

# LEVERAGE THE POWER OF **LASER TECHNOLOGY** TO YOUR ADVANTAGE

---

ARE YOU IN SEARCH  
OF A **PROCESS UPGRADE?**

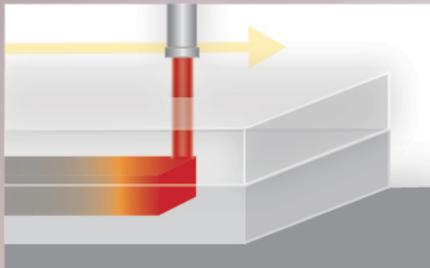
---

**Hamamatsu Photonics**, a leader in the photonics market, develops customizable and easy to operate semiconductor lasers. All manufactured in-house, we provide various solutions presented here, perfect for a range of manufacturing applications.

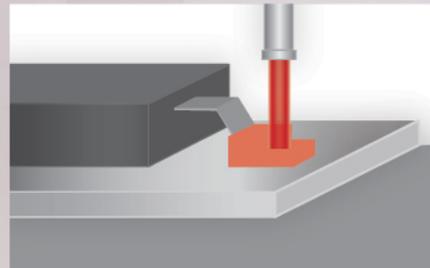
**HAMAMATSU**  
P H O T O N I S O U R B U S I N E S S

# HARNESS THE POWER OF LIGHT ENERGY

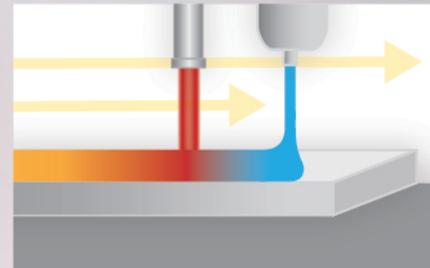
## OPERATIONS



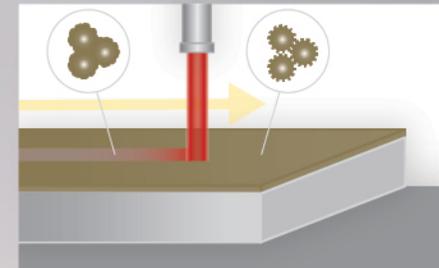
**WELDING** is a fabrication process that joins materials, usually thermoplastics, by using high heat to melt a part of the absorbent workpiece and allowing it to cool, causing fusion with the transparent piece.<sup>1</sup>



**SOLDERING** is a process in which two or more items are joined together by melting and putting a filler metal (solder) into the joint, the filler metal having a lower melting point than the adjoining metal.<sup>2</sup>



**CURING** is a chemical process employed in polymer chemistry and process engineering that produces the toughening or hardening of a polymer material by cross-linking of polymer chains.<sup>3</sup>



**SINTERING** is the process of compacting and forming a solid mass of material by heat or pressure without melting it to the point of liquefaction.<sup>4</sup>

## RETHINK YOUR PROCESSES WITH IMPROVED & PRECISE TECHNOLOGY

From the R&D lab to mass production lines, laser technology is a pillar for smooth and efficient ways to measure, control and improve production. Meet **SPOLD**, **SPOLD** built-in process monitor and the **T-SMILS**.

**SPOLD**<sup>®</sup>



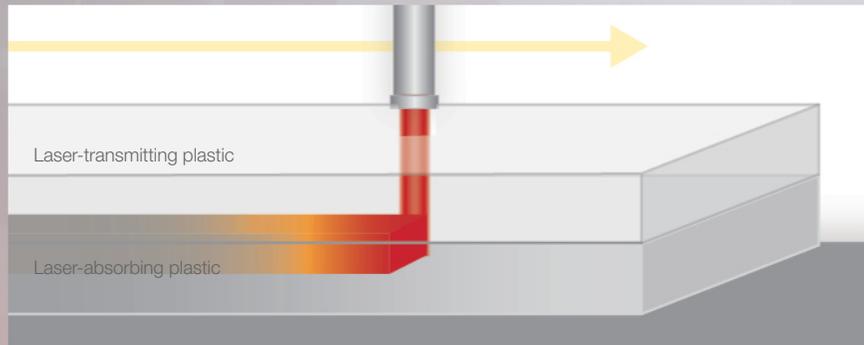
**SPOLD**<sup>®</sup> BUILT-IN-PROCESS MONITOR



**T-SMILS**<sup>®</sup>

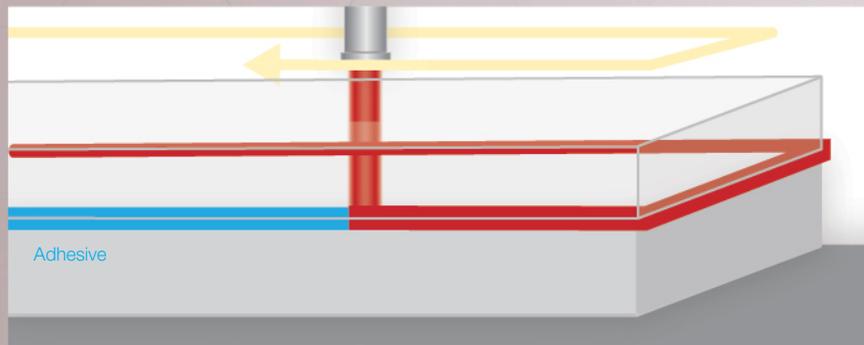


## APPLICATION EXAMPLES



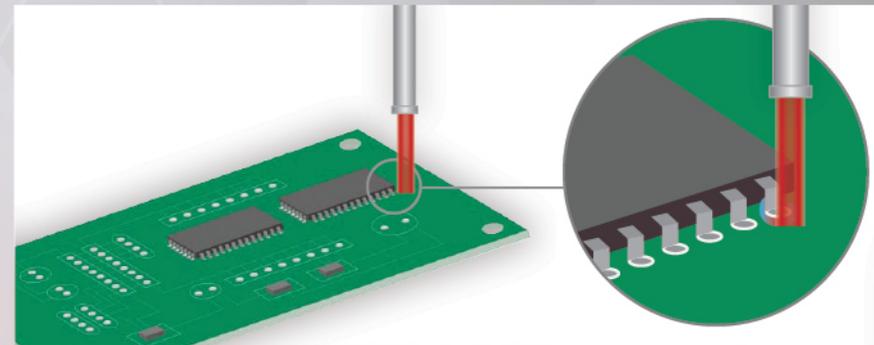
### WELDING: Plastic welding

In this method, two pieces of plastic are united through the heat of the laser. Once applied, it melts the materials, in a non-contact manner, until both parts cool and solidify to form a permanent weld.



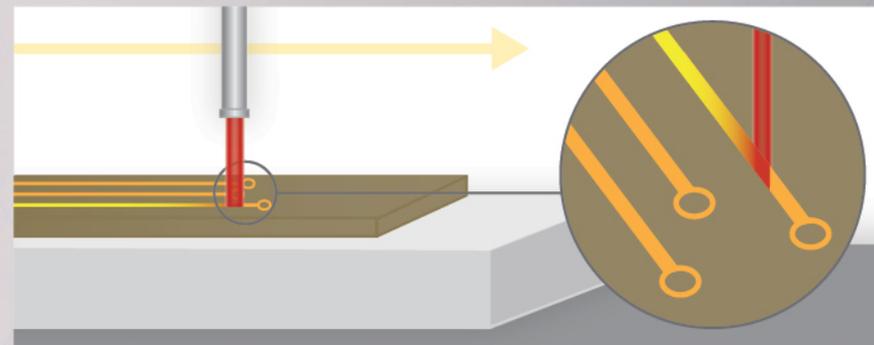
### CURING: Adhesive curing

This is a chemical process in which the adhesives dry or crystallize completely. For example, photopolymers (or other polymers of different forms) are cross-linked through the laser heat until the adhesives form a strong bond.



### SOLDERING: PCB parts soldering

The process of joining two small pieces together on the surface of a Printed Circuit Board. The heat and energy is transferred via a laser beam connecting two or more different electrical components on your circuit board.



### SINTERING: Metal nano-ink sintering

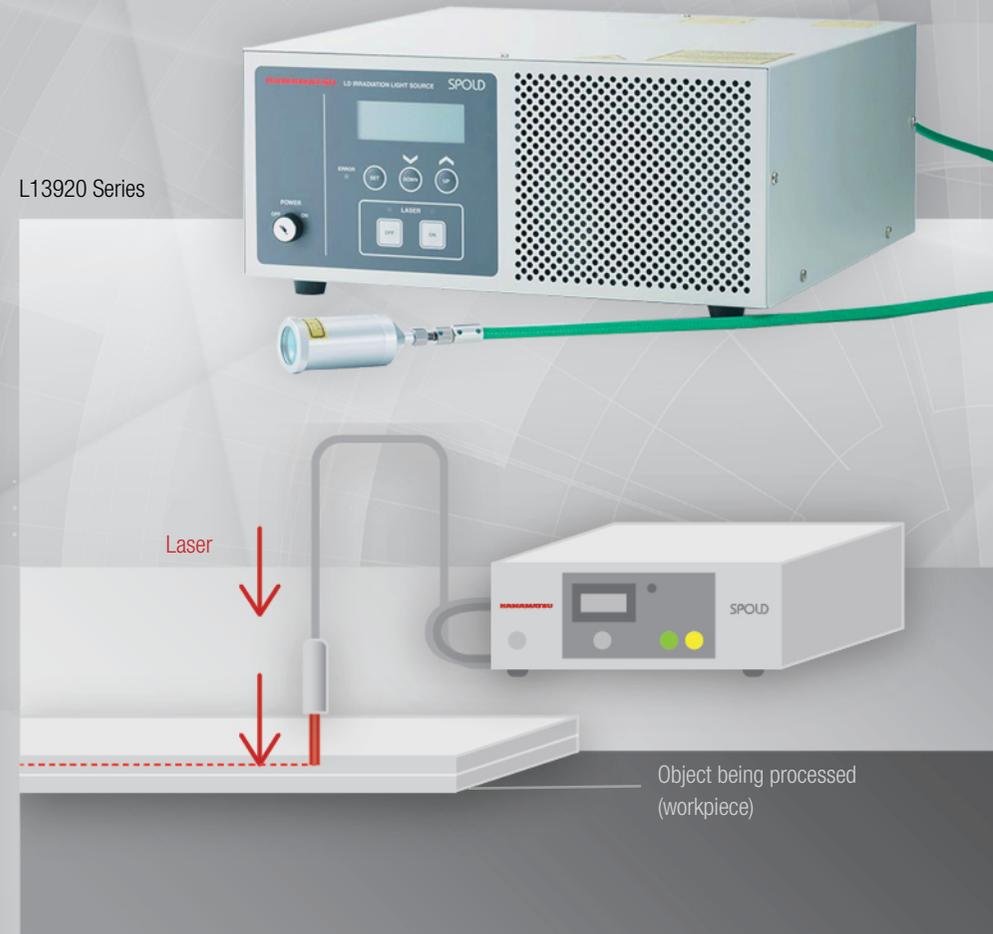
Once the metal nanoparticles are irradiated by infrared laser, an increase of electrical conductivity occurs. Metal nano-ink sintering is promising for applications in the printed electronics field.

## WELD, SOLDER, CURE OR SINTER

# SPOLD®

The laser beam condensed small spot is so powerful that your materials will not only merge to perfection but also harden quickly. Testing has shown that the **laser bonding lasts far beyond** the materials' breakpoint itself. Even on complex and different structured materials, a semiconductor laser means **smooth, equal and clear** bonding, regardless of the materials you are joining. It is also the perfect solution for curing or sintering applications: **fast, clean & guaranteed results.**

L13920 Series



**SPOLD stands for Spot Laser Diode.** Compact, cost effective and lightweight, the laser light source is optimized through its universal model for mass production lines. Choose a unit that emits at your **desired beam power, diameter and profile**, according to your production parameters.

## OPERATE WITH REAL-TIME PROCESS CONTROL

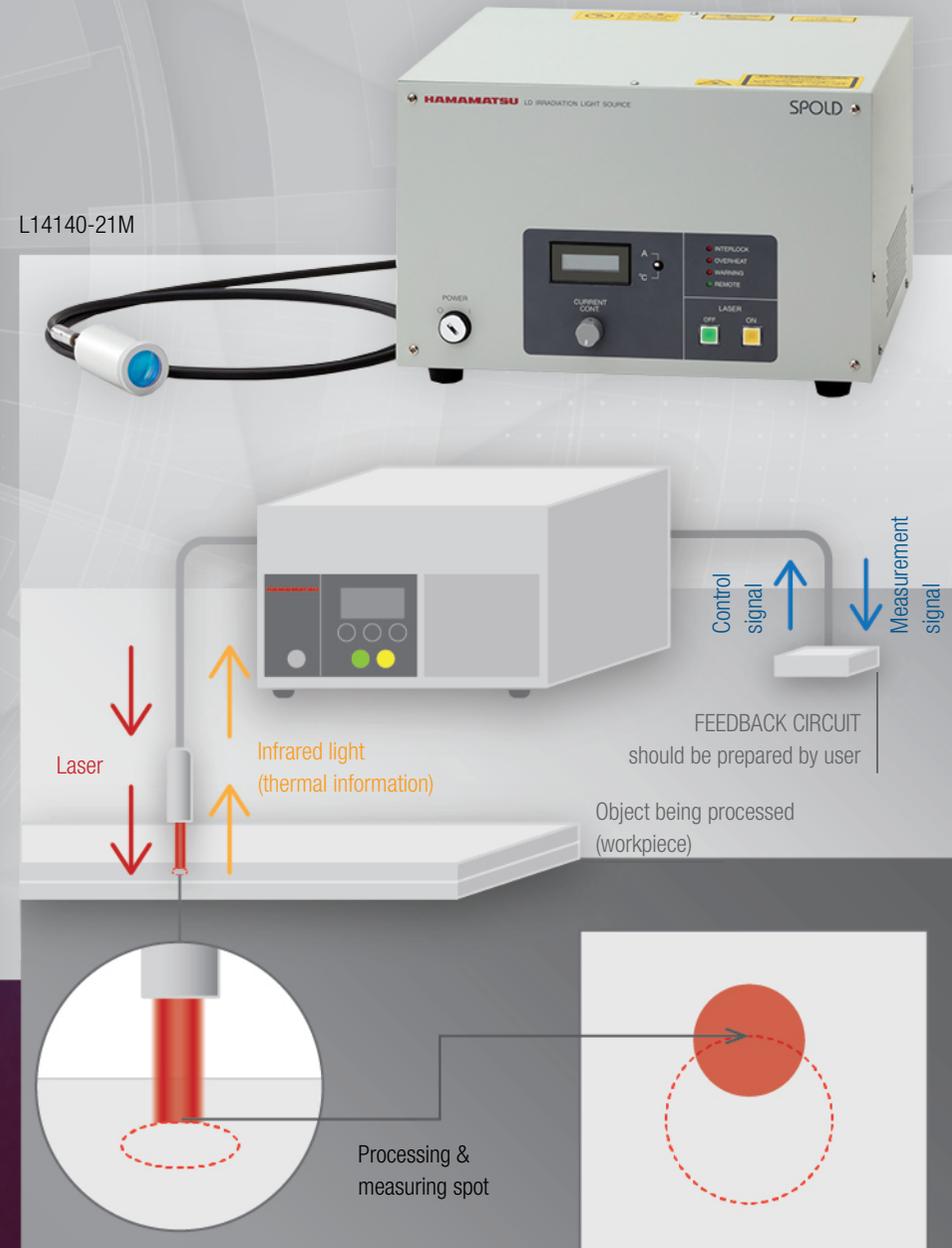
# SPOLD<sup>®</sup> BUILT-IN PROCESS MONITOR

Based on the SPOLD with an additional integrated system that allows you to **verify the thermal output** for in-line manufacturing processes. This monitor offers a non contact thermal profile enabling a quick-response and a non-destructive inspection. Processing materials at different temperatures is now **possible in real-time**.

This makes it easier for you to control the quality of production all while saving time.

**A single optical head for stable measurement.** Using a single optical fiber for processing and measurement makes all of the difference. It eliminates the need to adjust the alignment of the laser while monitoring its position, making it possible for **high repeatability measurements**.

L14140-21M



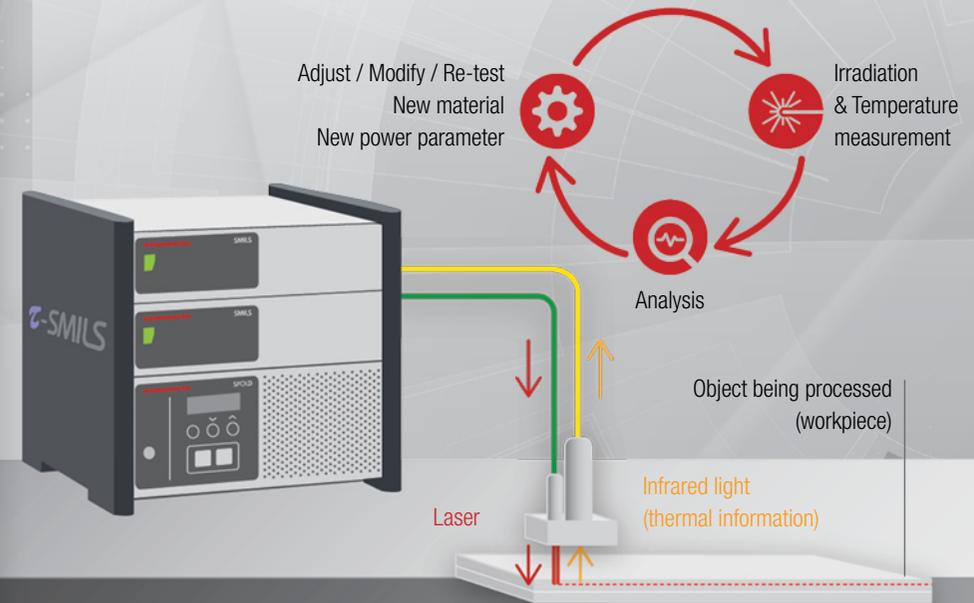
## FIND, OPTIMIZE & CONTROL YOUR PROCESSING CONDITIONS

# T-SMILS®

Temperature Sensing Module Integrated Laser System (T-SMILS) is the premium solution if precision with minimal effort is what you are after. We are **the only ones in the world offering temperature feedback control in real-time monitoring**. A temperature module, a communication module and a SPOLD are easily assembled\* to create the ideal optical system for in-line quality control and data logging systems meeting the needs of the Industry 4.0.

Set the temperature, power and watch it automatically respond and adapt to offer the highest quality standards. Optimize and control the ideal conditions in your R&D lab and for all of your production sites.

L15570-111  
L15570-211  
L15570-311



At what temperature will the bonding be resistant enough?

Will my samples pass all the tests?

How can I ensure the temperature will adapt to my sample's configuration?

\*Stand-alone models also exists.

**Temperature feedback** control means the laser can adjust automatically to avoid overheating caused by the change in scanning speed around sample corners for example. **Save time** on testing and **ensure your deadlines**. The T-SMILS makes it possible for you to **plan the right conditions**, which makes it the ideal tool for high standard quality testing and control.

# PRODUCT LINEUP

## SPOLD®



		L14140-11	L14140-21	L14140-31	L13920-411	L13920-421	L13920-511	L13920-521	L13920-611	L13920-711	
LD irradiation light source main unit	Light output (with max. current setting)	9.5 W (min.)		16.5 W (min.)	30 W (min.)		75 W (min.)	60 W (min.)	200 W (min.)	360 W (min.)	
	Output end of laser transmitting optical fiber										
	Peak oscillation wavelength (25 °C)	915 ± 20 nm				940 ± 20 nm	808 ± 20 nm	940 ± 20 nm	808 ± 20 nm	940 ± 20 nm	
	Output end of irradiation unit	9 W (min.)		15 W (min.)	27 W (min.)		67.5 W (min.)	54 W (min.)	180 W (min.)	320 W (min.)	
	Laser type	Laser diode (LD)									
Oscillation mode	CW										
Cooling method	Air cooling								Distilled water cooling *1		
Laser optical fiber	Fiber length	Approx. 2 m				Approx. 5 m					
Irradiation unit	Light condensing spot diameter	0.1 mm	0.2 mm	0.8mm	0.8 mm		1.6 mm			3.2 to 6.4 mm	

\*1 Cooler unit needs to be prepared separately. [L13920-611] Cooling water condition: 2 L/min to 3 L/min, cooling capacity: more than 300 W. [L13920-711] Cooling water condition: 4 L/min to 6 L/min, cooling capacity: more than 700 W.

## SPOLD® BUILT-IN-PROCESS MONITOR



		L14140-21M	L13920-411M	L13920-511M	
LD irradiation light source main unit (with process monitor)	Light output (with max. current setting)	8.5 W (min.)	30 W (min.)	70 W (min.)	
	Output end of irradiation unit				
	Peak oscillation wavelength (25°C)	915 ± 20 nm	940 ± 20 nm		
	Laser type	Laser diode (LD)			
	Cooling method	Air cooling			
	External control	D-sub 15 pin (main unit, process monitor unit)	D-sub 25 pin (light source unit) / D-sub 15 pin (process monitor unit)		
	Measurable infrared output *2	200°C to 600°C equivalent			
Measurement cycle	1 ms				
Laser Optical fiber	Fiber length	Approx. 2 m	Approx. 5 m		
Irradiation unit	Light condensing spot diameter	Approx. 0.2 mm	Approx. 1.6 mm		

\*2 When measured using a blackbody furnace. (emissivity: 0.93 mm)

## T-SMILS®



		L15570-111	L15570-211	L15570-311
Entire laser heating system		General rating: 390 x 360 x 390 mm l - 22 kg or less Laser guide: 650 nm +/- 50 nm , 1 mW or less		
Laser irradiating light source unit (SPOLD)	Light output	30 W (min.)	75 W (min.)	200 W (min.)
	Oscillation mode	CW (Continuous wave)		
	Peak oscillation wavelength (25°C)	940 nm +/- 20 nm		
	Cooling type	Air	Water	
Laser-transmitting optical fiber		Fiber length: Approx. 5 m (Length without light source main unit: approx. 4.5 m)		
Irradiating optical unit		Spot size: 0.8 mm to 6.4 mm in dia. (Depends on the customer's requirements)		
Temperature measurement		Measurement method: Radiation thermometry with two-color method through fiber Measurement range: 200 °C ~ 650 °C		
Communication protocol		Ethernet: TCP/IP		

## CONTACT US

### Meet us & test your samples locally

Whether you are seeking to upgrade an already set production process, to monitor the temperature, and hence the quality in-line, or to achieve the best operating conditions, we will help you find the optimal solution. Speak to one of our qualified local sales engineers so they can assist you with your queries each step of the way.

# HAMAMATSU

PHOTON IS OUR BUSINESS

## HAMAMATSU PHOTONICS DEUTSCHLAND MAIN OFFICE

Arzbergerstr. 10

82211 Herrsching am Ammersee, Germany

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

[info@hamamatsu.de](mailto:info@hamamatsu.de)

(49)8152-375-0

SPOLD and T-SMILS are registered trademarks of Hamamatsu Photonics K.K. • Information furnished by HAMAMATSU is believed to be reliable. However no responsibility is assumed for possible inaccuracies or omissions • Specification and external appearance are subject to change without notice.

<sup>1</sup> Welding: En.wikipedia.org. 2020. Welding. [online] Available here [Accessed 9 November 2020].

<sup>2</sup> Soldering: Collinsdictionary.com. 2020. Solder Definition And Meaning | Collins English Dictionary. [online] Available here [Accessed 9 November 2020].

<sup>3</sup> Curing: Transparencymarketresearch.com. 2020. Rubber Curing Chemicals Market Share, Trends | Forecast 2027. [online] Available here [Accessed 9 November 2020].

<sup>4</sup> Sintering: sintered. (n.d.) American Heritage® Dictionary of the English Language, Fifth Edition. (2011). Retrieved November 9 2020 from <https://www.thefreedictionary.com/sintered>