



## OPTICAL FREQUENCY DISCRIMINATOR

Ultralow frequency noise  
Compact & TurnKey  
UV-VIS-NIR-MIR

*1 to 2 channels*



# OVERVIEW

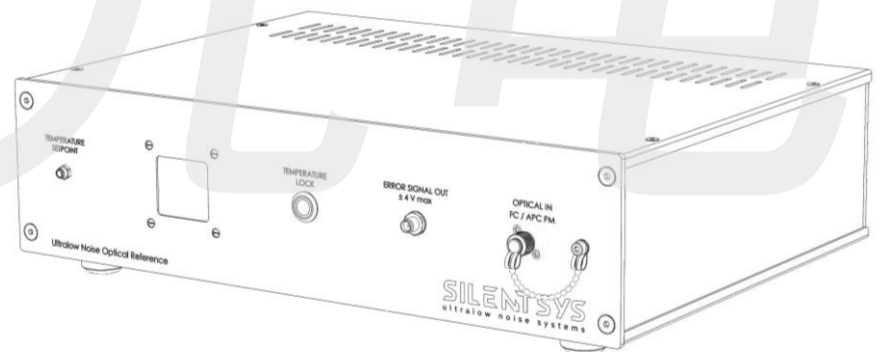
SILENTSYS is a french company, spin off of the University of Neuchâtel in Switzerland, that develops, produces and commercializes innovative ultralow noise systems covering photonics, microwave/THz and electronic modules. Thanks to our well-established know-how and our patented designs, SILENTSYS offers 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...).

The *OPTICAL FREQUENCY DISCRIMINATOR (OFD)* system smartly delivers a voltage signal that is proportional to the frequency fluctuations of the input laser beam. This turn-key module is suitable for laser frequency noise characterization and/or for laser frequency stabilization to drastically reduced its optical full width at half maximum linewidth. The *OFD* features ultralow noise performances being successful in achieving frequency noise level as low as  $0.1 \text{ Hz}^2/\text{Hz}$ ; and those in a compact and user-friendly package.

## SPECIFICATIONS

- Laser type : continuous wave (CW) and single-frequency
- Optical power in :  $200 \mu\text{W}$  max before saturation (possible system damage if  $> 3 \text{ mW}$ )
- Optical Input : FC/APC connexion<sup>1</sup>
- Wavelength input range :  $1050 \pm 50 \text{ nm}$ ,  $1550 \pm 50 \text{ nm}$ . Custom wavelength available on demand.
- 1 or 2 optical channels possible
- Electrical output voltage range :  $\pm 4\text{V}$  max
- Electrical output connector : SMA female
- System sensitivity<sup>2</sup> : typ.  $1 \text{ MHz} / \text{V}$
- Frequency noise bandwidth<sup>3</sup> : typ.  $4 \text{ MHz}$
- Frequency noise floor limit : typ.  $< 0.1 \text{ Hz}^2/\text{Hz}$
- Typical laser linewidth<sup>4</sup> : tens to hundreds of Hz
- Optical tunability<sup>5</sup> : typ.  $3 \text{ GHz}/^\circ\text{C}$
- Temperature lock activation<sup>6</sup> : Switch on front panel
- Temperature stabilization setpoint : trimpot potentiometer on front panel
- Temperature lock range<sup>7</sup> : room temperature  $\pm 5^\circ\text{C}$
- Temperature working range : typ.  $15^\circ\text{C}$  to  $30^\circ\text{C}$
- Systems dimensions & weight :  $334 \times 260 \times 94.7 \text{ mm}^3$  &  $6.5 \text{ kg}$
- Electrical power input<sup>8</sup> :  $24 \text{ VDC}$  &  $2.5 \text{ A}$  (included)
- Starting time<sup>9</sup> :  $10 \text{ min}$  and at least  $1 \text{ hour}$  for best performances



<sup>1</sup> PM Panda (key-aligned to slow axis) possible depending on the system configuration.

<sup>2,3</sup> Could be customized, contact us for more information.

<sup>4</sup> Full width at half maximum with  $1\text{s}$  integration time. See measurements and comments below and contact us for more information.

<sup>5</sup> When frequency stabilized and temperature locking is active.

<sup>7</sup> Switch with integrated LED. Green when locked and green blinking when stabilizing.

<sup>8</sup> From the room temperature, for stable operation. TEC current should not saturate (indicated in red on the display) or highly drift when locked.

<sup>9</sup> Use the provided power supply.

<sup>10</sup> Directly usable in the temperature free-running mode

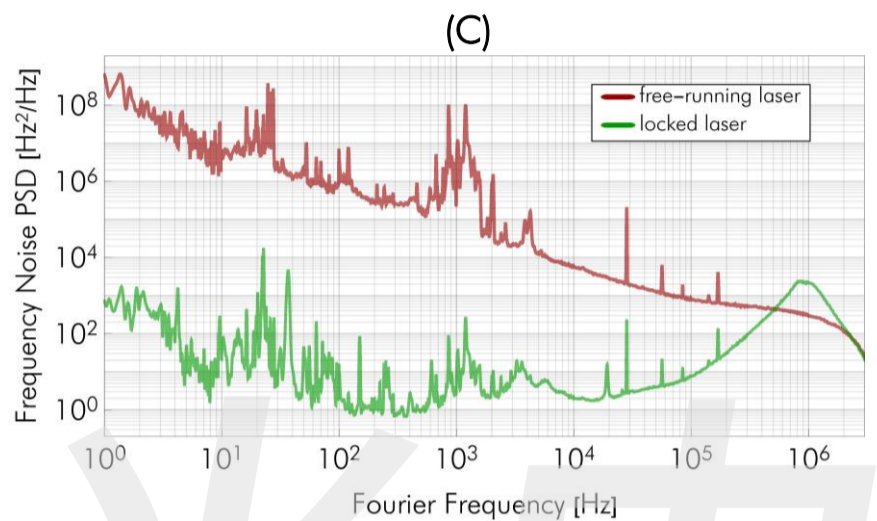
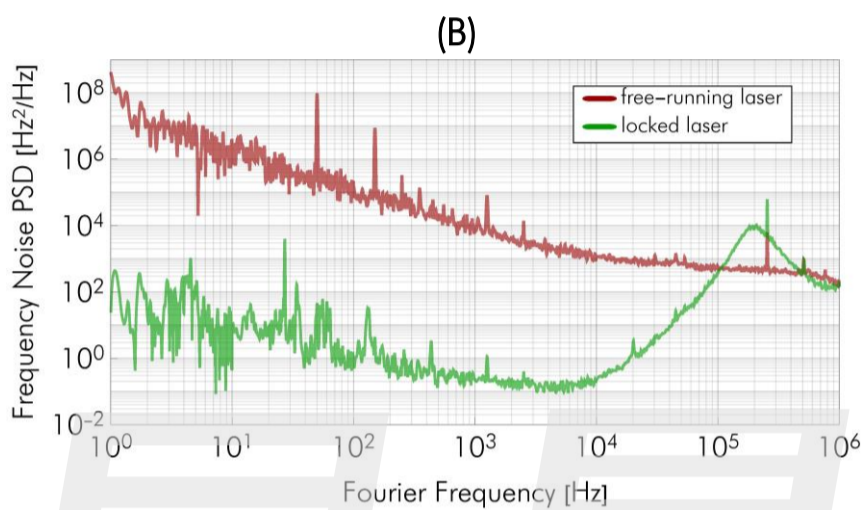
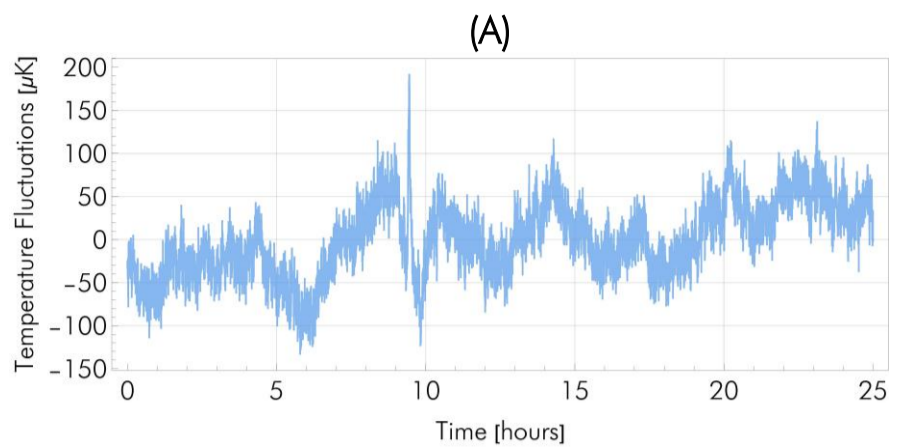
**General comment** : Performances depend on the laser source, on the locking electronic and the environment. Ask for more informations.

# PERFORMANCES

(A) : Temperature fluctuations, when stabilized, of the OFD measured during over 25h.

(B) : Measurements using the OFD of the frequency noise PSD of a diode laser emitting at  $1.5\mu\text{m}$  in a free-running mode and when frequency stabilized to an ultra-stable optical cavity.

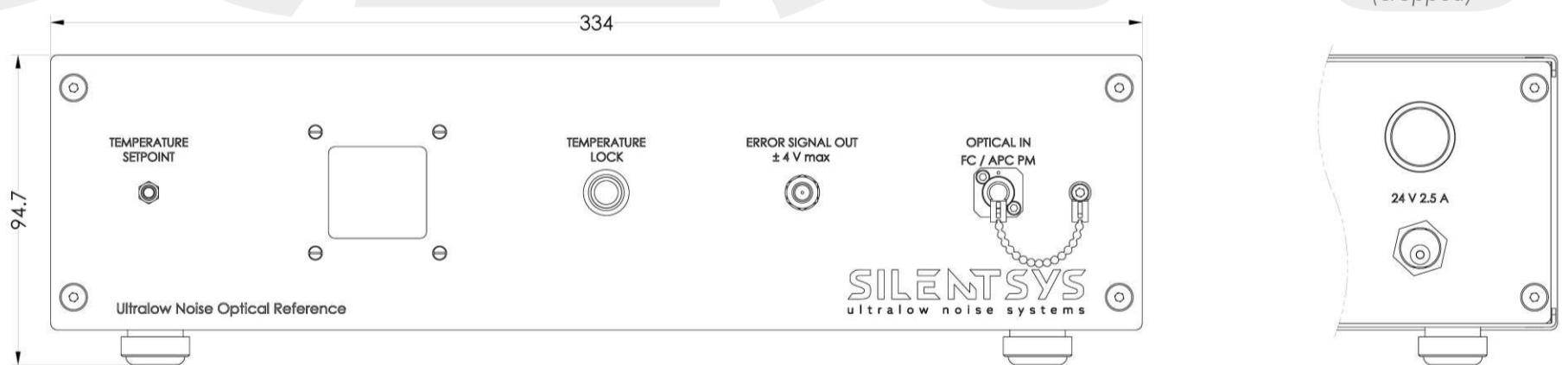
(C) : Measurements of the frequency noise PSD of a solid-state laser emitting at  $1\mu\text{m}$  in a free-running mode and when frequency stabilized to the OFD.



## DRAWINGS

FRONT VIEW

BACK VIEW  
(cropped)



Dimensions are in mm. The total dimensions are  $334 \times 260 \times 94.7 \text{ mm}^3$ .

**SILENTSYS**  
ultralow noise systems