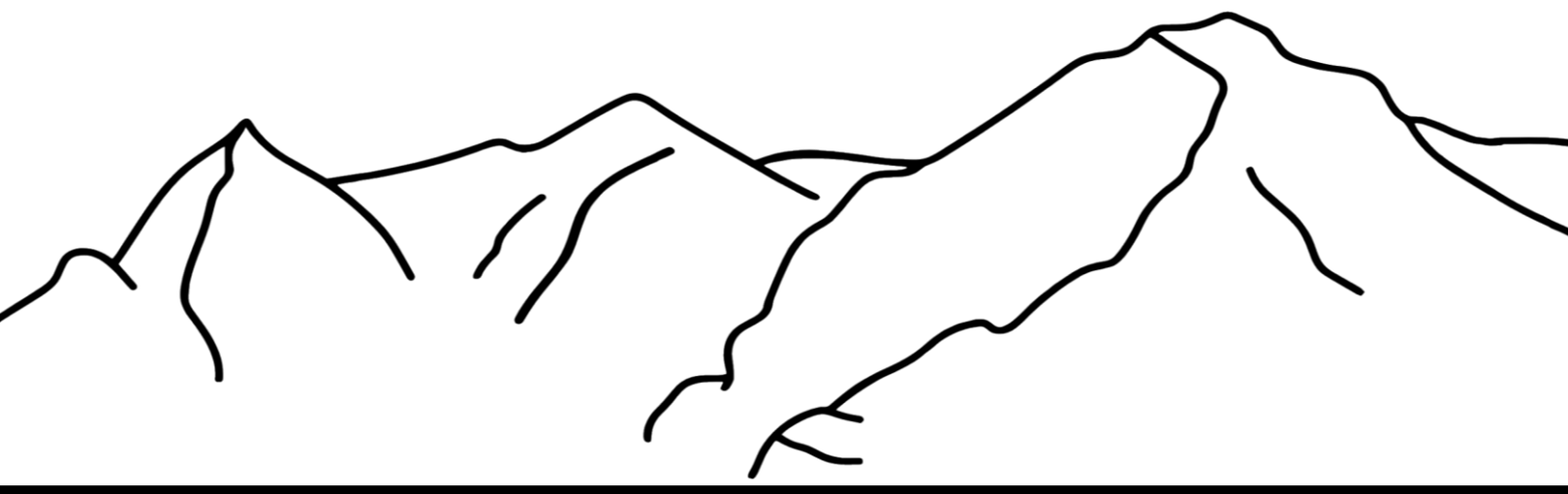
SILENTSYS

ultralow noise systems

CATALOG

PRODUCTS AND SERVICES



PHOTONICS ELECTRONICS THz / GHz

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www.silentsys.com

COMPANY PRESENTATION

WHO WE ARE

SILENTSYS is a French company based in Le Mans, that develops, produces, and markets innovative low-noise systems covering photonics, microwaves/THz, and electronic modules.

Thanks to our know-how, patented technology, and innovative designs, we offer high-performance, compact, easy-to-use, and affordable systems, such as turnkey laser frequency stabilization modules enabling linewidths in the Hz range to be achieved in a "compact format."

SILENTSYS
ultralow noise systems

- AGILITY
- KNOW-HOW
- INNOVATION
- PROFESSIONALISM

OUR MISSION

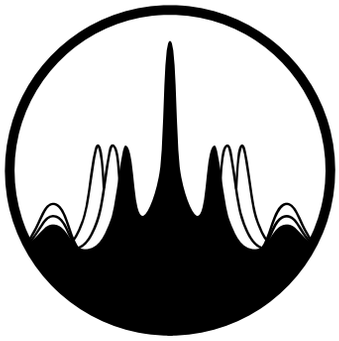
Our goal is to provide systems that are highly compatible with the needs of emerging industrial and laboratory applications such as those related to Quantum technologies, as well as Communications, Cryptography, Computing, Metrology, Sensing....

We aim to offer solutions that best fit your application and make your life easier.

- Since 02.2021
- Facilities 300 m²
- Made in France

SILENTSYS pushes research and industry forward by making deep tech accessible in terms of cost, size, and simplicity.

PHOTONICS ELECTRONICS THz / GHz



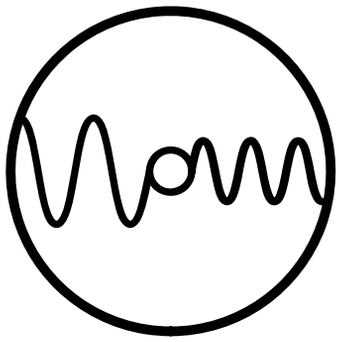
Optical Sensing

Long optical fibers are widely used for temperature, strain, and acoustic sensing. This relies on Rayleigh, Brillouin, and Raman scattering. Such sensing systems are limited in distance and resolution partly due to the laser's coherence length. SILENTSYS provides highly coherent laser sources, dramatically enhancing optical sensing capabilities.

Lidar / Radar

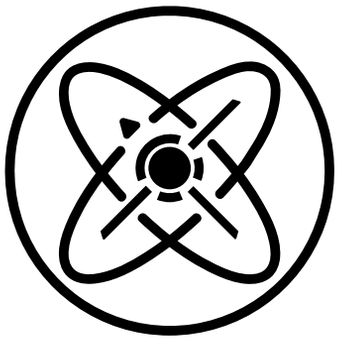
Lidar and Radar technologies are expanding rapidly, enabling greater distances and resolutions, for example, in wind speed monitoring. The oscillator source (laser or RF synthesizer) must exhibit minimal phase noise. SILENTSYS offers extremely low phase noise lasers, enabling tunable GHz/THz signal generation to boost Lidar and Radar.

APPLICATIONS



Metrology

Metrology, the science of precise measurements of physical quantities, increasingly relies on lasers and RF signals. The better the laser and RF quality, the more accurate the measurement. SILENTSYS provides low phase noise lasers and tunable low phase noise GHz/THz signals, advancing metrology with unmatched precision.



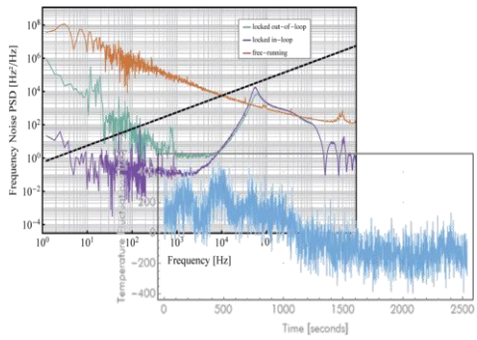
Quantum Tech

Quantum technologies are fundamentally transforming our world! These technologies explore matter at the microscopic scale (atoms, ions...). To interrogate, cool, and manipulate such particles, low phase noise and frequency-stable lasers are critical. SILENTSYS provides systems tailored for the rise of Quantum Technologies.

CUSTOM-MADE SOLUTIONS

You have specific needs in your company or lab for your systems or experiments and you can't find anything on the market that fits?

STUDIES & ANALYSIS



We are armed with several years of experience in the ultralow noise area; contact us to do specific measurements and analysis with our dedicated instruments.

EXPERTISE & SERVICES

- SIGNAL NOISE & STABILITY
- SIGNAL GENERATION AND ACQUISITION
- THERMAL STABILIZATION
- VIBRATION AND ACOUSTIC ISOLATION
- COMPACT SYSTEMS
- FIBERED PHOTONIC SCHEME
- CONTINUOUS AND PULSED LASERS

SILENTSYS PRODUCTS

SLIM LINER: HIGH SPECTRAL PURITY LASER

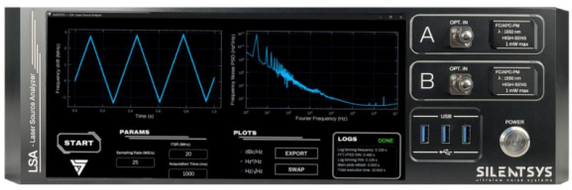
The SLIM LINER is a single-frequency laser that has an ultra-narrow linewidth and a frequency noise of 0.0004 Hz^2/Hz.

OFD-X: OPTICAL FREQUENCY DISCRIMINATOR

The OFD-X are a product family that can characterize and/or stabilize the laser frequency for laboratory experiments and industrial developments.

ULN-PDB: ULTRALOW NOISE BALANCED PHOTODETECTOR

The ULN-PDB modules are plug-and-play ultralow noise balanced photodetectors inside a compact and user-friendly package.



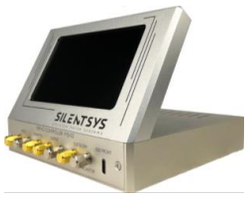
LSA: LASER SOURCE ANALYZER

The LSA system is a plug-and-play laser source analyzer that can measure different characteristics of a laser like Frequency Noise and Relative Intensity Noise, in a form compatible with a 19-inch 3U rack.

ALM-X: ULTRALOW NOISE POWER SUPPLIES

The ALM-X are power supply modules. They have been developed to offer the best performances in terms of output voltage noise and stability.

SILENTSYS PRODUCTS



PID-X: HIGH-SPEED SERVO CONTROLLER

PID-X are high-speed servo controllers that are digitally controlled using an integrated touchscreen and/or USB. They provide Proportional, simple Integrator, double Integrator, and slow Integrator functions.

DRV-01: ULTRALOW NOISE CURRENT DRIVER

DRV-01 is an ultralow noise current source. It has been developed to offer the best performances in terms of output current suitable for floating diode lasers.

ACQ-01: ULTRAHIGH-PRECISION NTC METER

ACQ-01 is an ultrahigh-precision NTC meter. It is an ultralow noise acquisition system for thermistors, it accurately reads up to 6 thermistors simultaneously, and it is provided with a dedicated software for precise temperature monitoring and recording.

OFC-X: OPTICAL FREQUENCY CORRELATOR

The OFC-X systems are comprised of a common 2-input optical frequency discriminator (OFD). This makes it possible to frequency-stabilize two wavelength-distant lasers onto the same optical reference in order to reduce their frequency fluctuations and to correlate them.

MORE TO COME !

SLIM LINER

THE NARROWEST-LINEWIDTH LASER

The SLIM LINER, a high spectral purity laser source, is a single-frequency, ultra-narrow linewidth laser. It is based on the Self-Narrowing Photonic Oscillator (SNPO) technology developed by the Institut Foton at Université de Rennes in France. A pump laser is locked onto a cavity using stimulated Brillouin scattering, which offers an extremely narrow gain bandwidth, naturally favoring a high spectral purity.

Laser emission	continuous wave (CW)
Available wavelengths	1529 to 1562 nm (customizable)
Output power	typ. 10 mW (customizable)
Integrated linewidth over 1 sec	500 Hz
Frequency noise	< 0.0004 Hz^2/Hz
Intrinsic linewidth*	1.5 mHz
Polarization Extinction Ratio (PER)	typ. > 20 dB
Optical output connector	FC/APC with narrow key
RIN	typ. <-150 dBc/Hz at 1 MHz
NTC resistance reading connector	SMA
Temperature control input connector	SMA
Power supply plug	P1J
Product dimensions	360 × 360 × 88 mm^3
Product weight	9 kg
Price	€49 900

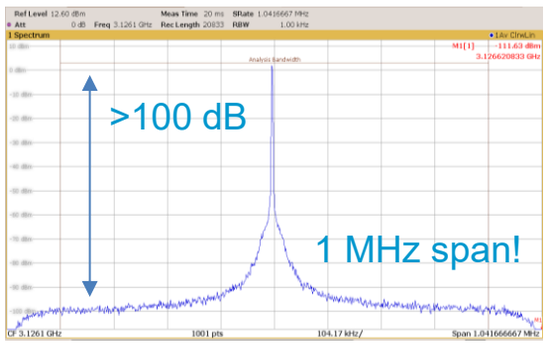


Fig.1: Optical Power Spectrum on a Span of 1 MHz

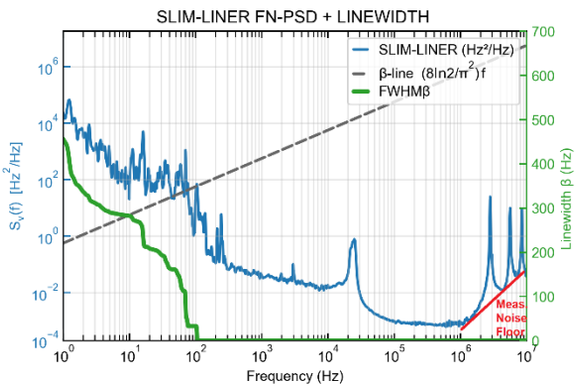


Fig.2: Frequency Noise Measurement of the SLIM LINER

*This value corresponds to π*white frequency noise, but it does not always have a physical meaning. Read more in our white paper.

OFD-X

OPTICAL FREQUENCY DISCRIMINATOR

The OFD-X systems smartly deliver a voltage signal that is proportional to the frequency fluctuations of the input laser beam. These turn-key modules are suitable for laser frequency noise characterization and/or for laser frequency stabilization to drastically reduce its optical full width at half maximum linewidth. The OFDs features ultralow noise performances that can successfully achieve frequency noise levels as low as 0.01 Hz²/Hz, while remaining in a compact and user-friendly package.

MODEL	OFD-ALPHA	OFD-PRO
Number of channel	1 or 2	1 or 2
Laser type	Single-frequency continuous wave	Single-frequency continuous wave
Available wavelengths	385 nm – 2200 nm (to be defined on order)	385 nm – 2200 nm (to be defined on order)
Optical power in	Typ. 200 µW before saturation	Typ. 200 µW before saturation
Optical input	Typ. FC/APC	Typ. FC/APC
Free Spectral Range (FSR)	Typ. 2 MHz to 2 GHz	Typ. 2 MHz to 2 GHz
Frequency noise floor limit	< 0.01 Hz²/Hz	< 0.01 Hz²/Hz
Typical laser linewidth achievable	Down to Hz-level	Down to Hz-level
Control of the optical module temperature	External	External
Servo Controller	-	Included
Input frequency modulation	Option	Included
Interface	Touchscreen	Touschscreen and USB
Product weight	8.2 kg	12 kg
Product dimensions	360 x 360 x 88 mm³	430 x 380 x 87 mm³
Price	Starting from €29 900	Pre-order

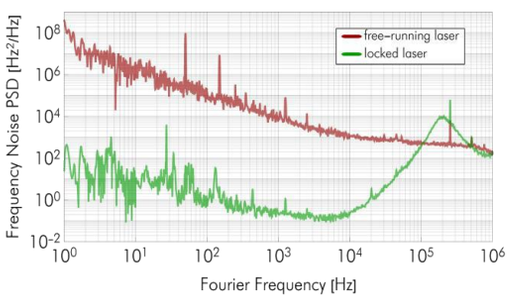


Fig.1: OFD-ALPHA used with 1557 nm telecom laser diode

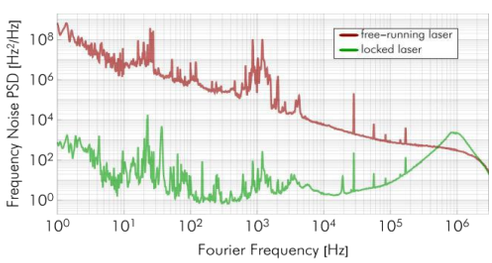
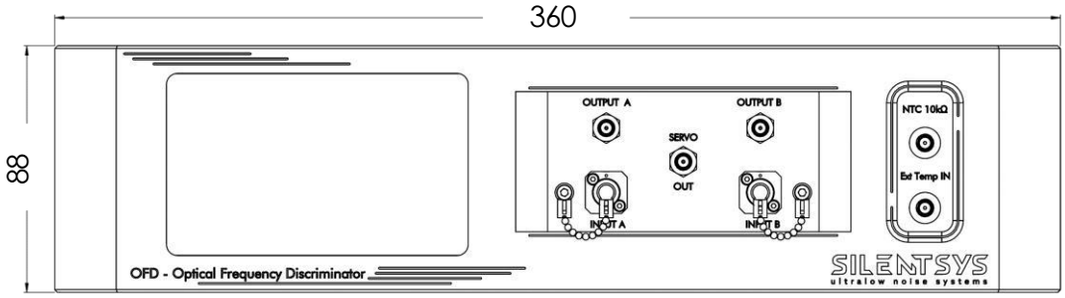


Fig.2: OFD-ALPHA used with 1064 nm tunable external cavity laser diode

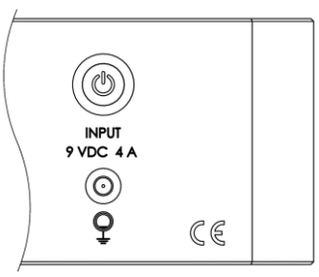
PRODUCTS

DRAWINGS

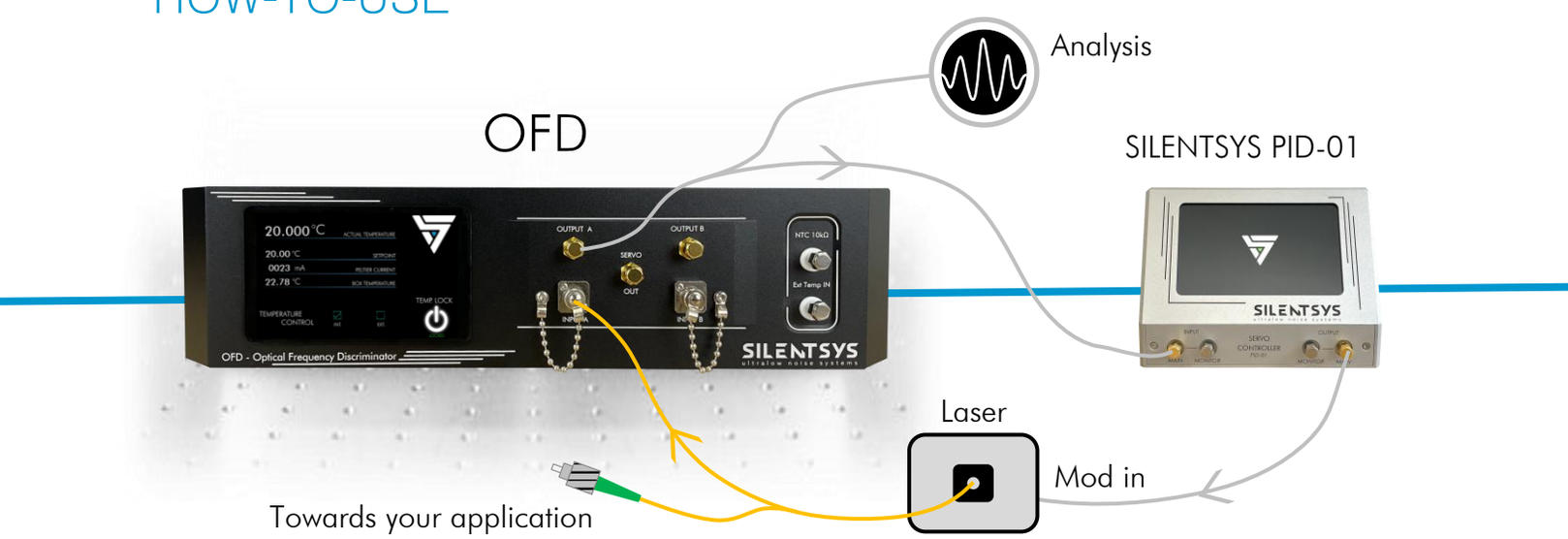
FRONT VIEW



BACK VIEW
(cropped)



HOW-TO-USE



ENHANCE YOUR LASER WITH SIMPLICITY !

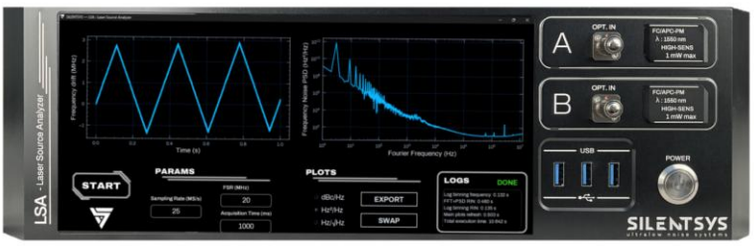
ULN-PDB

ULTRALOW NOISE BALANCED PHOTODETECTOR

The ULN-PDB modules are plug-and-play ultralow noise balanced photodetectors in a compact and user-friendly package. They are proposed with InGaAs, Si, or Extended InGaAs photodiodes and offer a selection of bandwidths and gains in DC- or AC-coupled versions. Moreover, the ULN-PDB-x4 version offers 4 balanced photodetectors in one unit. The ULN-PDB modules offer adaptable optical coupling like free-space, FC/APC, FC/PC (either wide or narrow key) with additional mechanical adaptors.

MODEL	ULN-PDB-200	ULN-PDB-400	ULN-PDB-800	ULN-PDB-2200	ULN-PDB-x4
Number of outputs	1	1	1	1	4
Spectral range	200 nm – 1100 nm	400 nm – 1100 nm	800 nm – 1700 nm	800 nm – 2200 nm	Depending on the selected photodiodes
Responsivity typ.	0.4 A/W at 800 nm	0.55 A/W at 850 nm	0.9 A/W at 1550 nm	1.2 A/W at 1850 nm	-
Photodiode damage threshold	typ. 5 mW (photodiode dependent)				
Common-mode rejection ratio (CMRR)	> 60 dB				
Electrical coupling	DC or AC				
Trans-impedance gain, Bandwidth, Minimum noise equivalent power (NEP) (example combinations)	39 kV/A, 100 MHz, 3 pW/√Hz 39 kV/A, 10 MHz, 0.3 pW/√Hz 3.9 kV/A, 100 MHz, 3 pW/√Hz 390 V/A, 500MHz, 6.5 pW/√Hz				
Output impedance	50 Ω				
Maximum Electrical Bandwidth	500 MHz (depending on the gain)				
Output voltage noise	typ. 2.5 nV/√Hz with 390 V/A // typ. 12 nV√Hz with 39 kV/A (noise floor)				
Output voltage range	-3 V to +3 V				
Output connectors	SMA female				
Input connectors	FC/PC or FC/APC (narrow or wide key) or Free space adjustable through mechanical adaptors				
Product dimensions	108 x 79 x 33 mm^3				272 x 108 x 33 mm^3
Product weight	300 g				1.2 kg
Price	Starting from €1 190				Starting from €3 750

LSA



LASER SOURCE ANALYZER

The LSA module is a plug-and-play laser source analyzer. It can measure the temporal evolution of the laser's emission frequency, the frequency/phase noise spectrum in three different units, the temporal evolution of the laser's power, and the relative intensity noise spectrum (RIN), while allowing exporting raw data and plots, in a form compatible with a 19-inch 3U rack.

Wavelength range	385 nm – 2200 nm (to be define at the order)
Input power range	mW to µW
Laser type	Single mode continuous wave
Input fiber type	FC/APC, PM slow axis (others on request)
Max Frequency noise bandwidth	50 MHz
Measurement quantities	Laser frequency fluctuations (Hz), Laser power fluctuations (mW), Laser frequency/phase noise PSD (Hz^2/Hz, $Hz/\sqrt{Hz}$, dBc/Hz), Laser relative intensity noise PSD (dB/Hz)
Time to measure and display the data	10 Hz to 12.5 MHz → 2 to 3 sec 10 Hz to 50 MHz → 5 to 6 sec 1 Hz to 50 MHz → 50 to 60 sec
Dynamic range	> 300 dB (for phase noise in dBc/Hz)
Minimum measurable intrinsic linewidth*	0.03 Hz
Minimum measurable RIN	-155 dB/Hz (with 500µW input power)
Interface	Capacitive Touchscreen QLED 10.4 inch
Output connectors	USB for data transfer
Product dimensions	440 x 380 x 135 mm^3
Product weight	15 kg

*This value corresponds to π*white frequency noise, but it does not always have a physical meaning. Read more in our white paper.

Pre-order Now!

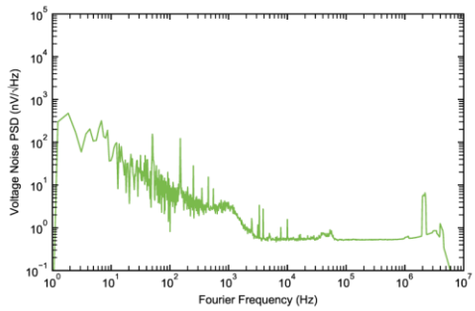
Dedicated contact:
andrea.bancora@silentsys.com

ALM-X

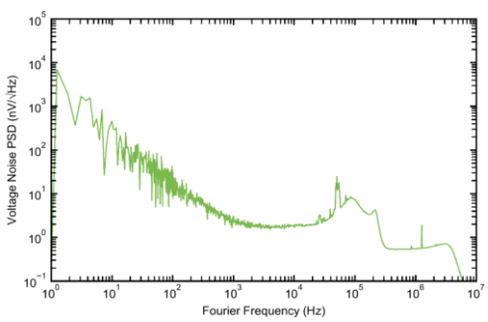
ULTRALOW NOISE POWER SUPPLIES

The ALM-X are power supply modules. They have been developed to offer the best performances in terms of output voltage noise and stability. ALM-01 offers 3 ultralow noise output voltages with up to 25 W in total, ALM-05 offers one voltage output with a maximum of 3 A, and ALM-08 provides two voltages.

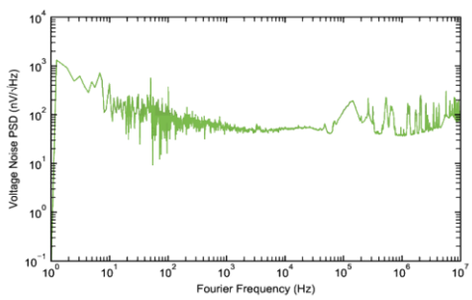
MODEL	ALM-01	ALM-05	ALM-08
Number of outputs	3	1	2
Output voltages	5 VDC, 12 VDC, 15 VDC	5 VDC	2 VDC, 5 VDC
Output currents	1.3 A per output	up to 3 A	8 A for 2 V and 1 A for 5 V
Output connectors	BNC	BNC	Screw terminal blocks
Residual ripple	< 5 to 50 µVrms (1 Hz...1 MHz)	< 5 to 50 µVrms (1 Hz...1 MHz)	-
Voltage accuracy	± 1%	± 1%	± 1%
Short circuit protections	Yes	Yes	Yes
Product dimensions	155 x 125 x 32 mm^3	125 x 80 x 35 mm^3	125 x 80 x 35 mm^3
Product weight	approx. 900 g	approx. 700 g	approx. 500 g
Bi-color LED indicator	1 per output	1 per output	1 per output
LED color threshold	approx. 1.2 A	approx. 2.8 A	approx. 5 A and 500 mA
Temperature elevation from ambient	-	-	17 °C at 5 A and 25 °C at 8 A
Price per unit	€1 290	€790	€890



ALM-01: Typical voltage noise power spectral density of 5 VDC output (limited by the measurement noise floor)



ALM-05: Typical voltage noise power spectral density of 5 VDC and 2 A output (limited by the measurement noise floor)



ALM-08: Typical voltage noise power spectral density of the 2 VDC channel

PID-X

HIGH-SPEED SERVO CONTROLLERS

PID-X are high-speed servo controllers that are digitally controlled using an integrated touchscreen. They provides Proportional, simple Integrator, double Integrator, and slow Integrator functions. They features ultralow voltage noise, high open-loop gain, and a large bandwidth.

MODEL	PID-01	PID-02
Input voltage noise	5 nV/√Hz	1 nV/√Hz
Output impedance	50 Ω	50 Ω
Input impedance	50 Ω	50 Ω / 1 MΩ
Input Voltage range max	-5 V / +5 V	- 5 V / + 5 V
Output voltage range max	-4.5 V / +4.5 V	- 3.7 V / + 3.7 V
Output/input connectors	SMA female	SMA female
Control bandwidth	> 30 MHz	> 60 MHz
Input attenuations	-	0 dB, 20 dB, 40 dB
Offset ranges	- 2 V / + 2 V	- 2 V / + 2 V
Ramp functionality	-	Included
Proportional Gain	OFF, from - 28 dB to 23 dB (0.2 dB increments)	OFF, from - 10 dB to 20 dB (0.5 dB increments)
Simple Integrator	OFF, from 100 Hz to 10 MHz (16 settings)	OFF, from 100 Hz to 10 MHz (16 settings)
Double Integrator	OFF, from 100 mHz to 1 MHz (16 settings)	OFF, from 1 Hz to 1 MHz (16 settings)
Slow Integrator	-	From 1 mHz to 1 kHz (16 settings)
Product dimensions	155 x 150 x 112 mm^3	155 x 150 x 112 mm^3
Product weight	approx. 1.5 kg	approx. 1.5 kg
Interface	Touchscreen	Touchscreen, USB, TTL
Price	€3 990	€5 490

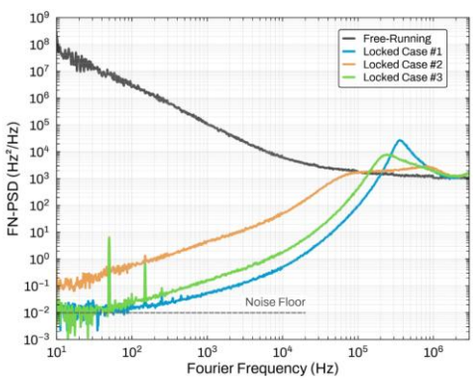


Fig.1: Typical result of laser locking using the PID-01 in two different configurations

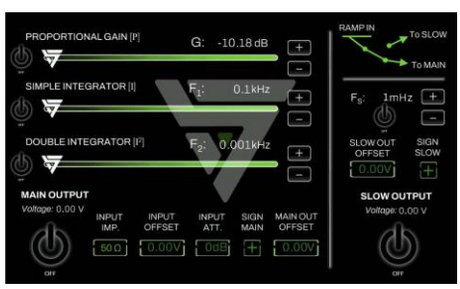


Fig.2: PID-02 interface

DRV-01

ULTRALOW NOISE CURRENT DRIVER

The DRV-01 is an ultralow noise current source. It has been developed to offer the best performances in terms of output current suitable for floating diode lasers. It provides up to 700 mA DC current with fast external modulation. The electronic circuit is integrated in a modern designed aluminum enclosure with standard connectors for an easy use.

Number of outputs	1
Output current	0 mA to 700 mA
Output current ranges	50 mA, 230 mA, 450 mA, 700 mA
Minimum current noise density	76 pA/sqrt(Hz)
Selectable modulation gain	3 per each current range
Output/input connectors	SMA female
3 dB modulation bandwidth	40 MHz
Interface	USB control with dedicated software
Operating temperatures	0 °C to 40 °C
Compatible diodes	Floating diodes
Product dimensions	125 x 80 x 35 mm³
Product weight	approx. 400 g
Supply voltage	9 VDC
Price	€1 750

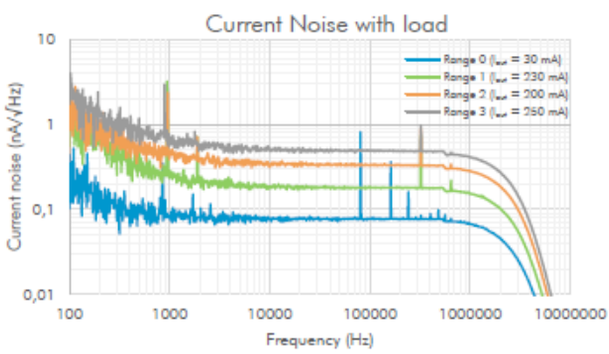


Fig.1: Typical current noise power spectral density of the current ranges

NEW !

ACQ-01

ULTRAHIGH-PRECISION NTC METER

ACQ-01 is an ultrahigh-precision NTC meter. It is an ultralow noise acquisition system for thermistors, it accurately reads up to 6 thermistors simultaneously, and it is provided with a dedicated software for precise temperature monitoring and recording.

Number of channels	6 (simultaneously)
Resolution	typ. 5 mΩ (PGA x1) typ. 10 µ°C at 10 kΩ (PGA x1)
Accuracy	typ. 0.02%
Resistance Range / Temperature Range (recommended)	30 Ω to 3 MΩ (PGA x1) -55 °C to +200 °C (PGA x1)
NTC Thermistor Resistance at 25°C	10 K or 100 K (example)
Sampling rate	5 S/s
Temperature sensitivity	10 µ°C/°C
Product dimensions	155 x 144 x 29 mm^3
Product weight	900 g
Interface	Dedicated software
Price	€4 450

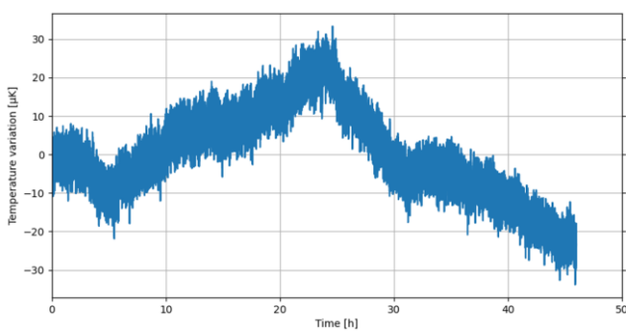


Fig.1: Out-of-loop measurement of the temperature stability of OFD-PRO using ACQ-01.

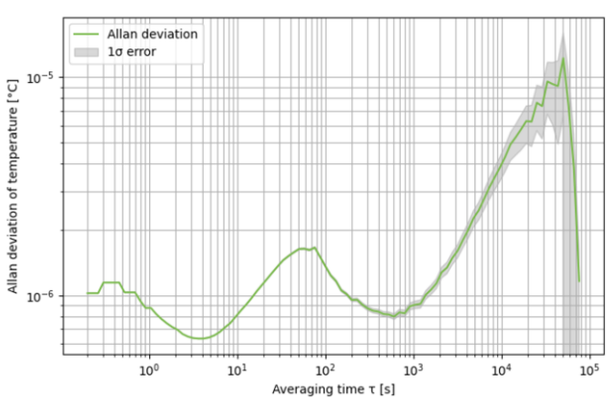


Fig.2: Out-of-loop measurement of the temperature stability (Allan deviation) of the OFD-PRO using ACQ-01.

NEW !

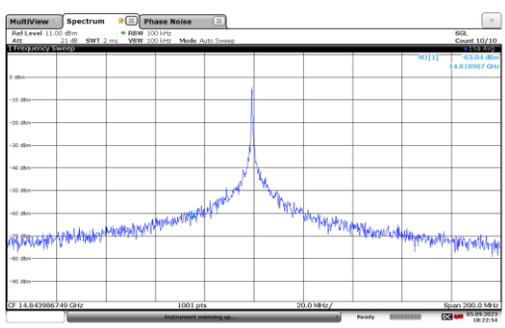
OFC-X

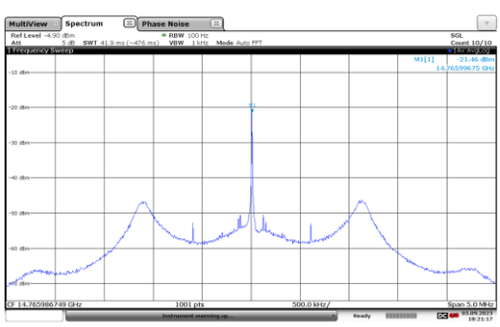
OPTICAL FREQUENCY CORRELATOR

The OFC-X systems are comprised of a common 2-input optical frequency discriminator (OFD). This makes it possible to frequency stabilize two wavelength-distant lasers onto the same optical reference to reduce their frequency fluctuations and to correlate them. Based on this fact, the optical beat frequency between the two stabilized lasers generates a THz or GHz signal that reaches a very low frequency noise level and high frequency stability.

MODEL	OFC-ALPHA	OFC-PRO
Number of optical inputs	2	2
Laser type	single-frequency continuous wave	single-frequency continuous wave
Available wavelengths	385 nm – 2200 nm (to be defined on order)	385 nm – 2200 nm (to be defined on order)
Optical input power	~200 µW before saturation (at 1.5 µm)	~200 µW before saturation (at 1.5 µm)
Optical input connector	typ. FC/APC connection	typ. FC/APC connection
Electrical output voltage range	±3 V max	±3 V max
Electrical output connector	SMA	SMA
Free Spectral Range (FSR)	typ. 2 MHz to 2 GHz	typ. 2 MHz to 2 GHz
Frequency noise floor limit	< 0.01 Hz^2/Hz	< 0.01 Hz^2/Hz
Typical laser linewidth achievable	down to Hz-level	down to Hz-level
Control of the optical module temperature	external	external
Servo Controller	-	Included
Input frequency modulation	Option	Included
Interface	Touchscreen	Touschscreen and USB
Product weight	8.2 kg	12 kg
Product dimensions	360 x 360 x 88 mm3	430 x 380 x 87 mm3
Price	€35 900	Pre-order

Below, typical result of a beat note measured at ~14.5 GHz, when two telecom lasers are free-running (top figure) and locked (bottom figure), respectively:





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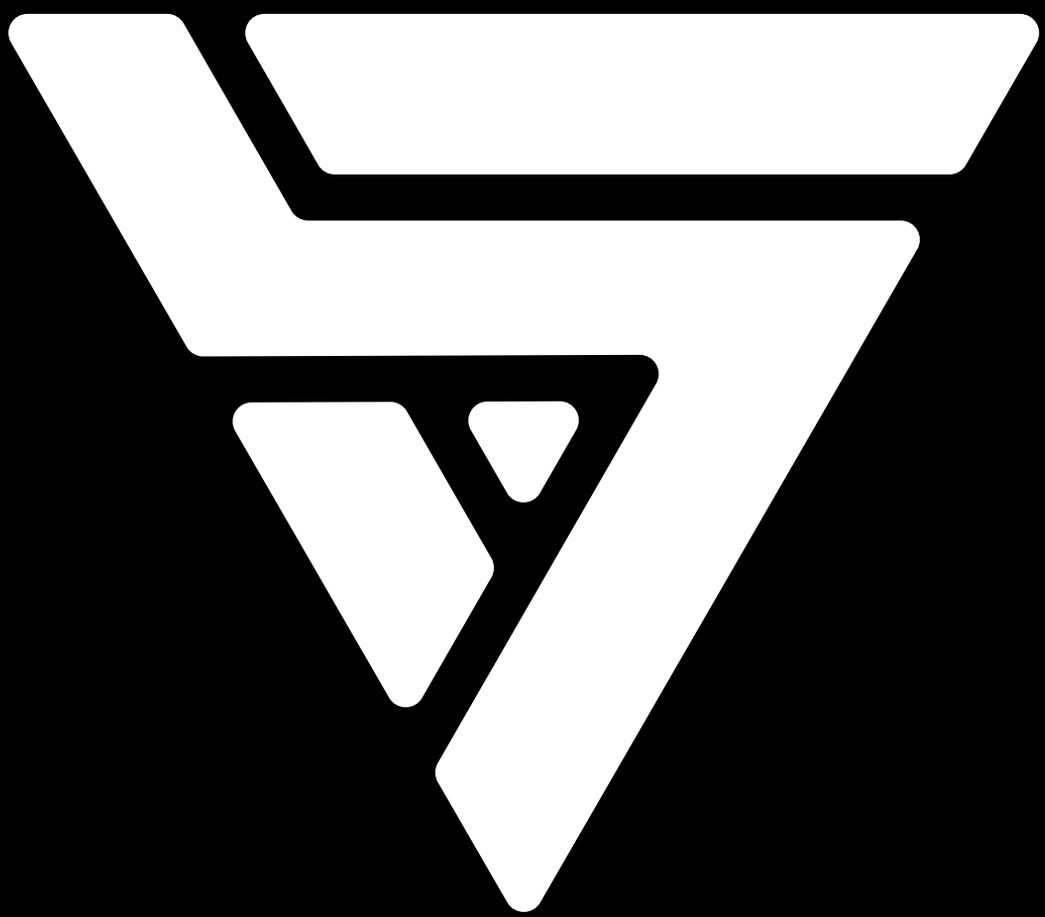

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