

SILENTSYS

ultralow noise systems

USER GUIDE



HIGH SPECTRAL PURITY LASER SOURCE

SLIM LINER



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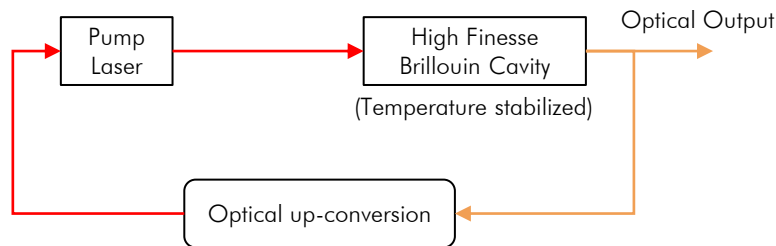


www.silentsys.com



I. INTRODUCTION

Thank you for ordering the SLIM LINER – High spectral purity laser source. This single-frequency, ultra-narrow linewidth laser is based on a Self-Adaptive Photonic Oscillator (SAPO) technology developed by the Institut Foton at Université de Rennes in France. The basic principle is illustrated in the figure below. A pump laser is locked onto a cavity using stimulated Brillouin scattering that offers an extremely narrow gain bandwidth, naturally favoring a high spectral purity.



The system is designed and manufactured by SILENTSYS with low noise and high-performance control electronics. It is integrated into a modern-style aluminum enclosure with touchscreen controls and standard connectors for an easy use.

IMPORTANT: Read the operating instructions carefully and especially observe the safety information. If you do not follow the safety instructions and information on proper handling in this manual, we assume no liability for any resulting personal injury or damage to property. Such cases will invalidate the warranty/guarantee.

II. DELIVERY CONTENT

The SLIM LINER is delivered with a case for easy transportation and protection. Inside the case, you will find:

- SLIM LINER – High spectral purity laser source
- AC/DC switching power supply – XP-POWER ACM36US09
- User Guide (this document)
- Data Report

IMPORTANT: For up-to-date Operating Instructions, please contact us directly (see contact information at the end of this document).



III. SAFETY INSTRUCTIONS

- Consult an expert when in doubt about operation, safety or connection of the device.
- Maintenance, modifications and repairs are to be performed exclusively by SILENTSYS SAS.
- If you are not sure about the correct connection or use, or if questions arise which are not covered by these operating instructions, please do not hesitate to contact our technical support or another qualified specialist.
- The device is not a toy. Keep it out of the reach of children and pets.
- Protect the product from extreme temperatures, direct sunlight, strong jolts, high humidity, moisture, flammable gases, vapors and solvents.
- Do not place the product under any mechanical stress.
- If it is no longer possible to operate the product safely, take it out of operation and protect it from any accidental use. Safe operation can no longer be guaranteed if the product:
 - is visibly damaged,
 - is no longer working properly,
 - has been stored for extended periods in poor ambient conditions or
 - has been subjected to any serious transport-related stresses.
- Also observe the safety and operating instructions of any other devices which are connected to the product.
- Never open the device or insert objects into it through its holes. Such cases will void the warranty/guarantee.
- Always lay the cables so that nobody can trip over or become entangled in them. This poses a risk of injury.
- Check the product for damage(s) each time before use. If you discover any damages, do not use the product.
- Do not operate the product in interior places or rooms with unfavorable ambient conditions. This can damage the sensitive electronics found inside the product and can potentially pose life-threatening risks. Poor ambient conditions are:
 - High humidity (>80 % relative, condensation)
 - Humidity, dust, flammable gases, solvent vapors, benzene
 - Electromagnetic fields (motors, transformers, audio systems for model building etc.) or electrostatic fields
- The maximum altitude allowed is 2'000 m (6'561 ft) above sea level.
- This device is powered down by removing the mains plug, which must remain accessible.
- **WARNING : INVISIBLE LASER RADIATION WHEN OPERATING WITH FIBER DISCONNECTED**
 - Do not operate with a broken fiber optic cable or with fiber disconnected
 - Refer to the laser warning label on the device for safety considerations



IV. DISPOSAL



Electronic devices are recyclable waste and must not be disposed of in the household waste. At the end of its service life, dispose of the product according to the relevant statutory regulations. You thus fulfill your statutory obligations and contribute to the protection of the environment.

V. CONNECTION INTERFACES

Your SLIM LINER is a turn-key continuous-wave laser system working at a given wavelength (see Data Report for details). The laser is accessible via the Narrow key (2.0 mm) FC/APC connector on the front panel that is labeled “OPTICAL OUT”. The front panel connectors are protected against dust with dedicated caps.

On the left side of the front panel, a touchscreen is available to control the system and display important information. On the far-right side of the front panel, two SMA connectors are provided for external control of the Brillouin cavity temperature. This feature enables a slight tuning of the laser wavelength. The top “NTC 10k Ω ” SMA is connected to an NTC thermistor that measures the cavity temperature and the bottom “Ext Temp IN” input controls a Peltier element through a voltage to current converter.



On the back panel of the device, there is a P1J plug for the power supply and an illuminated power switch to enable or to disable the entire system. Also on this face are the product serial number, and a 4 mm hole for grounding the device with a banana cable.



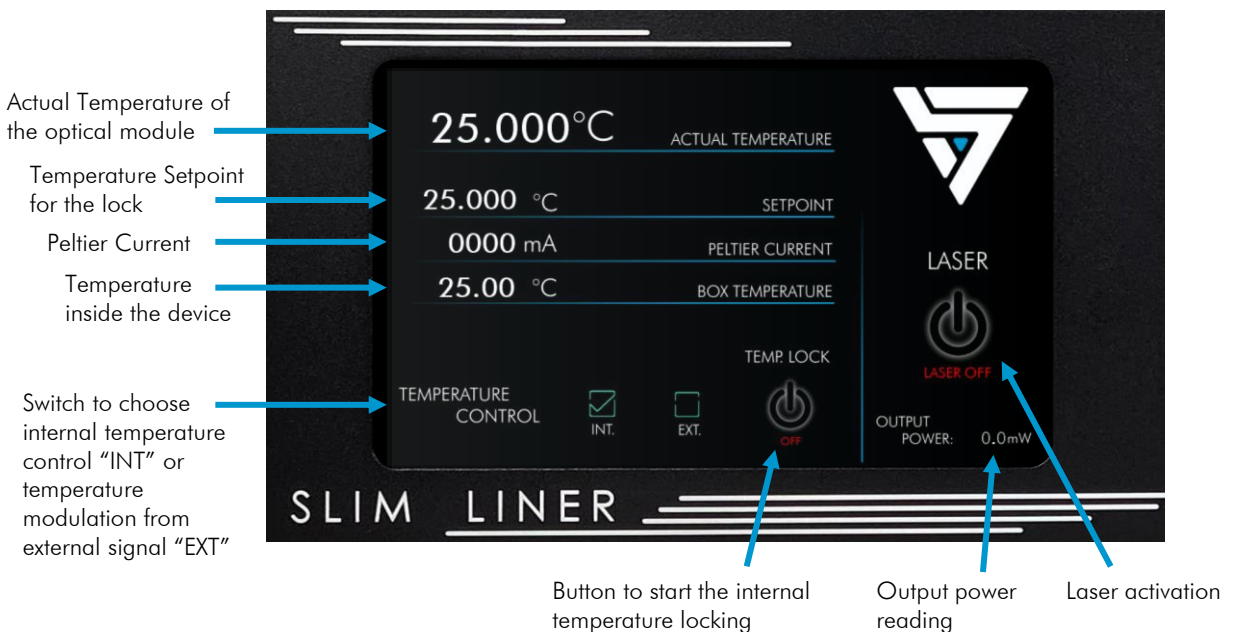
VI. QUICK START

1. Plug the provided power supply into an electrical socket.
2. Plug the P1J connector of the provided power supply into the "INPUT" plug on the rear face of the SLIM LINER and connect a grounded banana plug to the 4mm grounding hole.
3. Turn ON the SLIM LINER by pressing the power button on the rear face. The button will illuminate when the device is powered on.
4. The SLIM LINER is ready to be used and can be connected to your devices. However, temperature stabilization is important to reach the best optical frequency stabilities (see next section).
5. To turn OFF the SLIM-LINER, press the power button on the rear face and unplug the provided power supply from the SLIM LINER or the electrical socket. Socket must be accessible.

IMPORTANT: Place the SLIM LINER unit on a stable, level and robust surface. For the best results, use the SLIM LINER where the acoustic noise and mechanical vibrations are lowest and where the temperature stability is best.

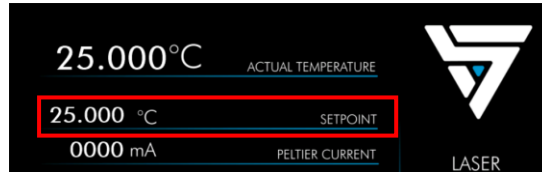
VII. TOUCHSCREEN CONTROLS

When the SLIM LINER is powered on, you will be presented with the following screen.

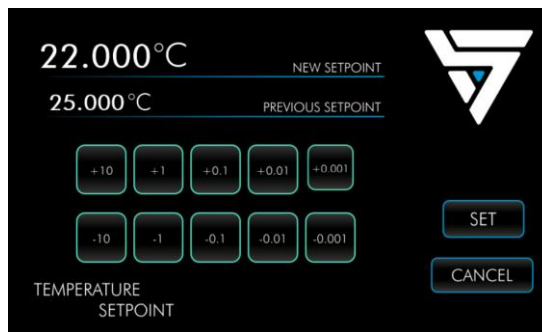


TEMPERATURE STABILIZATION:

1. Adjust the target temperature by clicking the Setpoint area on the touchscreen (red zone in the following image):

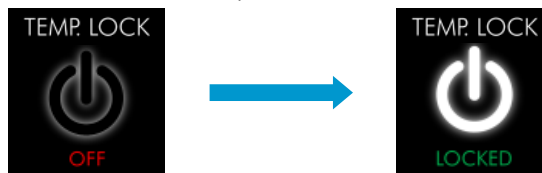


2. You will be presented with the following page. The adjustment of the setpoint is done by clicking on the +/– buttons. Press “SET” to make this new value the temperature setpoint or “CANCEL” to go back to the main page.



IMPORTANT: The value of the setpoint is saved in the internal memory of the system and recalled when the device is restarted.

3. Press the “TEMP. LOCK” button on the screen to launch the temperature stabilization of the optical module. The button will start blinking and the message “LOCKING” will appear. When both of the following conditions are met, the button will display “LOCKED”.
 - The mean value of the temperature for 5 seconds is within 20 mK of the setpoint.
 - The standard deviation of the temperature for 5 seconds is less than 2 mK.



4. The setup is complete, and your SLIM LINER is ready to use !

IMPORTANT: To reach the best performances, the temperature difference between the “Box Temperature” and the “Setpoint” should be as low as possible, meaning that the “Peltier Current” should be as low as possible.

IMPORTANT: A security is present in the software such that if the temperature locking is too long, it will be automatically stopped to protect the device. If the absolute value of the Peltier current is greater than 700 mA for 4 minutes consecutively, the lock is automatically stopped.

VIII. ERROR CODES

Code	Subsystem	Error Message
<0>	System	Automatic Reboot, Contact SILENTSYS
<1>	Optical Amplifier	Booster Temperature Error
<2>	Optical Amplifier	Booster Current Error
<3>	Optical Amplifier	Preamplifier Current Error
<4>	Optical Amplifier	Low Output Power 2
<5>	Optical Amplifier	Low Input Power 2
<6>	Optical Amplifier	Preamplifier Temperature Error
<7>	Optical Amplifier	Board Temperature Error
<8>	Optical Amplifier	Power Supply Error
<9>	Optical Amplifier	Low Output Power
<10>	Optical Amplifier	Low Input Power
<11>	Optical Amplifier	Bad Control Mode
<12>	Optical Amplifier	Communication Error
<13>	Pump Laser	Low Output Power
<14>	Pump Laser	High Output Power
<15>	Optical Amplifier	Output Power Out of Range
<16>	System	Output Power Exceeds Maximum
<17>	Optical Module	Peltier High Current Time Limit
<18>	Pump Laser	High Temperature Time Limit
<19>	Optical Amplifier	Illegal Power Setpoint
<20>	System	Save State Failed
<21>	Pump Laser	Temperature Must Be Locked
<22>	Pump Laser	OFF Command Unresponsive
<23>	Pump Laser	ON Command Unresponsive
<24>	Optical Amplifier	Unexpected Input Power
<25>	System	Box Temperature Out Of Range
<26>	Synthesizer	Unexpected State
<27>	Optical Amplifier	Input Power Error
<28>	Optical Amplifier	Unresponsive
<29>	Optical Module	Temperature Out Of Range

IMPORTANT: Contact SILENTSYS support if needed. Error messages are displayed on a red banner. Click on the banner to hide the message.



IX. TECHNICAL DATA

Optical

- Optical output connector: PM FC/APC with Narrow key (2.0 mm)
- Laser emission: Continuous Wave (CW)
- *See Data Report for the following optical specifications*
 - Output wavelength
 - Output power and stability
 - Frequency noise and stability
 - Relative Intensity Noise (RIN)
 - Polarization Extinction Ratio (PER)

Electrical

- External temperature control
 - NTC resistance reading connector: SMA
 - Temperature control input connector: SMA
 - NTC characteristics: *See Data Report*
 - Temperature control input voltage range: $\pm 5V$, permanent damage beyond $\pm 9V$
- Power supply plug: P1J
- Provided power supply : 9 VDC / XP-POWER ACM36US09

Mechanical

- Product dimensions: 360 mm x 360 mm x 88 mm
- Product weight: approx. 9 kg
- Aluminum case
- Temperature: +10°C to +40°C

ABOUT SILENTSYS

SILENTSYS SAS is a French company that develops, produces and commercializes innovative ultralow noise systems covering photonics, microwave/THz and electronic modules. Thanks to our well-established know-how and our patented designs, SILENTSYS offers high-performance systems that are compact, easy to use and affordable.

Our goal is to provide systems that are highly compatible with the needs of emerging industrial and laboratory applications such as those related to quantum technologies (Communications, Cryptography, Computing, Metrology, Sensing...).

CONTACT

Sales: sales@silentsys.com

Technical Support: support@silentsys.com

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LOCATION



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