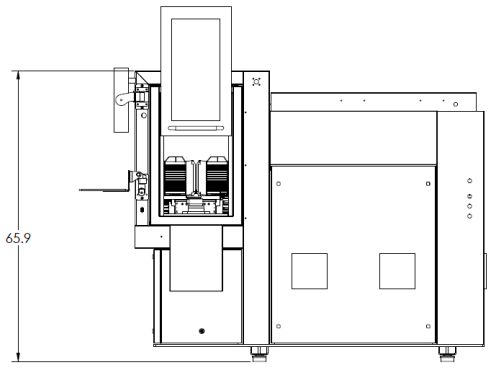
- 1300 nm laser
- Wafer / cassette handlers
- Optional network automation interfaces
- Automated barcode reading functions and job creation/loading
- Custom chucks and part fixturing
- External instrument support
- Switching matrix expansion

Facilities Requirements

- Electrical: 200-240 VAC, 1ph, 30A, 50/60Hz
- Compressed air: 6 bar, 56 l/min, dry and oil free

[1] Specifications are subject to revision





Example enclosure with handler for up to 200mm wafers.

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