

LASER SOCKET CLEANER



- High Champ design
- Made in Korea

Body size: 104 x 50 x 95 cm

Monitor (Optional)

All of our laser cleaning systems have integrated safety Interlock switches. The interlocks can be connected to Doors in designated rooms to provide a high degree of Protection.

The Shielding (goggles) must be adequate to the type of laser being used





System Specification

Nd:YAG Laser

- Wavelength (color) : $1.06\mu\text{m}$ (near infrared)
- Pulse duration : 10 nanoseconds
- Pulse energy : up to 600 millijoules
- Energy density : from 0.2 to 5 joules/cm²
- Pulse frequency : from 1 to 10 hertz

Utility

- Main power : 220VAC, 50/60Hz, 1 Phase, 20A
- Environment : Temperature: 10~30 °C, Humidity: <80 %RH
- Blowing Air : 12 $\overline{\square}$, 1Port, Over 5 Kg/cm²
- Safety : Laser Pointer, Integrated safety interlock switches
Laser goggles



Advantages

The Advantages

The advantages may be summarized as follows:

Laser cleaning does not degrade

- No abrasive effects
- Non-contact
- No thermal effects

Laser cleaning does not pollute

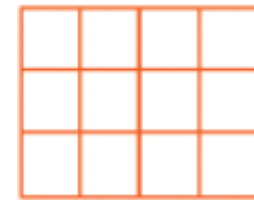
- No substances added
- No solvents
- Minimum amount of to be collected
- No photochemical effects

Laser Cleaning Method

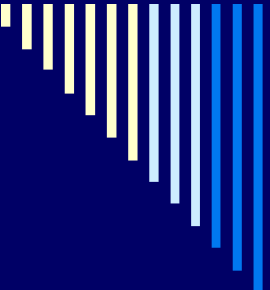
For industrial applications, the cleaning speed is an important parameter. In certain cases, the geometrical shape of the laser beam must be modified in order to optimize the geometrical overlap of the light pulses. It can be shown that a square shaped beam makes it possible to increase the cleaning speed by 50% compared to a circular beam. Laser blast offers beam delivery systems producing a square, uniform output beam for maximum cleaning effectiveness.



Round beam : a part of it useless



Square beam : optimum use of the energy



Socket Cleaning Issues Conventional Cleaning & Problems

- Laser Cleaning Technique Advantages
 - Test Socket Cleaning System
 - System Operation System
 - Specification
 - Cost Saving
-



Test Cleaning Issue 1

- Importance of Socket cleaning
 - During IC package testing, the contact pin surface is contaminated.
 - Test yield decreases and M/C downtime increase by poor contact between package and socket pin.

Test Cleaning Issue 2

- **Leadframe Material Change**
 - >> **Leaded => Lead free leadframe**
 - **Leaded leadframe: Soft (SnPb)**
 - **Leaded free leadframe: Hard (Sn, NiPdAu)**





Conventional Cleaning

>> Conventional cleaning methods

1. Manual brush cleaning
2. Chemical wet cleaning

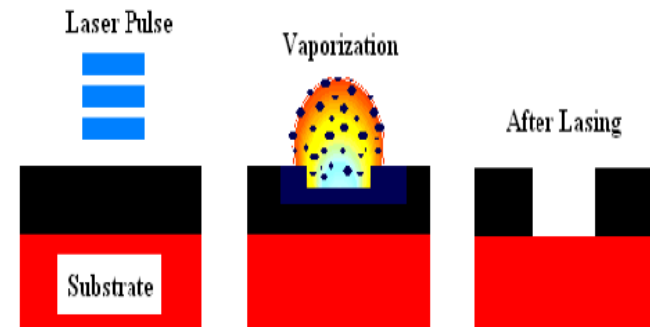
• Problems

- > Pulling sockets out of the board: additional labor
- > Brushing may cause pin surface wear
- > Brush cleaning performance is not so good
- > Long cleaning time & Long Tester downtime
- > Chemical: consumable cost & chemical waste
- > Socket reinserting process required after cleaning
- > Not applicable for emergency cleaning needs

Laser Cleaning Method

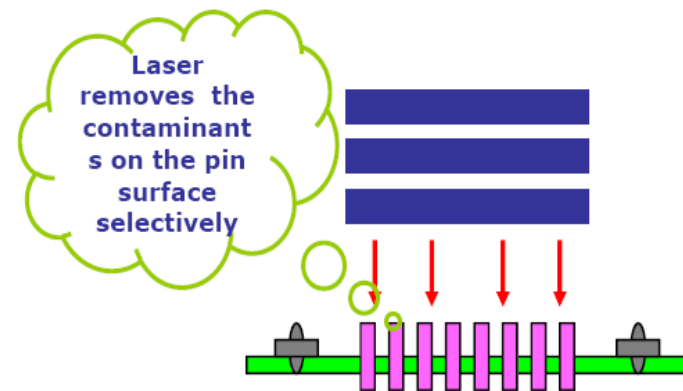
- **What is a laser cleaning?**

: Dry cleaning technique to remove the surface contamination selectively without inducing any substrate damage by using proper laser beam interaction



- **Definition of Socket laser cleaning**

: Removal Process of Tin(Sn) based contamination from the tester socket pin surface to enhance the test yield.





High Champ Laser Cleaner

Advantages of Laser Cleaning

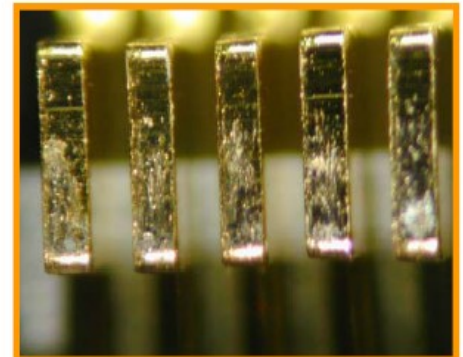
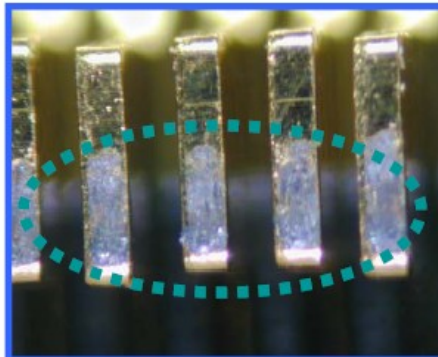
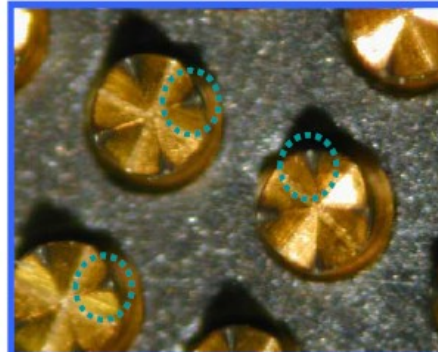
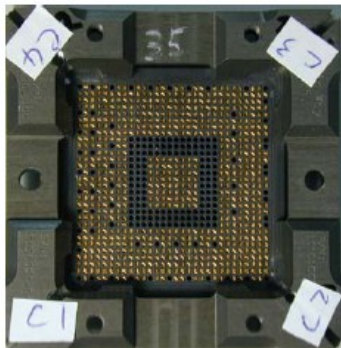
Only for Customer

- **In-situ cleaning** without socket detachment
- Mobile cleaning process by moving the system
- High speed cleaning: approx. **10 sec/socket**
- Very good cleaning performance of Pogo pin
- **Immediate test yield increase** (Approx. >2%)
- Very fast response process for emergency case
- Very simple and easy handling process
- **Low cost of ownership**

cleaning before and after

■ Target of Test Socket Cleaning

: To remove Tin(Sn) based contamination from pogo-pin surface

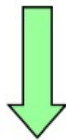
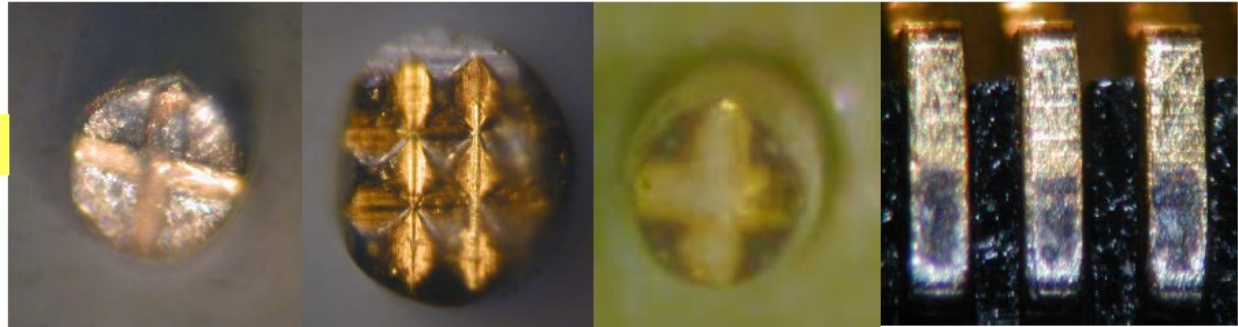


Cleaning Result

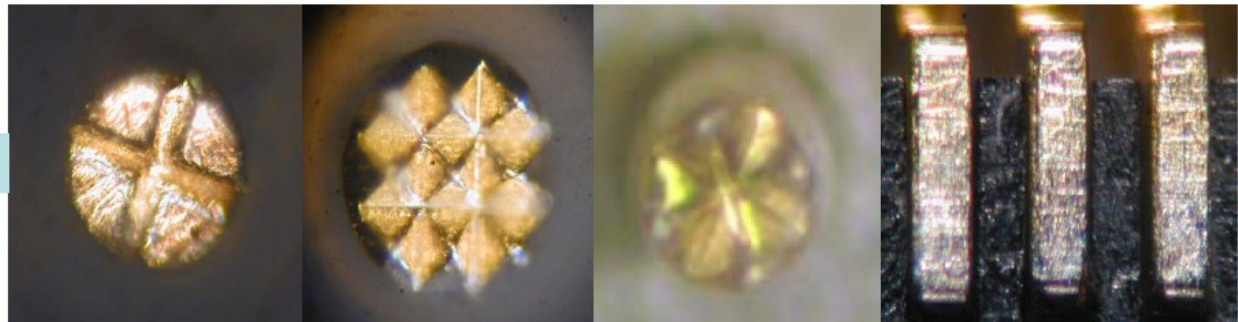
■ Test Summary

: It is proven that laser removes the surface contaminants selectively without causing any substrate damage in logic test sockets.

Before



After

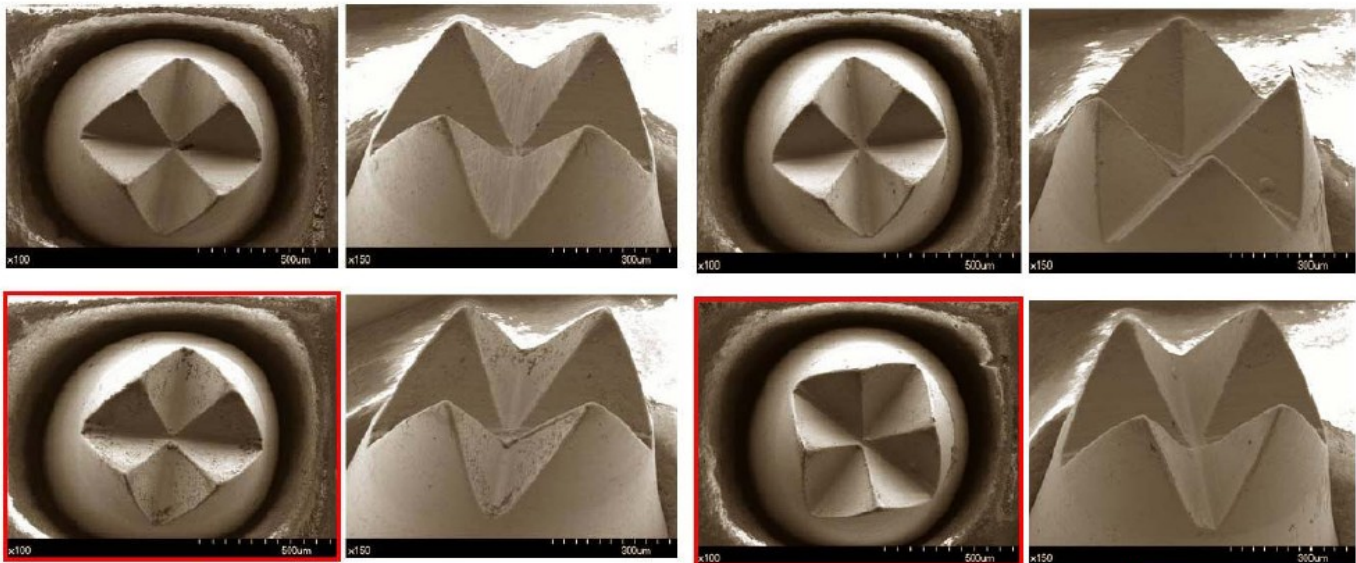


Before and After

SEM Analysis before and after Cleaning

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■ Crown type Pogo Pin





Before Cleaning

After Cleaning: Well removed

Yield Result

Result of Laser Cleaning: Yield Enhancement

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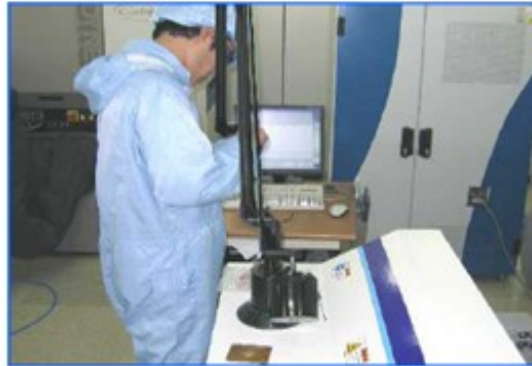
#06 => MLF10x10_64LD (Pogo)						
Before LC	Total: 2,572 Unit			After LC	Total: 3,896 Unit	
Good	(BIN1) 2,314	90%		Good	(BIN1) 3,752	96.3%
Reject	(BIN5) 167	6.5%		Reject	(BIN5) 128	3.3%
	(BIN6) 13	0.5%			(BIN6) 13	0.3%
	(BIN5) 8	0.3%			(BIN5) 9	0.2%
#11 => BGA 13x13 (Pogo)						
Before LC	Total: 1,495 Unit			After LC	Total: 3,104 Unit	
Good	(BIN1) 1,265	84.6%		Good	(BIN1) 2,809	90.5%
Reject	(BIN3) 42	2.8%		Reject	(BIN3) 50	1.6%
	(BIN5) 19	1.3%			(BIN5) 25	0.8%
	(BIN6) 97	6.5%			(BIN6) 109	3.5%
	(BIN7) 81	5.4%		(BIN7) 118	3.8%	

Operation Picture

System Operation

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Real Cleaning
operation
pictures at
customer site



Pay and Back

ROI (Return Of Investment) - Payback

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*** Based on 20 Test Handlers covered by 1 laser cleaner

*** Cleaning carried out every 6 hours every machine

Unit: US\$

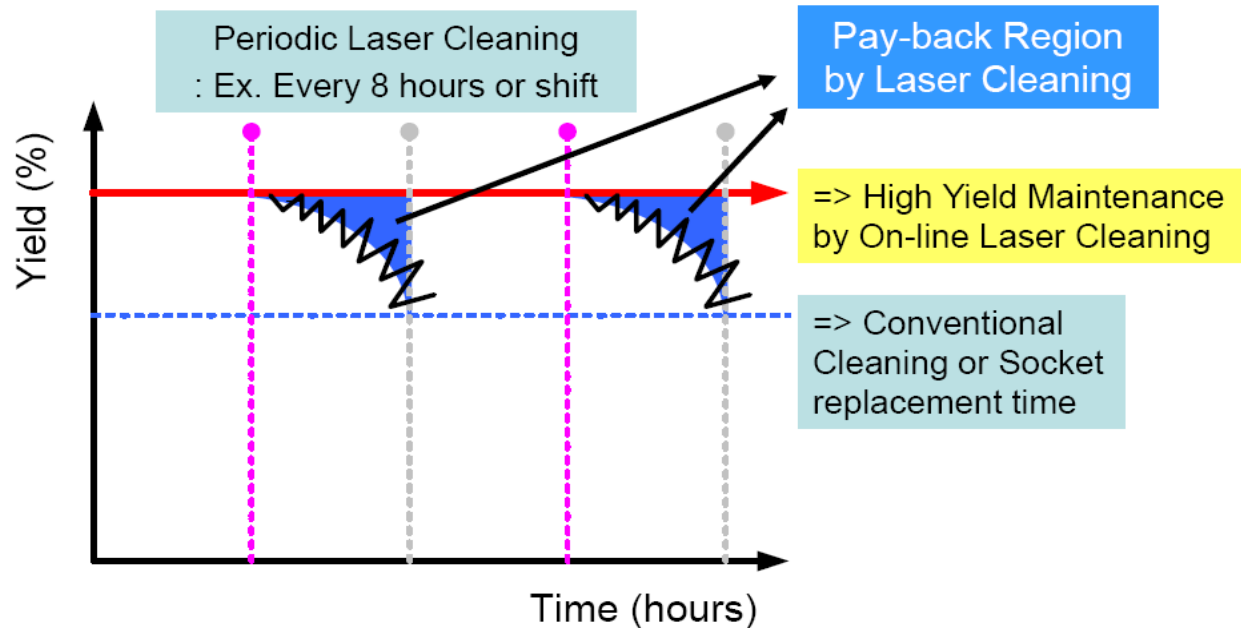
Saving Factor	Details	Saving Effect	Daily Test Capacity/ machine	Daily Test Capacity/ 20MCs	Yearly Test Capacity	Yearly Saving Cost
Yield	Final Test Yield up by regular cleaning (Assume ~3 US\$/chip)	0.5 %	3 K	60 K	21,900 K	328.5 K US\$
Machine Productivity	Details	Saving Time/ machine	Daily Saving Time/20MCs	Yearly Saving Time	Cost / Hour	Yearly Saving Cost
	Retest Time reduction by the increase of First Test yield (min. 3%)	0.72 Hour/ machine	14.4 Hour	5256 Hours	40 US\$	210.2 K US\$
	Test Time increase by rapid on-line cleaning without socket replacement	1.5 Hour/ machine	30 Hour	10950 Hours	40 US\$	438.0 K US\$
Labor	Time saving by rapid on-line cleaning	1.5 Hour/ machine	30 Hour	10950 Hours	15 US\$	164.3 K US\$
Socket Pin Consumption	Details	Saving Effect		Yearly Consumption Cost / 20 machines		Yearly Saving Cost
	Socket Pin Consumption down due to longer lifetime by regular laser cleaning	20%		6 K US\$		1.2 K US\$
Chemicals & Waste	No use of Chemical & water and no post-cleaning waste treatment	100%		1 K US\$		0.2 K US\$
Total Cost Saving & ROI	ROI Payback Time = $(150K / 1142.4K) * 12 = 1.6$ Month <=				Total / Year	1142.4 K US\$

Pay and Back

Yield Management and Cost Saving

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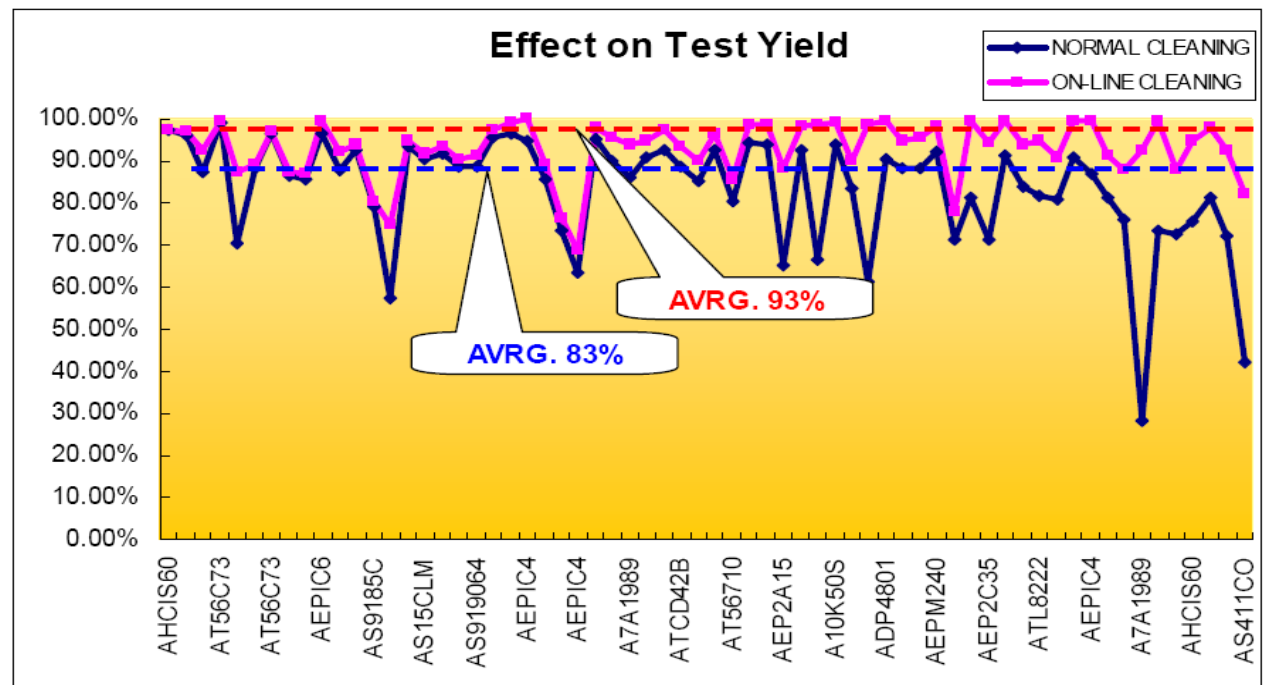
◆ High Yield Management by Laser Cleaning



Pay and Back

Actual Advantage – First Yield Up

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Pay and Back

Significant Cost Saving Effects

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- Yield Increase
 1. First Yield: approx \sim 5%
 2. Final Yield: approx \sim 1%
- M/C Productivity Increase
 1. Re-test time reduction
 2. M/C downtime reduction