

# LASER ANNEALING SYSTEM SWA-90GD

## SPECIFICATIONS

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Rev.B

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A	July.13.2009	<i>K.Tanaka</i>	<i>M.Sakamoto</i>	<i>T.Kawasaki</i>	
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## Table of Contents

	Page
1. Outline	2
2. System configuration and utility	2
2.1 System configuration	
2.2 Utilities	
3. Device configuration and specifications	4
3.1 Laser unit	
3.2 Processing station	
3.3 Automatic transfer device	
3.4 Control device	
3.5 Paint color	
3.6 Installation environment conditions	
4. Delivery range	11
5. Inspection, installation, trial-run and take-over	13
5.1 Inspection at manufacture's shop	
5.2 Witness inspection and test	
5.3 Training of operation and maintenance	
5.4 Participation into inspection	
6. Other general items	14
6.1 Documents for submission	
6.2 Warranty	
6.3 Limitation of liability	
6.4 Reservation of design change	
6.5 Accordance with the user's facility specification	
6.6 Specification change	

## 1. Outline

The main function of this System is to rapidly anneal semiconductor substrates using laser beam energy in order to recover defect crystals generated by pre-process such as ion implantation.

The System is composed of Solid-state laser units, processing station, control devices, transfer robot and other accessory facilities.

Although this system has been designed and manufactured so that it delivers the safety conforming to IEC 60825-1:2001, Safety of laser products-Part1: Equipment classification, requirements and user's guide, the laser unit used in this system corresponds to a **Class 4 laser product.**

Laser light including the scattering ray may cause loss of eyesight or burning when it is irradiated on eyes or skin. Please read the instruction manual and take appropriate safety measures.

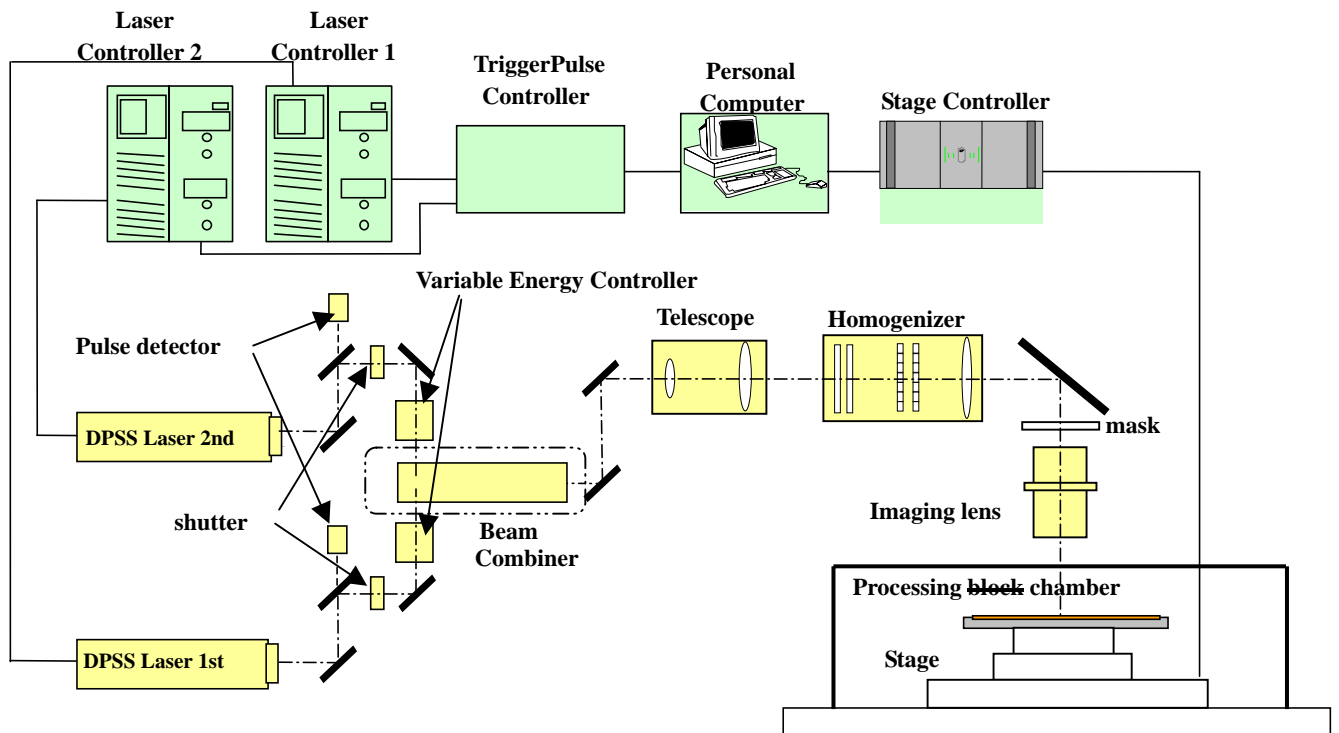
## 2. System configuration and utility

### 2.1 System configuration

Subject work piece: Silicon wafer 6-inch , 8-inch  $t = 100\sim 700 \mu\text{m}$  [ SEMI-standard ]  
(In-cassette warping is  $+0.5/-3.0 \text{ mm}$  or smaller.)

Note) Please prepare the cassette that pocket spacing is 12.7mm.

The wafer transfer operation needs to be checked in advance. Please supply us the wafer and the cassette for transfer test.



## 2.2 Utilities

Please prepare for the following utilities as your responsibility:

### 2.2.1 Power supply

	<u>Phase No.</u>	<u>Voltage (fluctuation)</u>	<u>Frequency</u>	<u>Capacity</u>	<u>Grounding</u>
(1) General	3-phase	210 V ( $\pm 10\%$ )	50 Hz	25 kVA	Type C
	(Including laser unit)				(Single grounding)

Note) We will discuss specification of UPS with you.

Note) Please make sure that there are no devices that generate radio frequency or high noise nearby.

Note) Without instantaneous blackout.

### 2.2.2 Gas supply

<u>Purpose</u>	<u>Supply pressure (flow rate)</u>	<u>Connection size</u>
(1) Driving air or N2	0.40 ~ 0.60 MPa	1/4" SWG
(2) Purging air or N2	0.3 ~ 0.4 MPa	3/8" SWG
	Flow rate: max. 250 L/min, average 100 L/min (Purge gas)	
	Flow rate: max. 100 L/min, average 50L/min (Robot hand)	

### 2.2.3 Vacuum source

<u>Purpose</u>	<u>Supply pressure (flow rate)</u>	<u>Connection size</u>
(1) For work piece absorption	-60 kPa or smaller (30 L/min or higher)	1/4" SWG

### 2.2.4 Exhaust

<u>Purpose</u>	<u>Flow rate</u>	<u>Connection size</u>
(1) Processing machine heat exhaust	5.0 m <sup>3</sup> /min	$\phi$ 100 duct
(2) Vacuum pump heat exhaust	0.25 m <sup>3</sup> /min	3/4" SWG
(3) Chamber exhaust	0.1 m <sup>3</sup> /min	3/4" SWG

Note) Please connect to the exhaust line for your plant to ensure the above flow rate.

### 2.2.5 Water supply & Draining

<u>Purpose</u>	<u>Flow rate</u>	<u>Connection size</u>
(1) Distilled water for optics	6 L/min	3/8" SWG

Note) Deionized water is not allowed to use for cooling water for chiller and cooling water for optics.

Note) Please prepare distilled water + Optishield II (10%) (water volume: 15L x 2chiller)  
for the cooling water. ( pH : 6.8~8.0 )

Please exchange the cooling water and filter element every 3 months.

Please ensure that the cooling water containing Optishield II is disposed according to  
the local laws and regulations with reference to its MSDS.

### 3. Device configuration and specifications

#### 3.1 Laser unit

##### 3.1.1 Specifications

Item	Specification	Remarks
(1) Model	Evolution	Coherent
(2) Laser materials	Nd-YLF	
(3) Wavelength	527 nm	

The Laser pulse width is an important factor affecting processing. However it is not controllable parameter. It is different every Laser and may change after maintenance. Please investigate the influence of the Laser pulse width beforehand.

##### 3.1.2 Device configuration

Item	Specification	Remarks
(1) Laser unit		2 units
(2) Power supply/controller for laser unit		2 units
(3) Chiller for laser unit		2 sets
(4) Power meter	For measurement of each Laser outlet	2 sets

## 3.2 Processing station

### 3.2.1 Specification

Item	Specification	Remarks
(1) X-Y stage		1 set
(a) Stroke	X: 350 mm Y: 250 mm	Feeding direction Irradiation scanning direction
(b) Maximum speed	X: 150 mm/sec, Y: 350 mm/sec	
(c) Positioning accuracy	20 $\mu$ m / 200 mm (*1)	
(d) Repeated positioning accuracy	$\pm 3$ $\mu$ m (*1)	
(e) Driving motor	Linear motor (with linear scale)	
(f) Chuck plate	Material: Ceramics ( $Al_2O_3$ 99.6%) Vacuum absorption	
(2) T axis stage (up/down movement of work piece surface)		1 set
(a) Stroke	2 mm	
(b) Driving motor	Stepping motor	
(3) Processing chamber	With a sight window	1 set
(a) Irradiation atmosphere	Air or N <sub>2</sub> , room temperature	
(4) Dry pump	Exhausting particles -30 kPa or smaller (120 L/min or higher)	1 set
(5) External optical system		
(a) Safety shutter, process shutter		2 sets
(b) Energy adjustment system		2 sets
(c) Beam combiner optical system		1 set
(d) Telescope		1 set
(e) Homogenizer		1 set
(f) Mask module	Mask shape	1 set
(g) Imaging lens		1 set
The irradiation beam size is fixed by the energy density that user needs.		
(6) Enclosure		1 set
(a) Processing block	With door lock/interlock	
(b) Optical system block	With unique bolt fixing cover and interlock Clean air module (ULPA) installed	

(\* 1) The positioning precision indicates the value measured by our inspection standard when the system temperature has stabilized. To implement precision processing, please do so under a constant-temperature environment adjusted to the standard temperature so that the processing precision is maintained.

### 3.3 Automatic transfer device

#### 3.3.1 Specification

Item	Specification	Remarks
(1) Robot		1 set
(a) Total transfer precision	$\pm 0.5$ mm or smaller $\pm 1.0$ deg or smaller	
* The total transfer accuracy will be measured by alignment camera.		
(b) 4-axis cylindrical coordinate type (with double-arm method)		1 set
(c) Transfer hand	Using Bernoulli effect, Silicone rubber contact With wafer sensor	2 set
(2) Pre-aligner		1 set
(a) Wafer center matching function		
(b) Orientation flat matching function		
(c) Angle adjustment	4 angle settings 0, 90, 180 and 270°	
(d) Pad	Silicone rubber contact	
(3) Cassette port		1 set
(a) Atmosphere	Air	
(b) Cassette	Of your supply	
(c) Cassette installation quantity	Up to 2	
(d) Cassette inlet/outlet door with door interlock		
(e) Static eliminator	Installed on top of cassette	
(4) Enclosure		1 set
(a) Cover	Inner surface: SUS cover Outer surface: Steel plate coating Clean air module (ULPA) installed	

Note) The wafer transfer robot corresponds to an industrial robot (Based on standards in Japan). When implementing robot instruction operation and so forth, special training on industrial robots is required.

### 3.4 Control device

#### 3.4.1 Control device and operation panel specification

Item	Specification	Remarks
(1) Operation panel		1 set
(a) Monitor	19"LCD	1 unit
(b) Keyboard and mouse		1 unit
(2) Maintenance panel		
(a) PC with mirroring HDD	OS: WindowsXP Pro	1 unit
(b) Monitor	17"LCD	1 unit
(c) Keyboard and mouse		1 unit
(d) Stage controller		1 set
(e) Trigger pulse controller		1 set
Delay time setting range	0~1000 nsec, resolution: 12.5 nsec	
(f) Oscilloscope for beam monitoring		1 set
(3) Control panel		1 set
(4) Control software		1 set
	The man-machine interface that is for setting recipe, monitoring the status of the process, including alert signal outputted from safety control mean.	
(5) Observation camera		1 set
(a) CCD camera	1/2"CCD color	
(b) Objective lens	Field of view about 6 x 4mm	
(c) Monitor TV	Displayed on PC monitor	
(d) Lighting	LED lighting	
(6) Wafer alignment camera		1 set
	Detects the wafer edge and adjusts the irradiation position.	
(a) CCD camera	1/2"CCD monochrome	
(b) Objective lens	Field of view about 6 x 4mm	
(7) Height sensor		1 set
	Detects the wafer surface and brings the wafer surface into focus. (measurement at wafer center).	
(8) Beam profiler		1 set
	Beam profiler camera is installed on the side of X-Y stage.	
	Measures the beam profile at irradiation surface.	
	Calculates average and standard deviation of beam length and width.	
(9) Average output monitor on irradiation surface		1 set
	A power meter is installed on the processing chamber.	
	Measures the average laser output on irradiation surface before irradiation on wafer.	
	The irradiation surface energy is adjusted by the energy adjustment system based on the measurement value.	



(10) Beam monitoring (Pulse width/pulse delay detection)

1 set

Beam parameter (Pulse width, Delay) is monitored and recorded every 10sec. (Not all pulses during processing)

Alarm is output by a case beyond the setting value for interlock.

(11) Computer Integrated Manufacturing

The CIM software is designed in compliance with SEMI standard, HSMS-SS/SECS- II/GEM.

We will discuss with you on the witnessed inspection details and schedule after received your specification.

The CIM software needs to be checked in advance at manufacture's shop. Please supply us the simulator for CIM test.

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### 3.4.2 Specification of other electrical components

Item	Specification	Remarks
(1) Pole type indication lamp	3 stages, 3 colors	2 pieces
△B Lighting specification: Lighting color (red, white and green from top)	Red: Alarm (Operation not allowed) White: ON: Working, Blink: Done Green: Idle, Working, Done (Without alarm)	
(2) Lighting inside the processing machine		1 set
(3) Door interlock		1 set
(4) Interlock cancellation switch Select switch with key (for maintenance)	In control panel	1 set
(5) Operation stop button (Yellow, without switch guard)	Does not shut down the power supply Operation panel	1 set
On the sides of processing machine (portable)		2 set
Control panel		1 set
(6) Emergency Power shutdown button (Red, with switch guard)	Shuts down the power supply. Operation panel	1 set
On the sides of processing machine		2 set
Control panel		1 set
(7) Service outlet for maintenance	AC100V, Max. 5A	2 set

### 3.5 Paint color

Item	Paint color
(1) Laser unit	Manufacturer's standard color
(2) Processing machine enclosure * No painting on aluminum cover and SUS cover.	Our standard color (ivory)
(3) Control panel	Our standard color (ivory)
(4) Other purchased products	Manufacturer's standard color

### 3.6 Installation environment conditions

- (1) Temperature range for use       $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$   
To use processing to need precision over a long period, please install in a room adjusted to a constant temperature so that the accuracy can be maintained.
- (2) Humidity range for use       $45 \pm 10\%$  relative humidity, there should be no condensation
- (3) Vibration      Vibration acceleration      0.005 G or smaller  
Displacement amplitude (half amplitude)       $5\text{ }\mu\text{m}$  or smaller
- (4) Atmosphere
  - ① Clean room
  - ② Do not install this system in an environment with higher concentrations of corrosive gas or mist (ex.: HCl, H<sub>2</sub>S) than normal.



### 3.7 Consumable parts

Consumable parts (Level "A" parts for one year in the consumable list) are included.

4. Delivery range

- (1) Regarding this system, we shall implement only the processes specified as our delivery range in the table below (indicated by ○, hereafter referred to as “processes included in our delivery range”), and you shall implement the processes other than the processes included in our delivery range (indicated by ×, hereafter referred to as “processes included in your construction range”).
- (2) We shall be responsible for damage compensation, repair and so forth as specified by this specification document only for delay, incompleteness, defects and so forth in processes included in our delivery range, and shall not have any responsibility over delay, incompleteness or defects in processes included in your construction range.

△B

No	Item	Qty	Included: ○ Not included: ×	Remarks
1	Laser unit	2 units	○	As specified in Section 3.1.1
2	Cooling water supply system for Laser	2 sets	○	As specified in Section 3.1.2
3	Processing station	1 set	○	As specified in Section 3.2.1
4	Wafer transfer robot	1 unit	○	As specified in Section 3.3.1
5	Control device	1 set	○	As specified in Section 3.4
6	Consumable parts	1 set	○	As specified in Section 3.7
7	Accessories			
	(1) Safety goggles	2	○	
	(2) Special tools	1 set	○	Please refer to tool list.
	(3) Tools	1 set	○	Please refer to tool list.
8	Anchor bolts for fixing the device		×	Please implement the fixing work by your responsibility.
9	Load dispersion plate for installing the device	1 set	○	SUS plate (approx. □600mm)
10	Partition or processing room for this system		×	Please prepare by your responsibility.  (Necessary for light shielding during system maintenance)
11	Duct for piping and cover for piping block		×	Please provide it by your responsibility.
12	Cooling water piping (between the delivered device)	1 set	○	Connection with the laser The connection of the primary cooling water piping to the system shall be implemented by your responsibility.
13	Exhaust duct and exhaust treatment system		×	Please provide it by your responsibility.

No	Item	Qty	Included: ○ Not included: ×	Remarks
14	Building wall penetration work and primary side wiring and piping, etc. depending on the device assignment		×	Please provide it by your responsibility.
15	Transportation and handling		×	Please provide it by your responsibility. ( FOB )
16	Unloading and carrying in		×	Please provide it by your responsibility. ( FOB )
17	Test operation and witness inspection	1 set	○	As specified in Section 5.
18	Wafer and cassette for adjustment		×	They will be required at system startup in our plant and your plant. Please supply them to us.
19	Utilities		×	Please provide the utilities at free of charge.
20	Safety fence, other safety devices and their installation		×	Please provide it by your responsibility if necessary.
21	Instruction manual and instruction	1 set	○	As specified in Section 5 and 6.

## 5. Inspection, installation, trial-runs and take-over

### 5.1 Inspection at manufacture's shop

In order to confirm performance of this system, manufacturer will implement inspection and trial operation based on "Acceptance Test Procedure" that is agreed with both, and the results of these inspections will be submitted as an Inspection Report.

We plan to implement the following Buy-off meeting (5 days) at manufacture's shop.

- Check on safety system
- Check on major operation
- Explanation on in-plant inspection results
- Check on CIM

### 5.2 Witness Inspection and Test

The inspections will be carried out in the presence of representative from the user after adjustments and trial runs have been completed at user's shop, and acceptance test will be implemented according to an Inspection Report.

We will discuss with you later on the witnessed inspection details.

### 5.3 Training of Operation and Maintenance



The Training will be done for 2 days at User's site, extra-support for 2 weeks and 1 month after final acceptance.

This Training includes Operation and Maintenance procedure of tool.

#### Operation training

- Safety
- Component
- Operating screen
- Working sequence (Start-up, Shut-down, normal working)

#### Maintenance training

- Verification and control methods
- Routine check
- Trouble shooting
- Exchange consumables

An additional charge is necessary to extend a training period.

### 5.4 Participation into Inspection

- |                     |     |
|---------------------|-----|
| In-plant Inspection | Yes |
| Local Inspection    | Yes |

## 6. Other general items

### 6.1 Documents for submission

- |  |                                      |
|--|--------------------------------------|
| (1) Manual ( Safety , Operation , Maintenance) | 1 copy ( English , Clean paper) , CD |
| (2) Inspection Report                          | 1 copy ( English , Clean paper) , CD |

### 6.2 Warranty

Other warranty conditions not described in this section will be governed by the General Terms and Conditions.

#### 6.2.1 Scope of Warranty

The scope of warranty is limited to the scope of equipment supplied by manufacturer.

#### 6.2.2 Term of Warranty

The term of warranty is fourteen (14) months from the date of delivery,. Shipment at Japanese seaport, or twelve (12) months from the date of start-up, first use at user's job site, whichever occurs first.

However, please note that consumables, optical parts and other parts specified in documents are exempted even within the warranty period.

Furthermore, the warranty period for laser diode is the shorter period between 5000 hours and 12 months.

#### 6.2.3 Contents of Warranty

- (1) Manufacturer warrants to user the normal and proper operation of the equipment and system only when the equipment and system have been used and operated under normal and proper conditions as described in the specification or under the specification agreed therein, and maintained in accordance with clauses described in operation manual.
- (2) Manufacturer warrants that the equipment and system delivered to user meet with the specification of the manufacturer.
- (3) Manufacturer reserves the right to judge the effectiveness of the term of warranty.
- (4) It is considered that the term of warranty is void under following conditions:
  - (4-1) Failure of connection between the equipment supplied by the manufacturer and any other devices and systems.
  - (4-2) Inappropriate maintenance and/or handling
  - (4-3) Operation of equipment and system beyond the contents of Specification
  - (4-4) Modification of equipment and system without having prior agreement from the manufacturer
  - (4-5) Failure of equipment and system caused by earthquake, fire, flood, lightning, thunder, and any other inevitable accident.
  - (4-6) Any and all other reasons which the manufacturer is not obliged of.
- (5) Manufacturer does not warrant for articles of consumption and optical parts.

### 6.3 Limitation of liability

This warranty does not cover any consequential or special losses, damages or expenses including but not limited to loss of time, loss of profit or earning, directly or indirectly occasioned to the customer, its employee and its property.

### 6.4 Reservation of design change

The design of this equipment may be changed partially, to the extent that the change does not interfere the function and performance of the equipment, if needed after obtaining the agreement of user.

### 6.5 Accordance with the user's facility specification

#### 6.5.1 Safety design standard

The system was designed, engineered and manufactured in accordance with SHI's Safety Design Standard and in compliance with SEMI S2/S8.

Safety Evaluation and Test & Inspection Services are performed by QSES Incorporated in Japan as a third party agency.

#### 6.5.2 User's facility specification

Each component is of the manufacture's standard component, and the user's particular specification is not applied.

#### 6.5.3 RoHS Directive & REACH

This system is not applicable to RoHS Directive & REACH.

### 6.6 Specification change

If it is requested by the user to do so after the agreement of firm specification, the manufacturer may change the specification by submitting a new quotation, including the revision of agreed delivery time.

End of document