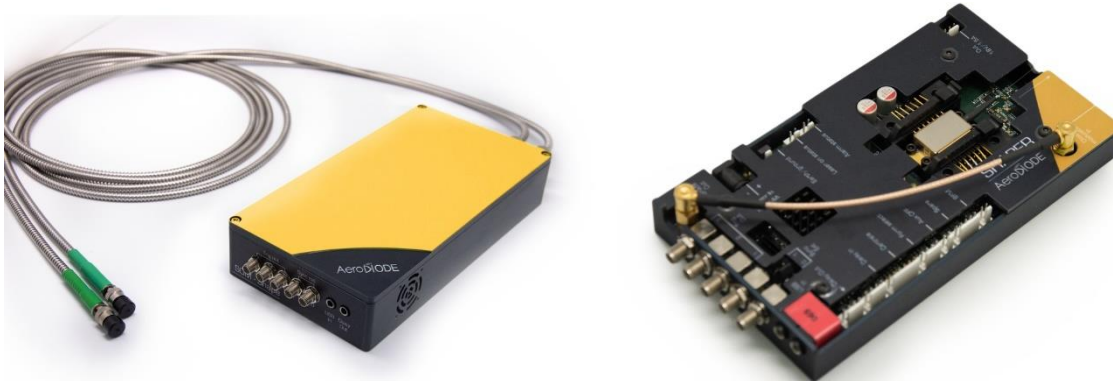


Shaper Product



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Revision Sheet

Release No.	Date	Author	Revision Description
V0.1	April 2018	JPO	First unfinalized draft
V1.0	26/10/18	LBO	First version
V2.0	12/11/18	LBO	Second version - .csv file details and other add on.
V2.1	20/12/18	LBO	Warning about MOS BIAS voltage New Input synchronization Sync Ext 24V 10kohm
V2.2	03/01/19	QMA	Replaced the programming documentation by the correct one
V2.3	08/2019	SER	Specifications for laser diode pinning
V2.4	24/10/2019	SER	MOS Bias level adjustment procedure updated
V2.5	19/11/2019	LBO	Specifications for all Shaper Products



V3.0	23/03/2020	AMU	AeroDIODE transfer
V3.1	17/04/2020	AMU	Added Warning against hazards
V3.2	20/04/2020	AMU	Layout overhaul
V3.3	23/04/2020	AMO	Details about how to use gain switch suppression. Remove section 8.2
V3.4	28/04/2020	SER/ AMU	Various improvements all over document.
V3.5	15/07/2020	AMO	Add how to use a gate signal, clarify CW and startup condition
V3.6	05/08/2020	AMO	Add new Shaper-I with support to Ethernet and M12 connector description. Add support to Shape 4
V3.7	18/09/2020	ACL	Add External Shaper configuration details
V3.8	26/05/2021	ACL	Modification of External Shaper configuration details
V3.9	16/06/2021	ACL	Add Clock Ext configuration and Ethernet details
V4.0	01/07/2021	AMO	Add Trig out 3 mode selection
V4.1	18/01/2022	SER	Add information for mounting various SOAs
V4.2	11/07/2022	AKU	ControlSoftware update Modification about the external clock
V4.3	17/03/2023	AMU	Added specifications regarding output/inputs
V4.4	21/04/2023	ACL	Modification of External Shaper configuration details

Disclaimer

Information in this document is subject to change without notice.

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1. General information

Please read this manual carefully, it describes the hazard the user might be exposed to while using the product. It also explains in detail how to use the product in the safest and more efficient way possible.

The safety of any system incorporating the product is the responsibility of the assembler of the system.

Any actions taken by the user that is not clearly described in this user manual might present a risk and is the sole responsibility of said user.

This product is to be used in laboratory or industrial tasks, and only by personnel who have followed a training in laser hazard.

1.1. Definitions

Caution: A caution is advised when dealing with hazardous situations, tasks or objects, to prevent harm or death and avoid material damage or failure.

Warning: A warning is given for potentially dangerous situation for people which cause them harm or lead to death

Note (📌) : A note is a complementary piece of advice that must be acknowledged by the user.

1.2. General warning

Caution

The compatible laser diodes used with the SHAPER can deliver up to several Watts of coherent LASER radiation. Always wear protective goggles and observe the safety instructions provided by the laser diode supplier when using the SHAPER driver with your laser diode.

WARNING

Do not try to open or remove the cover of the SHAPER module

Note

Only use the genuine power supply, and the supplied USB cable



WARNING

Avoid all chocs and strains when handling the SHAPER

WARNING

Handle the fiber-optic cable with care as it is fragile. Do not bend or pinch it.

WARNING

Any software settings or hardware tinkering that is not described in this user manual or in the usage recommendation may put the user or its environment at risk.

WARNING

the maintenance and servicing of the SHAPER should not be executed by the end user: only AERODIODE is able to maintain the SHAPER.

2. Safety Instructions

2.1. Wiring

Caution

- Please first connect the input pins to the board and then plug the DC Power Supply.
- Use caution when connecting the Power Supply.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the SHAPER module.
- Only use the supplied power and USB cable
- **Caution**

This product has been tested and found to comply with the limits according to IEC 61326-1 with the use of connection cables less than or equal to 3 meters. We also recommend using fully-shielded, high-quality cables such as ULC-3FT-SMSM+.

2.2. Operating Environment

Caution

- Do not install near any heat sources such as radiators, heat registers, stoves, or other equipment (including amplifiers) that produce heat.
- To reduce the risk of fire or electric shock, do not expose the SHAPER to rain or moisture.

WARNING

Not following the safety recommendations and the caution mentioned above can lead to eye damage.



WARNING

One or more variant of this product contain an OEM CLASS 4 laser. Do NOT look directly into the fiber connector when the electrical power is ON. Make sure that you wear appropriate laser safety goggles while operating the product.

WARNING

One or more variant of this product is dedicated to drive a LASER DIODE / SOA. Mounting and operating the LASER DIODE / SOA should only be realized by authorized personnel and with relevant hardware protection (PPE) as declared in the IEC-60825 directive in accordance with the classification of the LASER DIODE / SOA driven by the product.



2.3. Contact

If you have any question about the SHAPER module, please contact AeroDIODE.

3. Package content

The package comes with:

- 1 Shaper product
- 1 USB-Jack FTDI cable
- 1 USB Key with “AeroDIODE Control Software Suite”
- 1 User Manual (PDF)
- 1 DC Power Supply (+24V / 2.01A)(CE)

The power supply is a class I power supply

The jack power connector has a positive tip polarization :



The power supply will accept as **input** an alternative voltage between 100 and 240 V, at a frequency of 50 or 60 Hz, consuming 1.1 A.

It will then **output** 24V 201A.

The power supply must not be thrown away but disposed of in accordance with the European regulation (recycling) as shown by the following pictogram

The power supply comply with the European regulation as shown by the CE symbol



For additional information, the datasheet is available by following the link below :

<https://www.xppower.com/portals/0/pdfs/SFAFM30-60.pdf>



4. Shaper Products

This manual presents the use of all the Shaper products.

We offer four different Shaper-related products depending on your needs (see below). Please be aware that some paragraphs are useful for a specific product. Your product type is written on the delivered Test Report. If you have any questions, do not hesitate to contact AeroDIODE.



Shaper

Laser Diode Driver for precision pulse shaping
(classical one on the left and integrated one on the right)

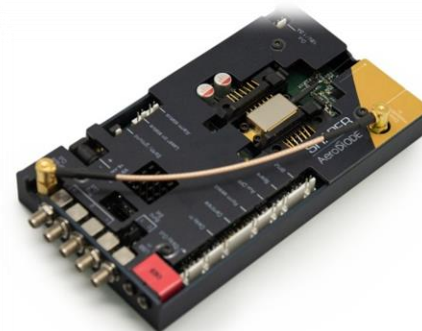


Shaper-I



SOM-Shape

High-speed fiber
modulator/shutter



SOA-Shape

Semiconductor Optical Amplifier
driver with pulse shaping

Figure 1: Shaper Products

5. Physical specifications

Shaper / SOA-Shape		
Length	172	mm
Width	91	mm
Height	25	mm
Weight	300	g

Physical Specifications for SOM SHAPE, Shaper-I in progress...

6. Output/input additional details

Connector	Input voltage (V)	Output voltage (V)	Frequency (Hz)	Impedance (Ω)
Shape OUT	na	0 – 1	Trigger dependent	50
Trigger outputs 1/2	na	0 – 3.3	10×10^6	50
Trigger output 3	na	0 – 3.3	20×10^6	50
Sync EXT	3.3/5/24	na	Internal 152×10^6 - external 500×10^6	50
Clock Ext	3.3 / 5	na	10×10^6	50



7. Shaper board

7.1. Shaper Board Features and Performance

7.1.1. Features

The Shaper is a laser diode driver used to generate any Pulse Shape with ns/ μ s pulse duration. It is a multifunctional unit with integrated AWG (Arbitrary Waveform Generator), TEC controller & multiple Pulse Delay Generators (PDG) for signal synchronization. This unit is a great asset to shape pulses with a very high precision or temporal resolution.

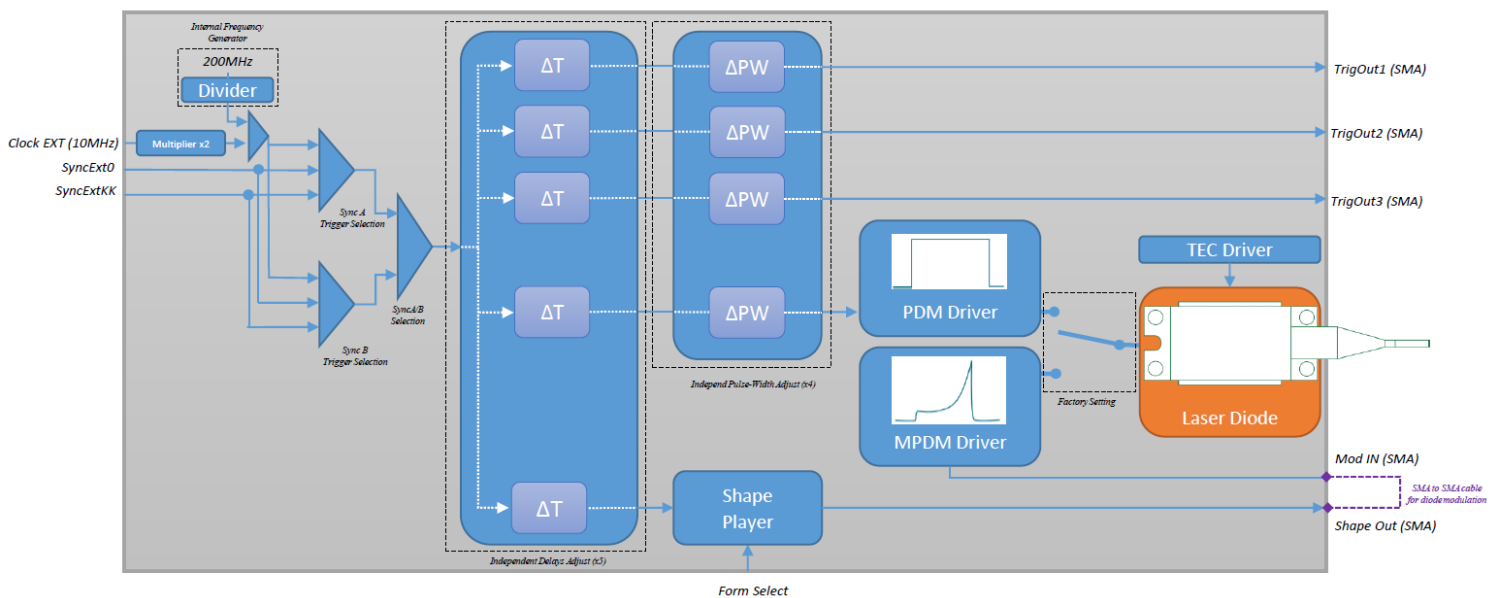


Figure 2 - Shaper Simplified Synoptic

Depending on the customer product, adapted characteristics and options are available.

- User set pulse shape from **500 ps to 8 μ s** with **0 - 20 MHz repetition rate**
- Integrated TEC controller with temperature protection
- Built-in pulse AWG with internal or remote triggering
- Electrical synchronization outputs: 0-10⁹ns duration at 3.3V (50 Ω) for 1ns resolution
- Integrated Pulse Delay Generator
- USB interface with intuitive GUI software or UART
- Compatibilities & libraries: WIN XP/7/10 – DLLs – UART protocol
- Power supply: 24V/4A (110V/220V adapter included)

7.1.2. Laser Diode Driver for precision pulse shaping: Shaper and Shaper-I

The board can operate in three different modes. Depending on the customer choice ordered version, **the selected mode is set during the board production and it is not possible to change it afterward.**

This product is available in three modes:

- The "**direct modulation**" mode allows the pulse shape to be applied directly to the laser diode and a new functionality allows the user to remove spurious effects such as "gain switch" relaxation peaks for optimal results. This mode uses the MPDM ("Modulated Pulse-on-Demand Module") Driver (Figure 2).
- The "**external modulation**" mode drives the laser diode with square waveforms and generates a shaping signal that is compatible with external devices such as acousto-optic or electro-optic modulators. This mode uses the PDM ("Pulse-on-Demand Module") Driver (Figure 2). An external amplifier is present.
- The "**full external modulation**" mode allows a squared laser pulse generated by an external board to launch the generation of an analog shape signal directed to an external optical modulator such as an Electro-Optic Modulator or Acousto-Optic Modulator.

Key features:

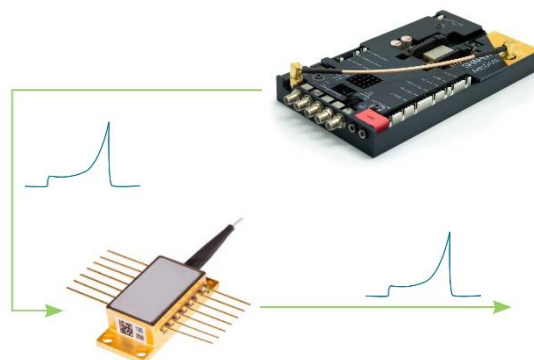
0 to 1.6 A output current with 16 bit/48 dB/30 μ A resolution

7.1.2.1. Direct Modulation

In this mode, the pulse shape is generated by the board (*Shape Out output*) and re-directed to the "MPDM Driver" module (*Mod In Input*) via the SMA to SMA cable. It is possible to generate laser pulses with any shape. A special mode for laser diode "gain switch peak" suppression is available.

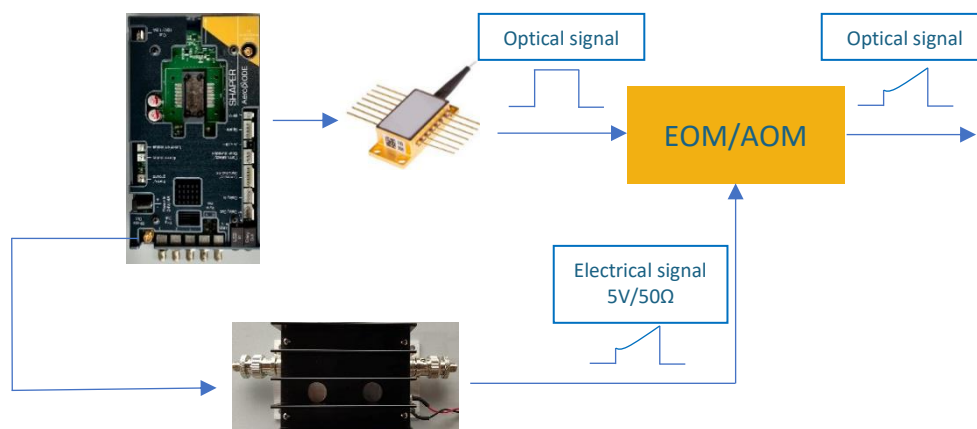
The current applied to the diode has the same temporal profile as the shape programmed.





Characteristics	Min	Max
Peak current level	0	1.6A
Pulse shaping duration	500ps	8μs
Number of steps	1	4000
Pulse shaping timing resolution	500ps	
Pulse shaping current resolution	30μA	30μA

7.1.2.2. External Modulation



In this mode, the squared laser pulse is generated by the board. After a programmable delay, an analog shape signal is generated by the board (*Shape Out output*) and directed to an external optical modulator such as an Electro-Optic Modulator or Acousto-Optic Modulator

Characteristics	Min	Max
Original pulse peak current level	0	2A
Original pulse timing resolution (delay/pulse-width)	-	1ns
EOM/AOM pulse shaping duration	500ps	8μs
Number of steps	1	4000
EOM/AOM pulse shaping timing resolution	-	500ps
Output voltage (factory configuration)	-	1V(50Ω) / 5V (50 Ω) * 3,3V (50 Ω)/5V (High Z)**

* With external dedicated amplifier

** Hardware configuration on request

7.1.2.3. Full external Modulation

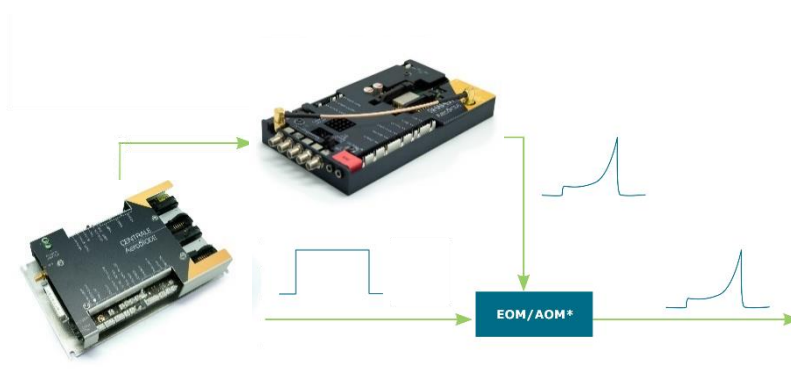


Figure 3 – External Modulation Synoptic

In this mode, the squared laser pulse is generated by an **external** board. After a programmable delay, an analog shape signal is generated by the Shaper board (*Shape Out output*) and directed to an external optical modulator such as an Electro-Optic Modulator or Acousto-Optic Modulator.

7.2. Shaper board overview

7.2.1. Shaper and SOA-Shape

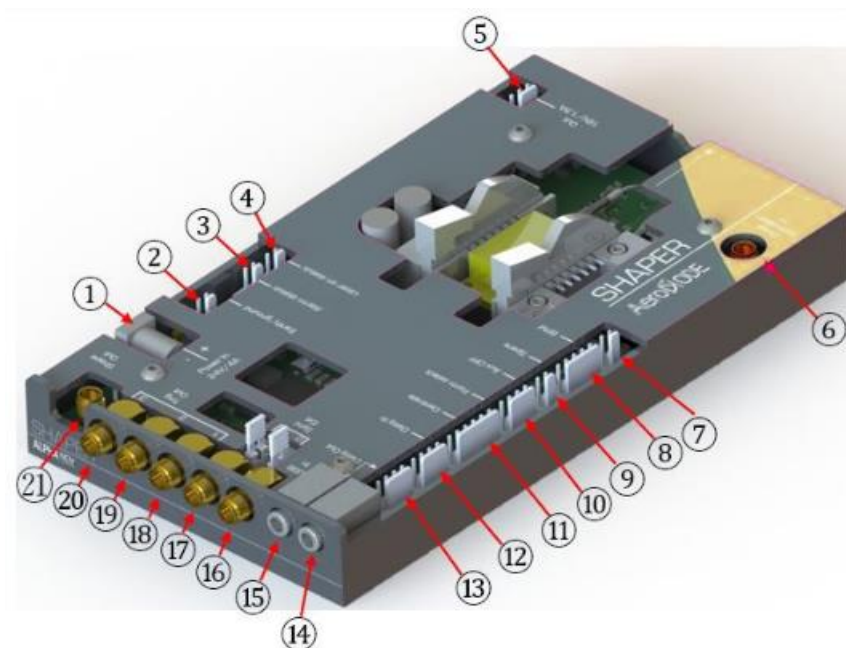


Figure 4 – Shaper and SOA-Shape connectors

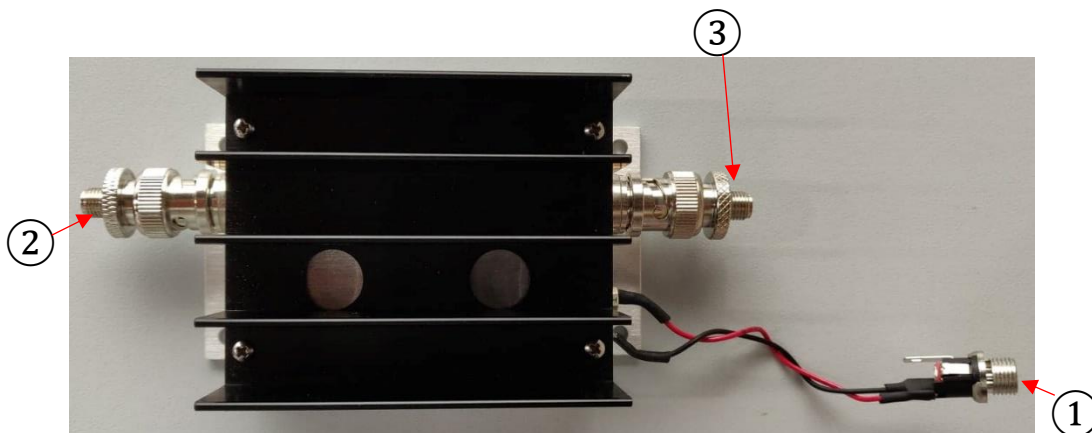
Type	N°	Name	Description
Power and Communication Connectors	①	Power In	Power Connector (24V/4A) – included in the package
	⑫	Daisy In	Input Molex Communication Connector
	⑬	Daisy Out	Output Molex Communication Connector
	⑭	Daisy Out	Output Jack Communication Connector
	⑮	USB In	Input Jack Communication Connector
SMA Output and Input Connectors	⑯	Sync Ext 0	External Synchronization Input Signal 0
	⑰	Clock Ext	External Clock
	⑱	Trig Out 1	Synchronization Output Signal 1
	⑲	Trig Out 2	Synchronization Output Signal 2
	⑳	Trig Out 3	Synchronization Output Signal 3
	㉑	Shape Out	Analog Output Signal

	⑥	Diode Modulation In	Diode Analog Modulation Input Signal
Molex Connectors	②	Earth/ground	Earth/Ground Connection
	④	Laser On status	Laser On External 24V LED Connector
	③	Alarm status	Alarm Status External 24V LED Connector
	⑤	Out 18V/1.5A	Symmetrical Power-Supply Output for powering external devices (Modulator EOM Bias Controller for example)
	⑦	BFM	Laser Diode Back Facet Monitor Connector
	⑧	Spare	Spare Connectors (<i>Factory use only</i>)
	⑨	Aux OFF	External Board Shutdown Connector
	⑩	Form select/Scan Duration	Analog Shape Choice and Scan Duration Connector
	⑪	Centrale/Sync Ext KK	Remote Centrale board Control Connector (for special laser global integration with AeroDIODE “Central board” contact.aerodiode@aerodiode.com for more information)



7.2.2. Shaper External Modulation

For this application, the Shaper has the same connections than the Figure 4. We use an amplifier for the amplification of the output electrical signal.



Type	N°	Name	Description
Power	①	Power In	Power Connector (24V/2A) – included in the package
SMA Output and Input Connectors	②	SMA_IN	Analog input signal
	③	SMA_OUT	Amplifier analog output signal

WARNING

Sequence to connect the amplifier :

1. Connect output load (50 Ω)
2. Apply DC Voltage (24 V – 2A)
3. Apply input signal (connect Shape Out to SMA IN of the amplifier)

Sequence to disconnect :

Remove 3, 2, 1 .



7.2.3. Shaper-I and SOM-Shape



For EU customers, the following label is present on the side of the product



For US/CA customers, the following label is also present on the side of the product

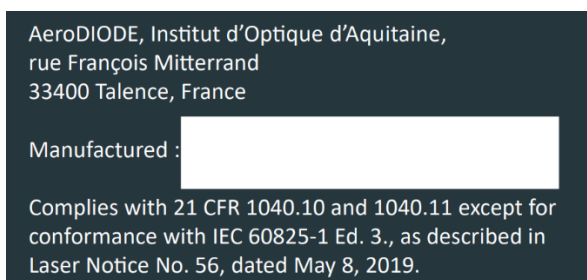




Figure 5 : Shaper-I and SOM Shape connectors – front side



Figure 6 : Shaper-I and SOM Shape connectors – back side



Figure 7 : Shaper-I and SOM Shape connectors –right side

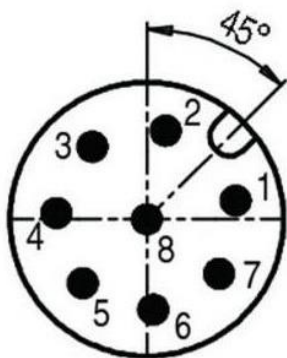
Type	N°	Name	Description
Power and Communication Connectors	①	Power In	Power Connector (24V/2A) – included in the package
	②	Daisy Out	Output Jack Communication Connector
	③	USB In	Input Jack Communication Connector
SMA Output and Input Connectors	④	Sync Ext 0	External Synchronization Input Signal 0
	⑤	Clock Ext	External Clock
	⑥	Trig Out 1	Synchronization Output Signal 1
	⑦	Trig Out 2	Synchronization Output Signal 2
	⑧	Trig Out 3	Synchronization Output Signal 3
Optical Input/Output	⑨	In	Optical Diode Input
	⑩	Out	Optical output : it could be an inox 3mm output fiber or a FC/APC narrow key mating sleeve
Interlock	⑪	Interlock	Laser interlock
Power and interlock	⑫	M12 – 8 pins Male connector	Power connector, laser interlock and Form select function

Communication	⑬	Ethernet communication	Input RJ45 Ethernet cable for communication
---------------	---	------------------------	---

Note

- The synchronization input signal are available Sync Ext 0. The signals impedance is 50 Ω and theirs input levels are depending on your demands.
- The synchronization output signals are available Trig Out 1, 2, 3. The signals impedance is 50 Ω and theirs output levels are 3.3V.
- The Ethernet port can be present but not necessary available for using. This is a special mode of communication with the product. Please contact contact.aerodiode@aerodiode.com for more information.

Description of M12 connector (n° ⑫) (Reference : T4130012081-000)



1	Interlock GND
2	GND
3	Scan duration (see 7.3.1.2)
4	Form Select 1 (0-1V) (see 7.3.1.2)
5	Form Select 0 (0-1V) (see 7.3.1.2)
6	+24V DC / 2A
7	Interlock (internal pull-up 3.3V)
8	GND

Pin 1 and Pin 7 must be shunt in order to have laser emission



7.3. Shaper and SOA-Shape: Hardware

7.3.1. Molex connectors

This part explains the pins of each useful Molex connectors.

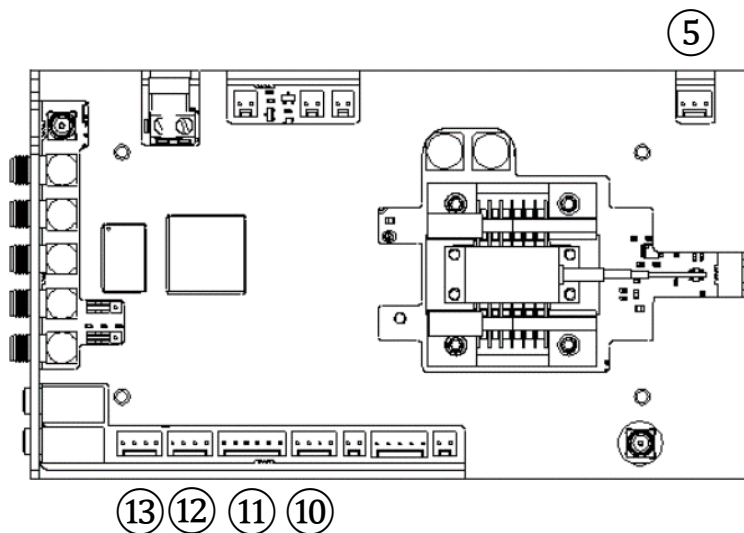
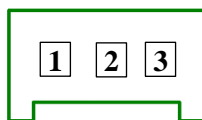


Figure 8 – Shaper Board connectors

7.3.1.1. Out 18V/1.5A (5)



1	+18V
2	Ground
3	-18V

Figure 9 – Out 18V/1.5A connector

7.3.1.2. Form select/Scan Duration (10)

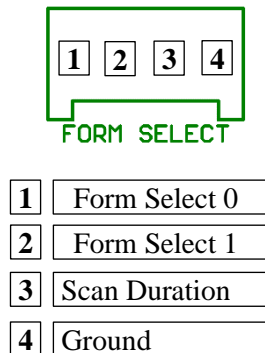


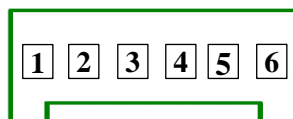
Figure 10 – Form select/Scan duration connector

The Form select connectors have to be set as described in the following table with the mode External shape (8.4.3.1). The signals impedance is 50 Ω .

Pin 2	Pin 1	Shape Number
0	0	1
0	3.3V	2
3.3V	0	3
3.3V	3.3V	4

The scan duration is used to adjust the intershape time with the trigger or analog mode (8.4.4.3 and 8.4.4.4). Its level is 5V with high impedance.

7.3.1.3. Centrale/Sync Ext KK (11)

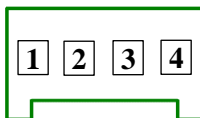


1	Centrale board
2	Sync Ext KK
3	Out KK
4	Centrale board
5	Centrale board
6	Ground

Figure 11 – Centrale/Sync Ext KK connector

dedicated for special laser global integration with AeroDIODE Central board
Contact info@AeroDIODE.com for more information

7.3.1.4. Daisy In (12) and Daisy Out (13)



1	GND
2	Rx
3	Tx
4	INT\

Figure 12 – Form select/Scan duration connector

7.3.2. Synchronization signals

7.3.2.1. Synchronization inputs

Two synchronization inputs are available Sync Ext 0 or KK.

Sync Ext 0 (for HW <3.0)

The PDG module provides some hardware setup to adjust input trigger voltage level by moving jumpers on electronic board.

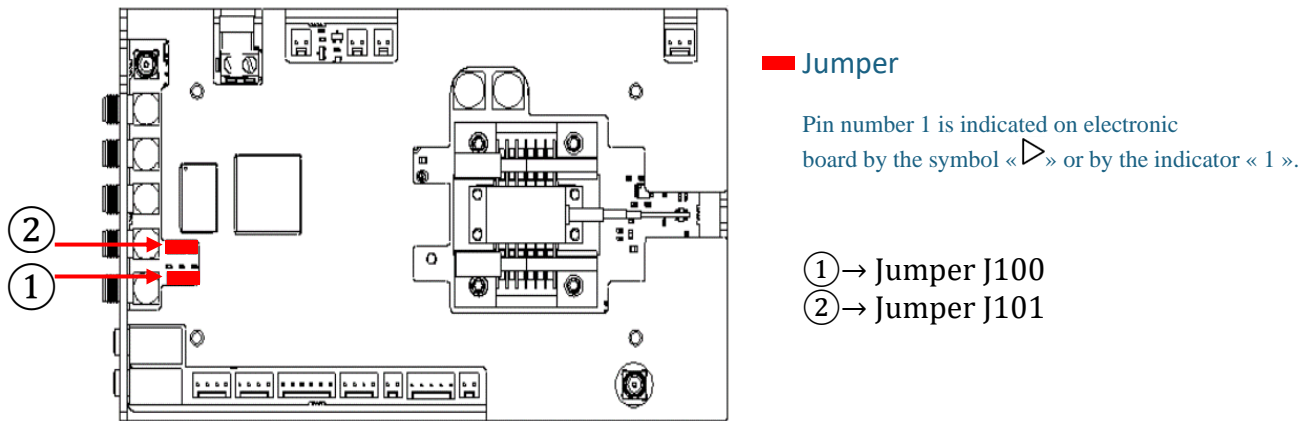


Figure 13 - Shaper hardware setup

These jumpers must be configured according to the input voltage level on the SMA.

Input voltage level on SMA	“Sync Ext 0” Voltage Input Trigger	Impedance
3.3V	Jumper J100 in position 1-2	50 Ω
5V	Jumper J100 in position 2-3	50 Ω
24V*	Jumper J100 in position 2-3	10kΩ

WARNING

24V configuration is done during the production at AeroDIODE, it is not possible to change this configuration. Applying 24V when the product is configured in 3.3 or 5V leads to an immediate destruction of the driver.

Sync Ext 0 (for HW ≥3.0)

The PDG module provides some hardware setup to adjust input trigger voltage level by moving jumpers on electronic board.

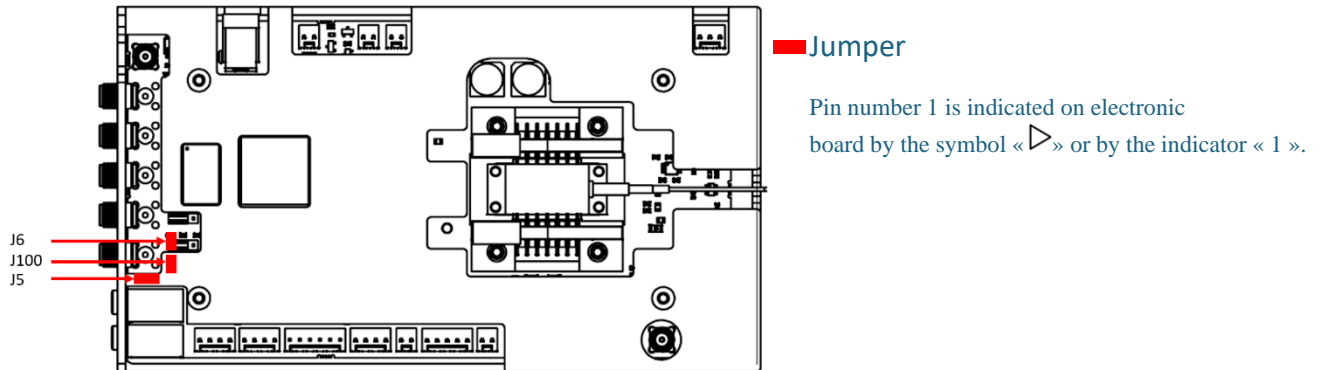


Figure 14 - Shaper hardware setup

These jumpers must be configured according to the input voltage level on the SMA.

Input voltage level on SMA	“Sync Ext 0” Voltage Input Trigger	Impedance
3.3V	Jumper J100 in position 1-2 Jumper J5 in position 2-3 Jumper J6 mounted	50 Ω
5V	Jumper J100 in position 2-3 Jumper J5 in position 2-3 Jumper J6 mounted	50 Ω
24V	Jumper J100 not mounted Jumper J5 in position 1-2 Jumper J6 mounted (not isolated) or not mounted (ground isolated)	10kΩ

Sync Ext KK

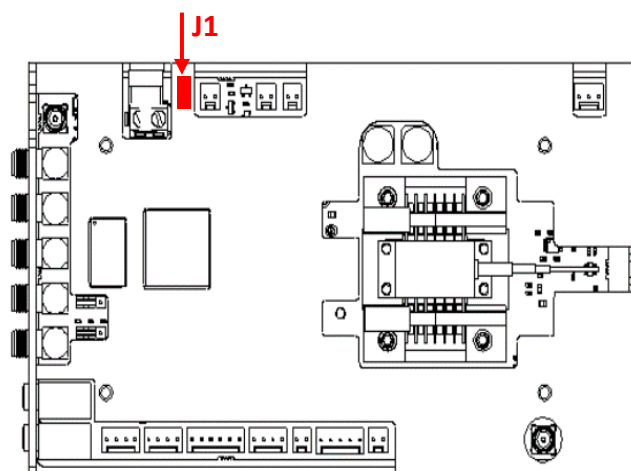
The input voltage level on the Molex connector is 3.3 V for 50 Ω impedance.

7.3.2.2. Synchronization outputs

Four synchronization outputs signals are available Trig Out 1, 2, 3 or KK. The signals impedance is 50 Ω and theirs output levels are 3.3 V.

Trig Out 3 selection (for HW ≥ 3.0)

The output signal for Trig Out 3 could be changed between the user selectable Trig out 3 or a clock output reference of the board (20 MHz)



■ Jumper

Pin number 1 is indicated on electronic board by the symbol « \triangleright » or by the indicator « 1 ».

Trig Out 3 mode	J1	Impedance
Clock reference output	Jumper J1 in position 1-2	50 Ω
User selectable trig out 3	Jumper J1 in position 2-3	

7.3.3. External reference clock

An external 10MHz reference clock can be input to synchronize the product clock with the external reference clock. This is perfect for removing optical jitter.

The input voltage on the Clock Ext SMA can be a periodic signal (square, sinus,...) of 10MHz frequency and up to 3.5Vrms in 50 Ω .

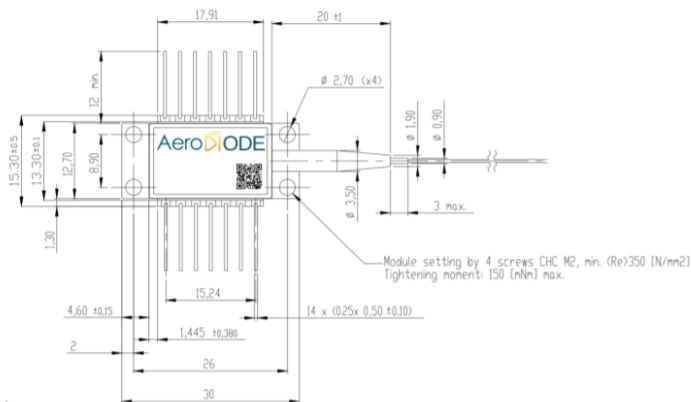
7.4. Shaper and SOA-Shape: Laser Diode compatibilities

7.4.1. Shaper board pin configuration (Type-1 Board)

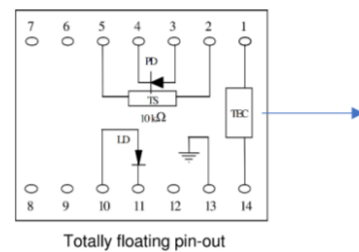


For a standard laser diode like below, the output fiber goes in the direction of the arrow. It is a more complex subject when considering a SOA (see §0)

Form factor:



Laser diode pinning:

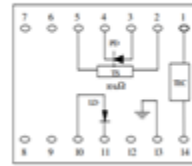


7.4.2. Standard Version for Type-1 laser diodes

The Standard version is compatible with fully floating Type-1 laser diodes like this one :

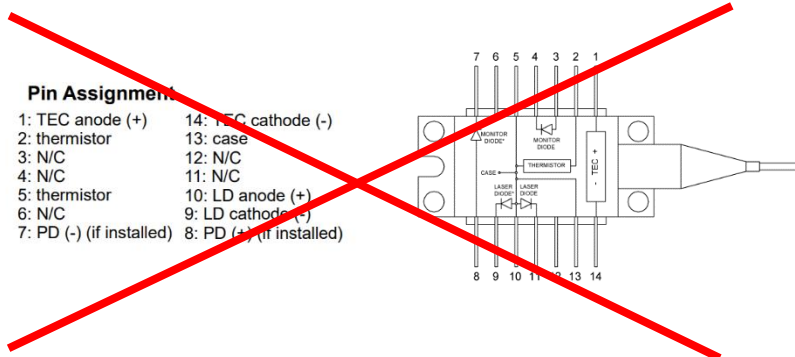
PIN ASSIGNMENT

N°	Description	N°	Description
1	TEC (+)	8	No connect
2	Thermistor	9	No connect
3	Monitor PD Anode	10	Laser Anode (+)
4	Monitor PD Cathode	11	Laser Cathode (-)
5	Thermistor	12	No connect
6	No connect	13	Ground
7	No connect	14	TEC (-)



Totally floating pin-out

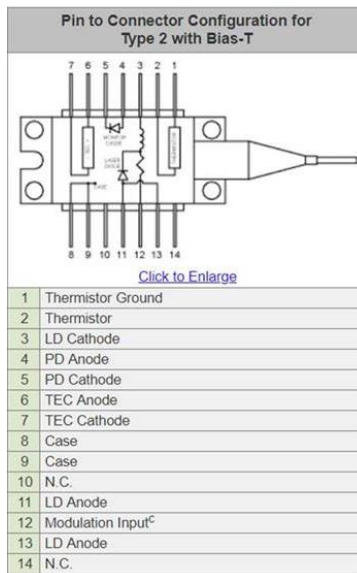
Be aware that this driver is **NOT compatible** with anode grounded type-1 laser diodes. Especially laser diodes like this one :



Important : There is a **major risk of damage** if « case-anode connected » or « ground-anode connected » packages or « thermistor-anode connected » packages are mounted.

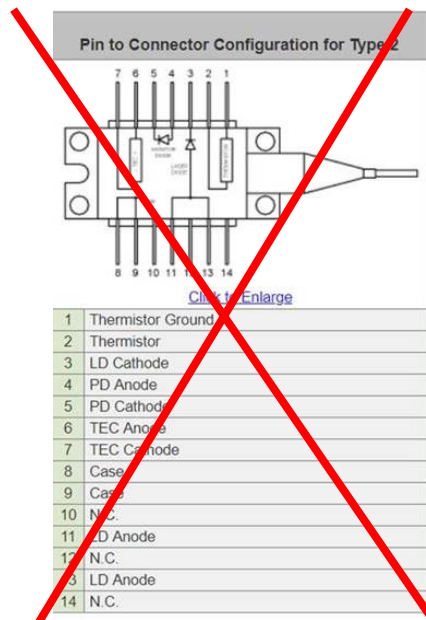
7.4.3. Special Version for Type-2 laser diodes

A special version for Type-2 laser diodes has been developed. It is, in particular compatible with Type-2 Bias-T laser diodes like this one (most of the type-2 laser diodes on the market in fact).



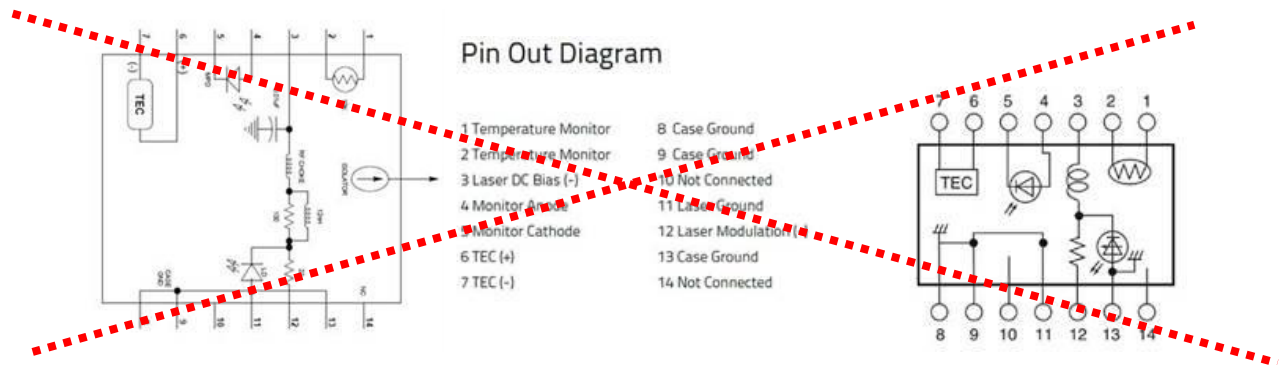
Note that the pin which are used by the board for lasing are Pin 11/13 for Anode and Pin 12 for the Cathode to Ground. Pin 3 is not connected.

Type-2 laser diodes where only Pin 3 is connected to the cathode are not directly compatible (unless an external wire is connected between pin 3 and 12).



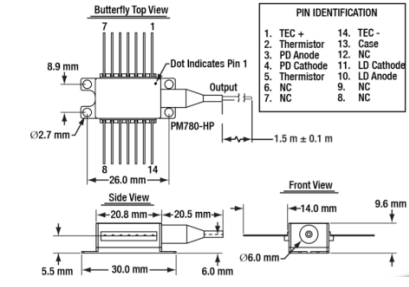
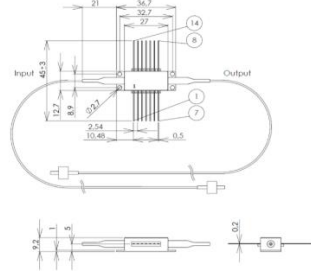
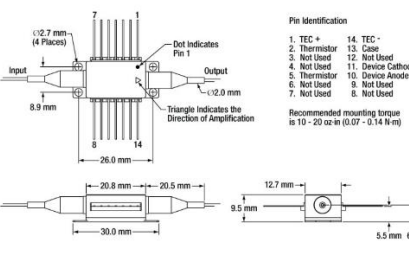
Also special anode grounded laser diodes (where pin 11/13 is connected to 8/9) can cause some major conflicts and potentially destructive damages.

Please contact us in case you want to use such laser diode as some solutions may be proposed.



7.4.4. SOA installation

Caution : In case a SOA is used, make sure the SOA is mounted in the correct direction. Refer to the pin of the SOA (below, right hand side) and compare with a standard Type 1 laser diode (below, left hand side) and verify that the SOA anode and cathode are connected to the correct pad :

Standard laser diode output fiber direction :	Special SOA fiber direction (Innolume SOA)																																										
 <p>PIN IDENTIFICATION</p> <table border="1"> <tbody> <tr> <td>1. TEC +</td> <td>14. TEC -</td> </tr> <tr> <td>2. Thermistor</td> <td>13. Case</td> </tr> <tr> <td>3. PD Anode</td> <td>12. NC</td> </tr> <tr> <td>4. PD Cathode</td> <td>11. LD Cathode</td> </tr> <tr> <td>5. Thermistor</td> <td>10. LD Anode</td> </tr> <tr> <td>6. NC</td> <td>9. NC</td> </tr> <tr> <td>7. NC</td> <td>8. NC</td> </tr> </tbody> </table>	1. TEC +	14. TEC -	2. Thermistor	13. Case	3. PD Anode	12. NC	4. PD Cathode	11. LD Cathode	5. Thermistor	10. LD Anode	6. NC	9. NC	7. NC	8. NC	 <p>Pin identification:</p> <table border="1"> <tbody> <tr> <td>1</td> <td>TEC "+"</td> </tr> <tr> <td>2</td> <td>Thermistor</td> </tr> <tr> <td>3</td> <td>-</td> </tr> <tr> <td>4</td> <td>-</td> </tr> <tr> <td>5</td> <td>Thermistor</td> </tr> <tr> <td>6</td> <td>-</td> </tr> <tr> <td>7</td> <td>-</td> </tr> <tr> <td>8</td> <td>-</td> </tr> <tr> <td>9</td> <td>-</td> </tr> <tr> <td>10</td> <td>SOA anode "+"</td> </tr> <tr> <td>11</td> <td>SOA cathode "-"</td> </tr> <tr> <td>12</td> <td>-</td> </tr> <tr> <td>13</td> <td>Case</td> </tr> <tr> <td>14</td> <td>TEC "-"</td> </tr> </tbody> </table>	1	TEC "+"	2	Thermistor	3	-	4	-	5	Thermistor	6	-	7	-	8	-	9	-	10	SOA anode "+"	11	SOA cathode "-"	12	-	13	Case	14	TEC "-"
1. TEC +	14. TEC -																																										
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12	-																																										
13	Case																																										
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Standard SOA fiber direction :																																											
 <p>PIN IDENTIFICATION</p> <table border="1"> <tbody> <tr> <td>1. TEC +</td> <td>14. TEC -</td> </tr> <tr> <td>2. Thermistor</td> <td>13. Case</td> </tr> <tr> <td>3. Not Used</td> <td>12. Not Used</td> </tr> <tr> <td>4. Not Used</td> <td>11. Device Cathode</td> </tr> <tr> <td>5. Thermistor</td> <td>10. Device Anode</td> </tr> <tr> <td>6. Not Used</td> <td>9. Not Used</td> </tr> <tr> <td>7. Not Used</td> <td>8. Not Used</td> </tr> </tbody> </table> <p>Recommended mounting torque is 10 - 20 oz-in (0.07 - 0.14 N-m)</p>	1. TEC +	14. TEC -	2. Thermistor	13. Case	3. Not Used	12. Not Used	4. Not Used	11. Device Cathode	5. Thermistor	10. Device Anode	6. Not Used	9. Not Used	7. Not Used	8. Not Used																													
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6. Not Used	9. Not Used																																										
7. Not Used	8. Not Used																																										

In the example above, one can see that the fiber output of the laser diode on the left (see CCS picture with fiber direction) corresponds to the input of a SOA. Some SOAs have fiber output going to the right and some SOAs have fiber output going to the left (like the one above top right).

8. Software

8.1. System Setup

8.1.1. Power

To power the Shaper module, please use the DC Power adapter provided.

First plug the cables into the power connector (①) of the module.

- If the power connector is a jack, simply plug the jack cable in
- If the power connector is a screw terminal, plug the positive pole cable in '+' and negative pole cable in '-' (*polarity is indicated on the product*).

You can then plug the DC Power Adapter to a plug socket.

Note: after powered the Shaper, the product needs few seconds (< 5 s) to be initialized and is not able to communicate with the computer within this startup.

8.1.2. USB

To communicate with the module, please use included USB → Jack cable provided.

First connect the jack part into USB In Communication Connector of the module.

Please install software and drivers before plugging USB cable to computer. See section below

8.1.3. Tools Installation (Windows)

Shaper boards works with "AeroDIODE Control Software": this software is unique and compatible with all AeroDIODE electronic modules and boards.

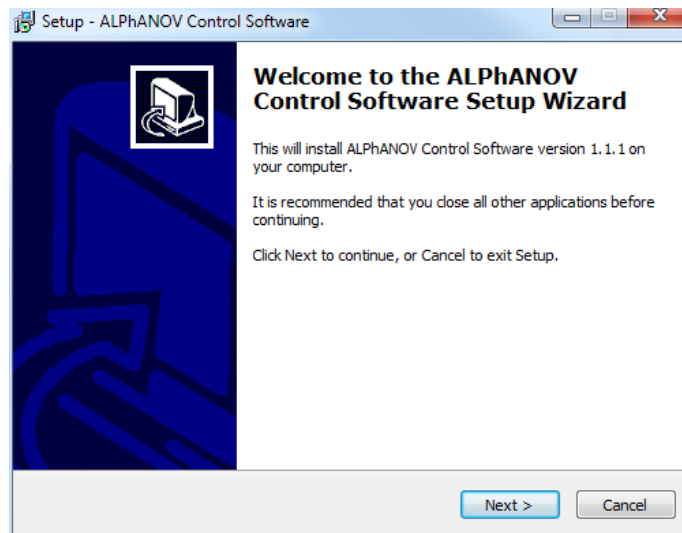
8.1.3.1. Software Installation

Insert CD-ROM or USB Key provided with the module. Then open an Explorer windows and navigate into "Computer" part. Open the USB folder.

Double click on ControlSoftware_x_x_xx.exe file name.

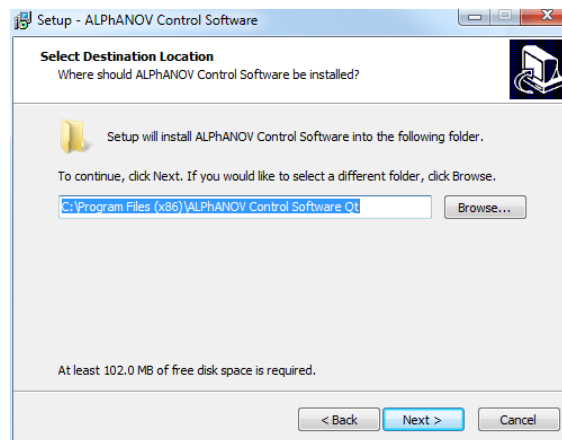
The following window will show:





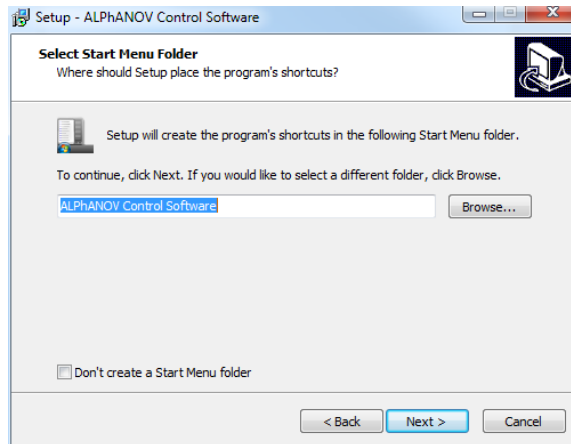
Click on Next;

In the following windows, choose a specific installation path or leave the default one. Then, go to the next section.

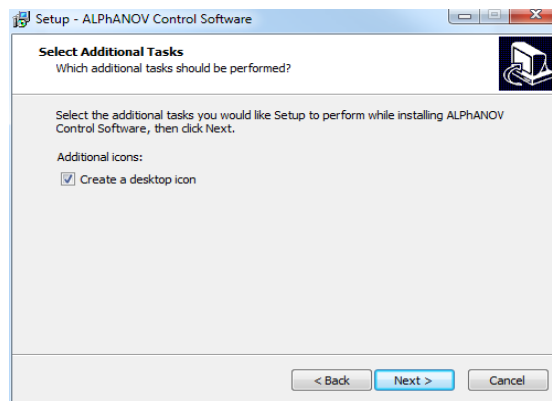


The following window lets you choose the program's shortcut name in the Start Menu folder, if you want to have a shortcut in the Start Menu folder.

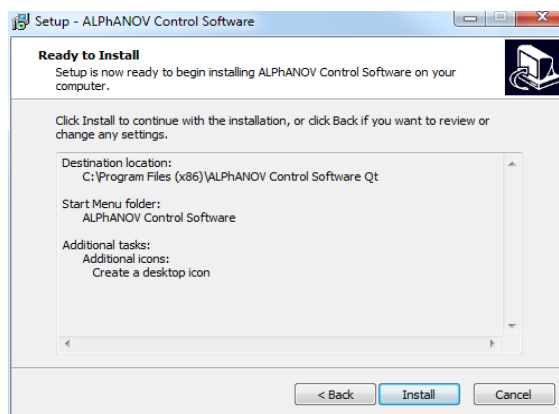




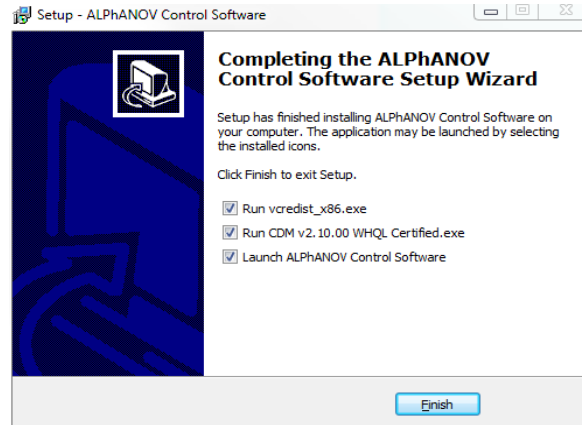
The next part lets you choose if a desktop icon needs to be created. If so, please check the box. Then go to the next section.



Finally click on the Install button.



Installation of the software is now completed. To install drivers & tools please let all the boxes checked and click on “Finish”. You can now move to next section “Essentials Installation”.



8.1.3.2. *Essentials Installation*

The essential items installation runs in 2 parts:

- Microsoft Visual Studio Compiler Runtime installation
- FTDI USB Driver installation

No specific indication here, just click on “Next” and “Install” dialogs and wait until installations are finished. An installation may fail if you already have this specific version or a more recent one. You can safely ignore the error message if that is the case.



8.2. Front-Panel User Interface

8.2.1. Overview

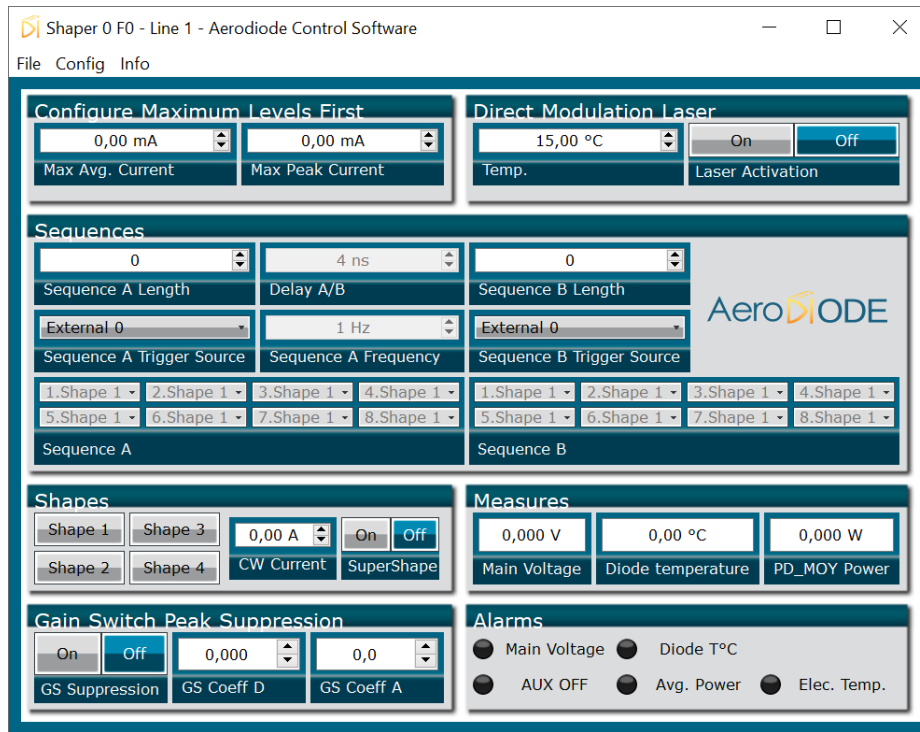
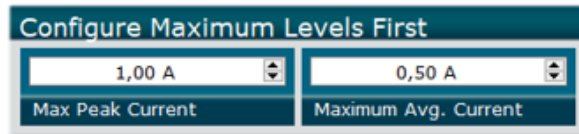


Figure 15 : Main Window

8.2.2. Configure Maximum Levels First section



These parameters must be set before using the board. The Max peak current or voltage must be adjusted by the customer and restrains the other current parameter to protect the customer laser diode.

When the board is configured as Direct Modulation, this setting is called “Max peak Current” and sets the maximum peak current which flows into the diode when shape is at its maximum.

- It can be set from 0 to 2A depending on the used diode

When the board is configured as External or Full External Modulation, this setting is called “Peak Voltage Amplitude” and sets the maximum peak voltage that is outputted by the board when the shape is at its maximum amplitude. The Shape_Out signal can be set from 0 to 1V. But with the External configuration, an external amplifier is present in order to increase the output voltage until 5V.



Maximum Avg. Current or voltage parameter is another laser diode protection: if the laser diode average current is higher than the maximum adjust in the software, the hardware board limits the current to protect the customer laser diode.

✎ This last setting is only available for boards with a hardware version greater than or equal to 2.1.0. You can check the board hardware version in the General Information Window.

8.2.3. Modulation Section



Figure 16 : Direct modulation vs External modulation HMI

This section depends on the mode in which the ordered shaper board is (see §7.1.2) :

Name	Description	Direct Modulation	External Modulation	Full-External modulation
Temperature	This setting is the diode temperature setpoint. It can be set from 15 to 50°C	✓	✓	✓
Laser Activation	This button is the laser activation button <ul style="list-style-type: none"> When set to 'OFF' the diode does not emit laser. When set to "ON" the diode can emit laser. A blue LED lights up on the module when laser can be emitted	✓	✓	✓
Current	This setting is the peak current for the PDM driver module. It can be set from 0 to 2A.		✓	



Offset	This setting is the offset current for the PDM driver module It can be set from 0 to 0.15A.		✓	
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8.2.4. Sequences Section (see part 8.4.3.1)

Two parts allow to define the parameters of each sequence.

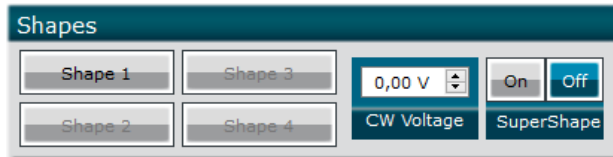
Name	Description
Sequence A/B Length	This setting is for choosing the length of the sequence (from 1 to 8)
Sequence A/B Trigger Source	This is the Trigger Source selection setting, it can be selected to -Internal (Frequency Generator 'Synchro Frequency') -External 0 (SMA) -External 1 (SMA) -External KK (Molex Connector) => Not available for Shaper-I and SOM-Shape
Sequence A/B	Define the order of the shape in the sequence (Shape 1,2,3,4 or external)
Delay A/B	This setting is the delay between the A and B sources.
Sequence A frequency	This setting is the internal frequency generator value. • It can be set from 0 to 20MHz

Note

To generate only one shape, put the following parameters: Sequence A Length=1 ; Sequence A Trigger Source=Internal or external; Sequence A=Choose the shape you want; Sequence B Length=0.



8.2.5. Shapes Section (see part 8.4.2.1)



Name	Description
Shape 1/2/3/4	These button opens 'Shape X' configuration window.
CW Voltage (current)	<p>This setting is the shape default voltage on the 'Shape Out' SMA connector when no shape is generated.</p> <p>This setting makes sense only in External Mode (not in direct modulation of laser diode).</p> <p>Note:</p> <p>Adding CW current to the laser diode is not possible in direct modulation.</p>
SuperShape	This function activates a functionality to put up to 16 000 points in the shape.

8.2.6. Gain switch peak suppression section



Only available in Direct Modulation Mode.

When pulsing laser diodes, an undesirable ultrashort pulse could be observed at the beginning of the pulse.

In order to reduce this gain-switch peak the "GS Suppression" could be activated.

There is two parameters, called "GS Coeff D" and "GS Coeff A", to optimize the results in order to reduce the gain-switch without disturbing the main pulse. It is recommended to use a fast photodiode and oscilloscope in order to properly optimize this parameter step by step.

Typical values are:

- GS Coeff D : 0,030
- GS Coeff A : 10

If the gain-switch peak is always too strong, "GS Coeff D" and "GS Coeff A" could be increased smoothly by step of 0,010 and 5 respectively. On the other hand, if the desired pulse is too much distorted, the "GS Coeff A" and "GS Coeff D" could be lowered together.

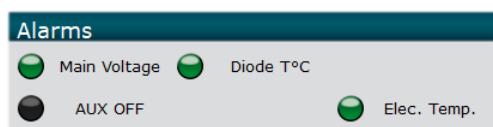


8.2.7. Measurements Section



Name	Description
Main Voltage	This measure shows the board input voltage value in volts
Diode temperature	This measure shows the butterfly diode temperature in °C
PD_MOY Power	This measure shows the average power value in W. (deprecated)

8.2.8. Alarms Section



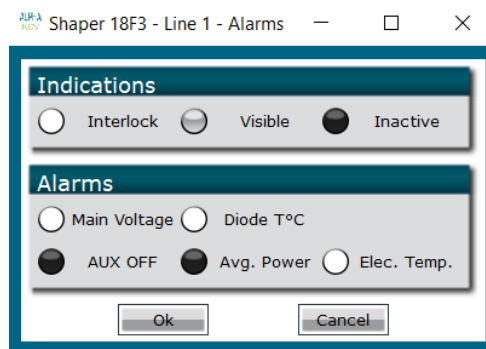
All alarms are configurable and can be enabled or disabled, see part 8.2.9 for more details.

Name	Description
Main Voltage	This indicator shows all is nominal about the board supply voltage. It turns red when the board supply is below 11 volts.
Diode T°C	This indicator shows all is nominal about the diode temperature regulation. It turns red when the diode temperature is over 45°C (configurable in the General Configuration Window)
Avg. Curr (Display not operational yet)	This indicator shows all is nominal about the average current. <ul style="list-style-type: none"> It turns red when the diode average current is over the programmed value (Maximum Avg. Current). <p> This setting is only available for boards with a hardware version greater than or equal to 2.1.0. You can check the board hardware version in the General Information Window section 2.6.6.</p>
AUX OFF	This indicator shows all is nominal about the Auxiliary OFF connector ⑨. <ul style="list-style-type: none"> It turns red when there is no contact between the two pins of the connector <p>For Shaper-I and SOM-Shape this indicator must be on Interlock Mode, it is cabled to the Interlock output signal.</p>



Avg. Power	<p>This indicator shows all is nominal on diode average output power (deprecated)</p> <p>✎ This setting is only available for boards with a hardware version lower than or equal to <u>2.0.0</u>. You can check the board hardware version in the General Information Window section 8.2.13.</p>
Elec Temp.	<p>This indicator shows all is nominal about the temperature of an electrical component used in MPDM driver.</p> <p>It turns red when the component temperature is over 70°C (configurable in the General Configuration Window cf. 2.6.4).</p>

8.2.9. Alarms Configuration Window



This window allows to configure the different alarms behavior. Each alarm can be configured as:

- ☐ Interlock: If the alarm occurs, the board will trigger an Interlock signal and stop emitting laser
 - To be able to emit laser again, the board has to be powered off and on.
 - The alarm will be visible in the Alarms Section of the Main window.
- ☐ Visible: If the alarm occurs, the referring indicator will switch to red in the Alarms Section on the Main window.
- ☒ Inactive: If the alarm occurs, nothing will happen.

Each alarm mode can be configured by clicking on the round circle on its left in the “Alarms” section.

The parameters will be applied after validating the choice by the “Ok” button.

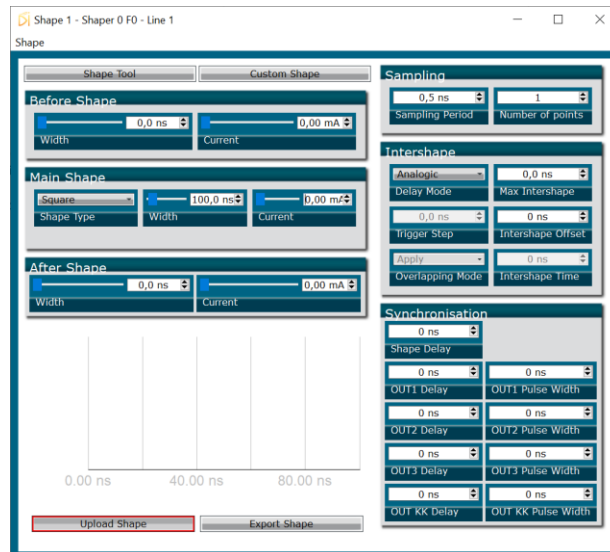
Note

For Shaper-I and SOM-Shape this indicator must be on Interlock Mode, it is cabled to the Interlock output signal.



8.2.10. Shape Window

This window exists to simplify the generation of common shapes or load a shape and to adjust all the shape parameters. The parameters used in this window are never stored within the product, they are only saved locally on the computer AeroDIODE Control Software runs on.



8.2.10.1. Shape Tool Section



In this section, the parameters can be set either by entering the value in the boxes as usual, but they can also be set using the sliders next to them. It is the same value that is modified by both, so changing one will act on the other.

Part	Name	Description
Before shape	Width	This setting sets the width of the plateau before the main shape. It can be set from 0 to a number dependent on the other widths of this shape generation window and the number of points, the sum of all widths cannot exceed step size x 4000 ns
	Voltage/current	This setting sets the voltage/current of the plateau before the main shape. It can be set from 0 to 1V or 2A.
Main Shape	Shape Type	This setting sets the type of the main shape. The existing types are Triangle, Square, Sinus, Exponential and Gaussian
	Width	This setting sets the width of the main shape. It can be set from 0 to a number dependent on the other widths of this shape generation window, and the number of points, the sum of all widths cannot exceed step size x 4000 ns.
	Voltage/current	This setting sets the voltage/current of the plateau of the main shape. It can be set from 0 to 1V or 2A.
	Rise/Fall width	This setting sets the rising/falling width. It can be set from 0 to a number dependent on the other widths of this shape generation window, and the number of points, the sum of all widths cannot exceed step size x 4000 ns.
	Period	This setting sets the period of the Sinus. It is only visible when the Shape Type is Sinus.
	Starting Angle	This setting sets the starting angle of the Sinus. It is only visible when the Shape Type is Sinus. It can be set from -0 to 360.
	Slew Rate	This setting sets the standard deviation of the Exponential. It is only visible when the Shape Type is Exponential. It can be set from 0 to 999999



	Standard deviation	This setting sets the standard deviation of the Gaussian. It is only visible when the Shape Type is Gaussian. It can be set from 0.1 to 999999.
	Order	This setting sets the order of the Gaussian. It is only visible when the Shape Type is Gaussian. It can be set from -999999 to 999999.
After Shape	Width	This setting sets the width of the plateau after the main shape. It can be set from 0 to a number dependent on the other widths of this shape generation window and the number of points, the sum of all widths cannot exceed step size x 4000 ns
	Voltage/current	This setting sets the voltage/current of the plateau after the main shape. It can be set from 0 to 1V or 2A.
Graph		This zone is where a preview of the shape is displayed.
Buttons	Upload Shape	This button uploads the shape to the Board once clicked. It stays red if the user does not load the shape current shape.
	Export Shape	This button exports the shape to a .csv file that can be loaded in the module at a later time.

8.2.10.2. Custom shape Section



It is possible to load an existing shape (csv file), please refer to part 8.4.2.3 for the file template.

8.2.10.3. Sampling Section



8.2.10.4. Intershape Section (see part 8.4.4)

Name	Description
Delay Mode	<p>This setting is the delay mode configuration, it can be configured as:</p> <ul style="list-style-type: none"> - Analog: The intershape value is set by an external analog signal (<i>not operational yet</i>) - Trigger (<i>not operational yet</i>)/Soft: The intershape value is either incremented via a numeric external signal or set via a software setpoint <p>✎ For more information on double shape mode, please refer to part 8.4.4</p>
Overlapping mode (<i>not operational yet</i>)	<p>This setting makes it possible to decide on the action to be performed if two consecutive pulses do not respect the minimum time and the alarm is set to do nothing:</p> <ul style="list-style-type: none"> - Ignore the second pulse - Apply the second pulse <p>✎ For more information, please refer to part 8.4.4.6</p>
Intershape Minimum (<i>not operational yet</i>)	<p>This setting sets the intershape minimum value It can be set from 100ns to 1s.</p> <p>✎ For more information, please refer to part 8.4.4</p>
Trigger step (<i>not operational yet</i>)	<p>This command allows to define the step in trigger mode.</p>
Intershape offset	<p>This setting defines the delay to start the intershape</p>
Intershape Time	<p>This button allows to define the duration of the intershape.</p>
Max intershape	<p>This setting defines the maximum duration of the intershape.</p>

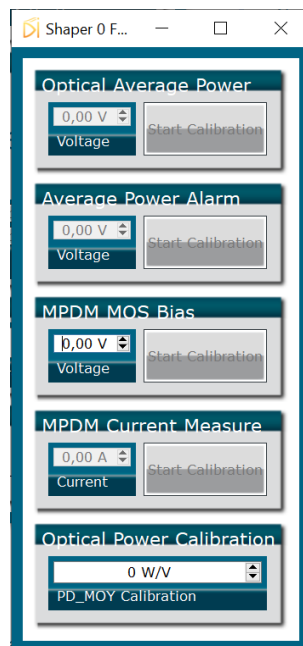
8.2.10.5. Synchronization Section



Figure 17 : Direct modulation mode vs External modulation mode with laser diode pulse parameters shown in red

It is possible in this section to adjust each Delay and Pulse Width of the trig-out signals (1,2,3, KK) and the PDM (for External and Full External mode), and the Delay shape.

8.2.11. Calibration Window



Only the following parameters are operational for the moment.

8.2.11.1. MPDM MOS Bias voltage adjustment

This setting sets the electronic component manual calibration value. It can be set from 0 to 5V. **Classical value is around 2.7 V for this MOS Bias Voltage.** It is important to have the best adjustment for the customer Laser diode:

- If the value is too low, there will be no laser emission
- If the value is too high, it can damage the laser diode

For product delivered with the Laser diode, the adjustment is done in AeroDIODE. When the Laser diode is put after the delivery, please follow the following steps:

- Observe the output laser diode power with a power meter
- Select None for the Sequence A and B trigger source
- Laser needs to be set ON at 0 mA level
- Change the MPDM MOS BIAS voltage with 0.01V step and observe the power value
- The best MPDM MOS BIAS voltage is the last value for which there is no laser emission

WARNING : Never set the MOS bias voltage above 3V.

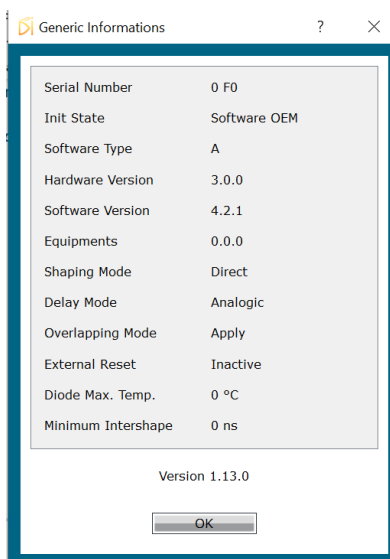
8.2.11.2. PD_MOY Calibration

This setting is a calibration parameter for the reading of the average power radiating the integrated photodiode of the Butterfly laser diode accessible in the Measures part of the GUI.

8.2.12. General Configuration Window

This part of the software is protected for *factory use only*.

8.2.13. General Information Window



This window shows some information about the board configuration.

8.2.14. Ethernet Configuration Window

The screenshot shows the 'Ethernet Configuration' window. It has two main sections: 'Ethernet Parameters' and 'Ethernet Current Configuration'. In the 'Ethernet Parameters' section, the 'Static' tab is selected. The 'Ethernet IP Mode' is set to 'Static'. The IP Address is 10.0.0.0, the Subnet Mask is 0.0.0.0, the Port is 0, and the Gateway IP Address is 0.0.0.0. The 'Ethernet Current Configuration' section shows the current state of the board, with IP Address 0.0.0.0, Subnet Mask 0.0.0.0, MAC Address 0.0.0.0.0.0.0, and Gateway IP Address 0.0.0.0. At the bottom are 'Ok' and 'Cancel' buttons.

Ethernet Parameters	
<input checked="" type="radio"/> Static <input type="radio"/> Dynamic	
Ethernet IP Mode	
IP Address	Port
10 0 0 0	0
Subnet Mask	Gateway IP Address
0 0 0 0	0 0 0 0

Ethernet Current Configuration	
IP Address	MAC Address
0 0 0 0	0 0 0 0 0 0
Subnet Mask	Gateway IP Address
0 0 0 0	0 0 0 0

Ok Cancel

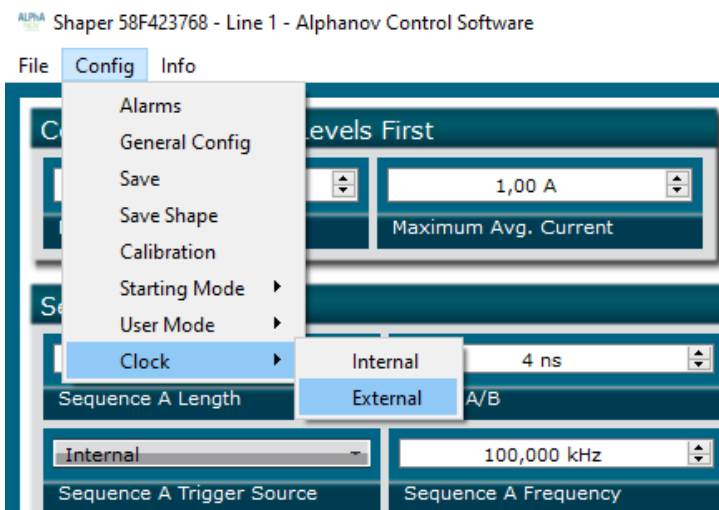
The window is dedicated to ethernet configuration. The IP mode could be switched between static or dynamic.

In case of static configuration all parameters (IP, Port, Mask) need to be entered in the “Ethernet Parameters” section.

The “Ethernet Current Configuration” contains only read-only values indicated the state of the board.

Note : The Save function (see below in the Menu “Config”) must be called and the board needs to be powered-off and powered-on after changing the static IP Address and associated parameters to be taken into account.

8.2.15. Clock configuration section



The clock of the product is internal by default. An external reference clock of 10 MHz could be used (see paragraph 7.3.3)

8.2.16. Menu bar

Menu Bar	Name	Description
File	Load Parameters	Load a preset of board parameters (.csv file)
	Save Parameters	Save the current board parameters into a file. (.csv file)
	Exit	Closes the current window
	Exit all	Closes all the windows
Config	Alarms	Opens the alarm configuration window
	General Config	Opens the general configuration window
	Ethernet Config	Open the ethernet configuration window
	Save	Saves the current settings into the board memory
	Save shape	Saves the current shapes into the board memory
	Calibration	Opens the calibration window
	Starting Mode	Change the starting mode dedicated for OEM integration (please contact AeroDIODE for further information)
	User Mode	Change the GUI view
	Clock	Choose between internal and external clock
Info	General Information	Opens the General Information window

8.3. Getting Started

Be careful using a SOM-Shape, follow the action order below:

8.3.1. To start an emission:

1. Turn on the optical diode input (External seeding LASER diode)
2. Turn on the SOM-Shape module (ON Button on the GUI)

8.3.2. To stop an emission:

1. Turn off the SOM-Shape module (OFF button on the GUI)
2. Turn off the optical diode input (External seeding LASER diode)

By changing the order to process, it can damage the SOM-Shape.



8.4. Shape generation

8.4.1. Introduction

This module is dedicated to generate arbitrary waveforms and apply them to either a special devices like AOM or EOMs or directly to a butterfly laser diode. The basic use of the device is thus to generate a unique shape. There is also other modes useful for special configurations which allow the user to combine 2 or several shapes in a given sequence.

The software GUI and shape generation tools are described in part 8.2.

8.4.2. Shape generation

8.4.2.1. Shapes

Up to four shapes can be defined.

There are two possibilities to define a shape by using the software tools or by loading a csv file. The maximum amplitude is classically 2A or 1V depending on the shaper board mode and the diode used. The sampling period is 500ps minimum.

8.4.2.2. Shape Software tools

Simple tools allow to define a shape. Triangle, Square, Sinus, Exponential and Gaussian shapes can be generated. A shape is defined in three parts: before, main and after shape.

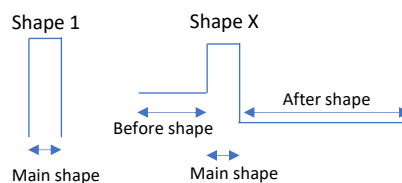


Figure 18 – Two shapes example. Shape 1: only a main shape ; shape X: a shape with a before, main and after parts

8.4.2.3. Csv file

A shape can be loaded with a csv file. The first value of this file is the number of points of your shape, the second value is 0. Then each point of the shape is written. The delay between two points is defined in the software (sampling period see part 8.2.10.3), the value of the point is between 0 to 65535 corresponding to 0 to the Max Peak Current or Voltage in the software (see part 0). This possibility is very interesting if the desired shape is not a common form.



	A	
1	1002	Number of points
2	0	Always 0
3	0	
4	66	
5	131	Points of the shape
6	197	65535 corresponds to the Max Peak Current
7	262	⇒ For example Max Peak Current = 2A ; 262 corresponds to $262 * 2 / 65535 = 8\text{mA}$
8	328	
...		

Figure 19 – Example of a csv file

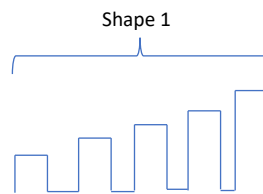


Figure 20 – Example of non-common shape

8.4.3. Sequence of shape

It is possible to generate two sequences of maximum 8 shapes each. The following image details a complete configuration.

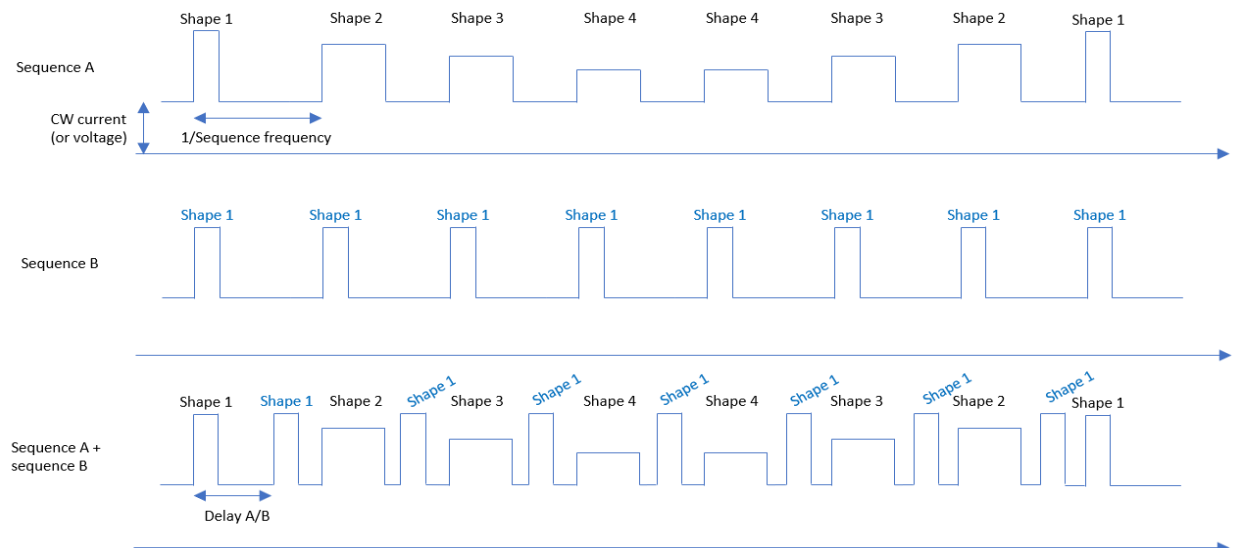


Figure 21 – Sequence examples



8.4.3.1. Sequence

A sequence is defined by several parameters:

- Its length (up to 8 shapes)
- The shape order/choice (4 different shapes possible)
- Shapes CW voltage (only in external mode)
- Its synchronization (internal or 3 external synchronization)
- Sequence frequency
- Delay A/B (if two sequences used): size first shape (sequence A) + 44 ns minimum

In this example, two sequences are described.

Parameters	Sequence A	Sequence B
Length	8	1
Shaper order/choice	S1-S2-S3-S4-S4-S3-S2-S1	S1

The sequence synchronization and frequency depend on the Trigger source:

Sequence A	Sequence B	Sequence frequency	Delay A/B
None	None External0 External KK	X Sync Ext 0 frequency Sync Ext KK frequency	X X X
Internal	None Internal	Software sequence frequency	X Software Delay A/B
External 0	None Internal External1 External KK	Sync Ext 0 frequency Sync Ext 0 frequency Sync Ext 0 frequency Sync Ext 0 frequency	X Software Delay A/B Delay between sync signals Delay between sync signals
External KK	None Internal External 0 External 1	Sync Ext KK frequency Sync Ext KK frequency Sync Ext KK frequency Sync Ext KK frequency	X Software Delay A/B Delay between sync signals Delay between sync signals



8.4.4. Intershape Configuration

8.4.4.1. Global Introduction

The board includes a special mode called Intershape. This mode allows to “pause” the shape playing during a configurable duration. Here’s an example below:

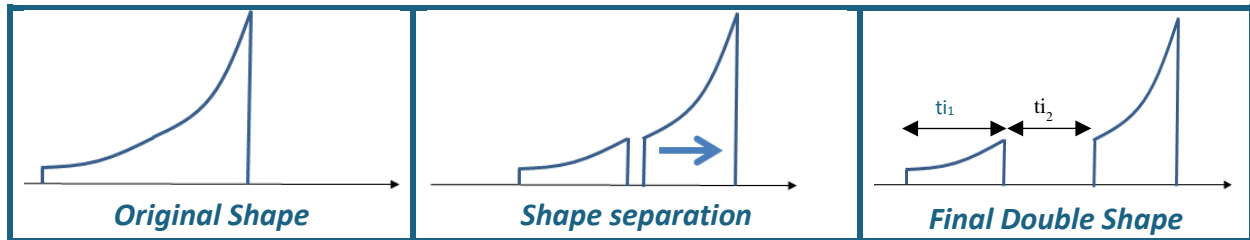


Figure 22 - Intershape Principle

Double Shape can be configured with 2 parameters:

- Intershape Offset: the duration of the first part of the shape (ti_1)
- Intershape Time: the duration of the pause between the two parts of the shape (ti_2)
-

8.4.4.2. Intershape Configuration

The Intershape offset value can only be defined with the software.

The “Intershape time” can be configured in 3 different ways:

- Analog Mode: The intershape value is set by an external analog signal.
- Trigger Mode: The intershape value is incremented via a numeric external signal
- Soft Mode: The intershape value is set via a software setpoint.

8.4.4.3. Intershape Analog mode configuration- (not operational yet)

In this mode, the intershape time can be set via the Molex KK connector n°⑩ with an analog signal. The Maximum intershape time must be previously set in the software.

The behavior is the following:

- 0 V on the analog signal corresponds to 0% of the maximum intershape time set in the software.
- 5 V on the analog signal corresponds to 100% of the maximum intershape time set in the software.

The analog signal should be cabled on pin 3 of Select Form/ Scan Duration Connector.



8.4.4.4. *Intershape Trigger mode configuration- (not operational yet)*

In this mode, the intershape time value is incremented of a previously programmed value at each rising edge on the Scan Duration signal. The incrementation step is called Trigger step and can be set in the software.

After the incrementation, if the Intershape time is higher than the maximum intershape time, the Intershape time is reset.

8.4.4.5. *Intershape soft mode configuration*

When the intershape mode is set to Soft mode, it can be set manually via the software's (see part 8.2.10.4).

8.4.4.6. *Overlapping Mode- (not operational yet)*

This setting will decide what to do if two consecutive pulses do not respect the minimum time and the alarm is set to "do nothing":

- Ignore the second pulse
- Apply the second pulse

Note

If a pulse is being generated and another sync arrives then this sync will be ignored.



8.4.5. Output signals

Four output signals are available SMA Trig outs 1/2/3 (or Molex connector Out KK for Shaper and SOA-Shape). For each signal it is possible to adjust a delay and a pulse width.

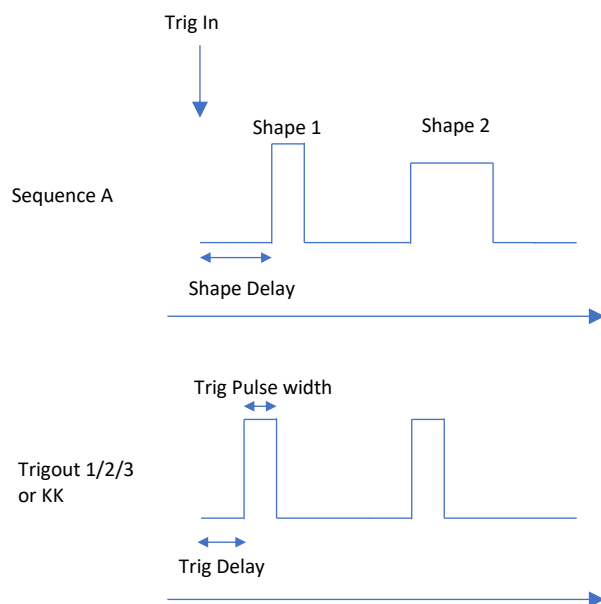


Figure 23 – Output signals synchronization

8.4.6. Direct modulation option : Gain-Switch Suppression Mode

For more information about the Gain-Switch Suppression Mode, please see 8.2.6.

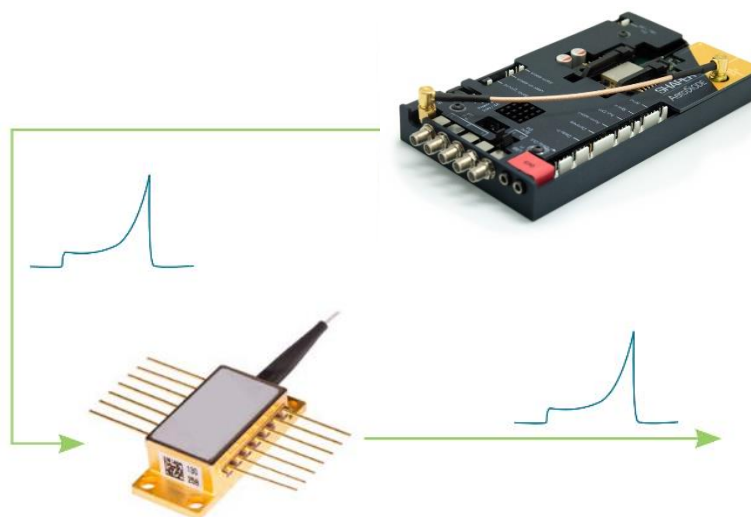


8.5. Using the Shaper Module as an arbitrary direct pulse shaping driver

8.5.1. *Presentation*

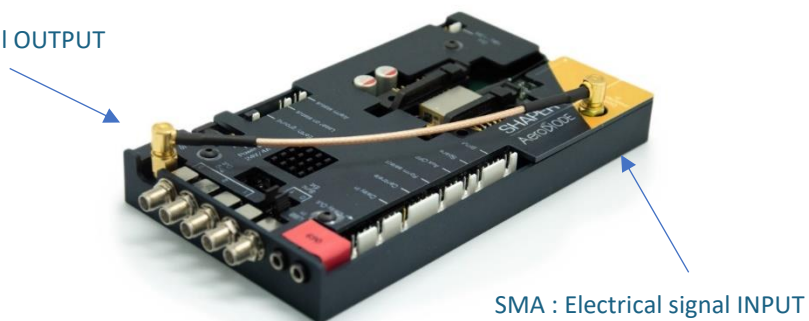
The shaper module allows to apply a pulse shape directly to the diode.

8.5.2. *Synoptic*



8.5.3. *Cabling*

SMA : Electrical signal OUTPUT

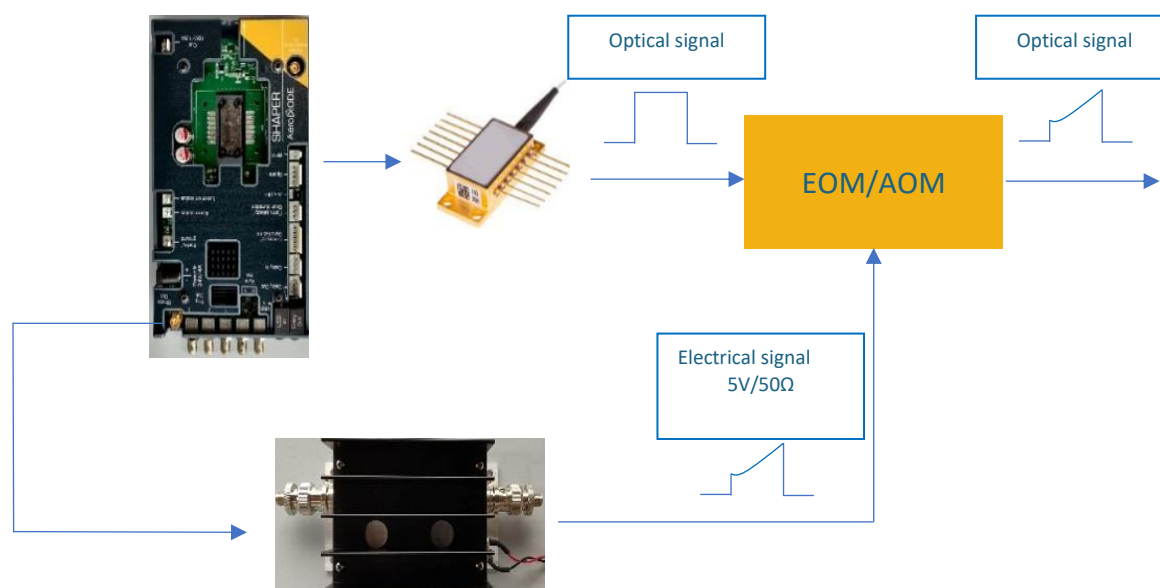


8.6. Using the Shaper Module as an arbitrary external pulse shaping

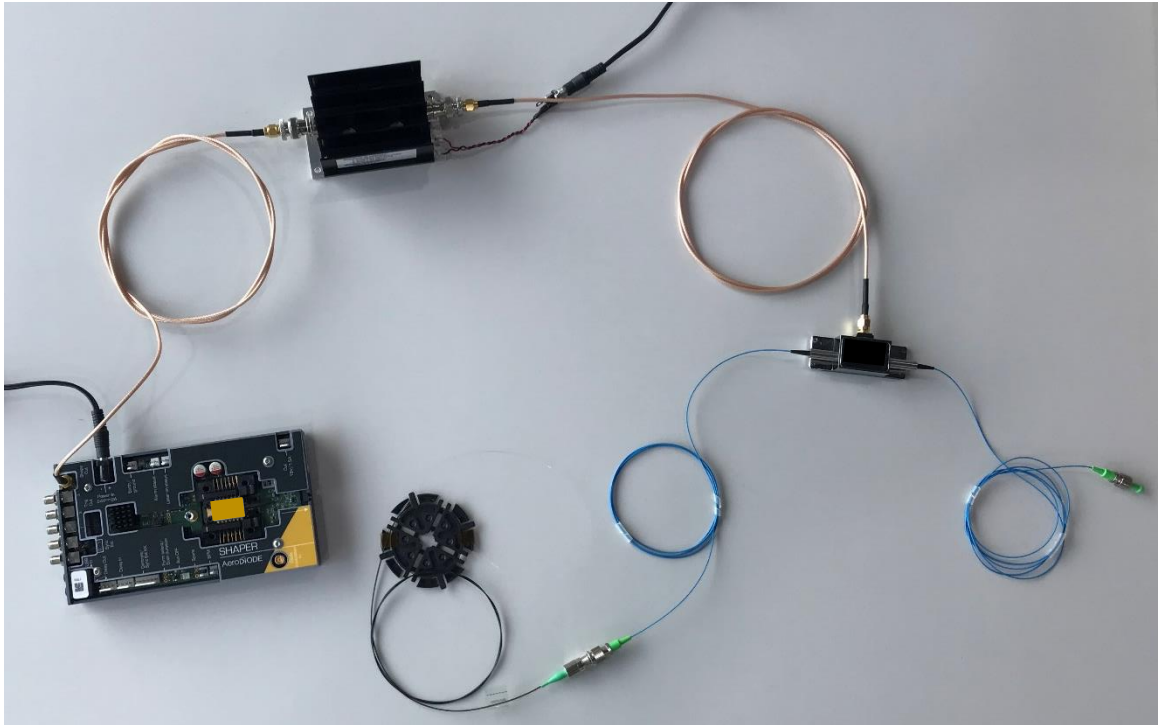
8.6.1. Presentation

The shaper module allows to apply an external pulse shape to the diode. This configuration is used for the EOM control.

8.6.2. Synoptic



8.6.3. Cabling



9. Configuration examples

Please note that the USB cable can be removed after the product has been configured.

9.1. Generate a common triangular shape

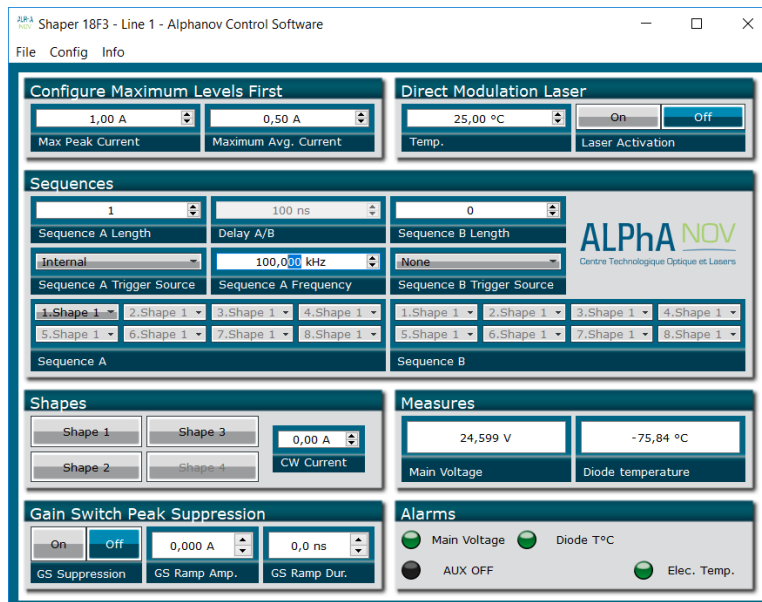
Configure The window by putting the same parameters as shown below:

- Sequence A length -> 1
- Sequence B length -> 0
- Trigger source -> Internal
- Frequency (repetition rate of the sum of all the shapes)

Caution

Don't forget to set the **max peak** and **average current** (depends on your laser diode, check its datasheet!)

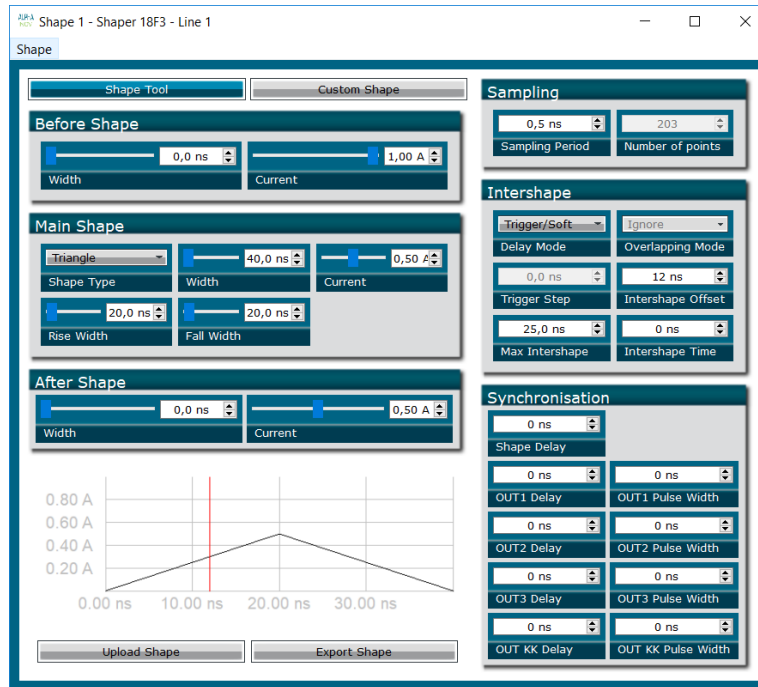
Do the same for the temperature



Click on “Shape 1 Category”

The following window appears :





Set the desired Shape (For this example, Triangle), then the max current, pulse width, rise and fall time. Nothing in the the before and after shape.

Warning

Check that the end-point of the fiber optic is in a measure instrument to avoid any risk.



On the main window, in the Laser activation category, click **ON**.

With the end-point of the fiber optic connected to an oscilloscope, you may check that you have the right signal. If not, First check if any alarm has been triggered.

If it isn't the case, you can remove the SMA cable and plug a probe on the Electrical Signal Input to see if there is a signal corresponding to the shape. This will tell you if your diode is faulty.

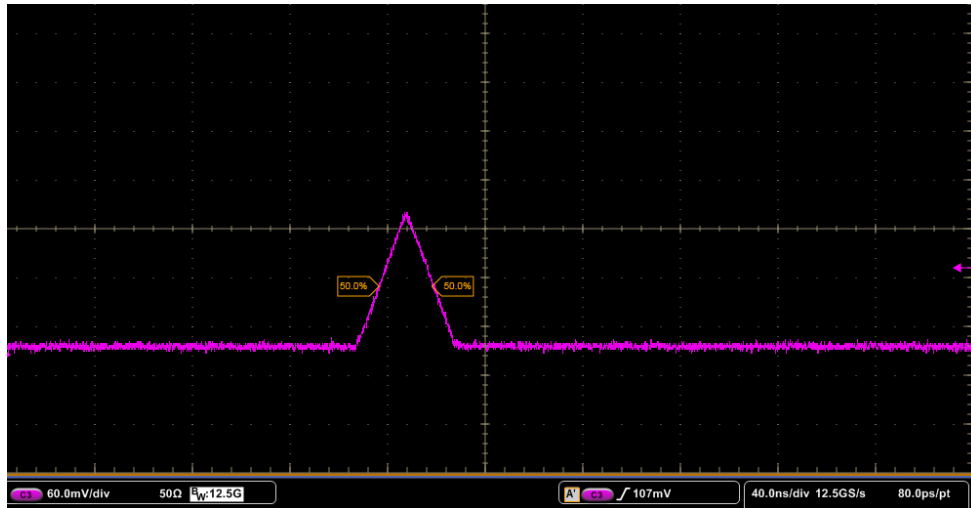


Figure 24 – Shape Out Oscilloscope

9.2. Generate a non-common shape

With a csv file it is possible to create non-common shapes. The following example is a shape of a burst of square signals. The current level of the square is increasing until 2A.

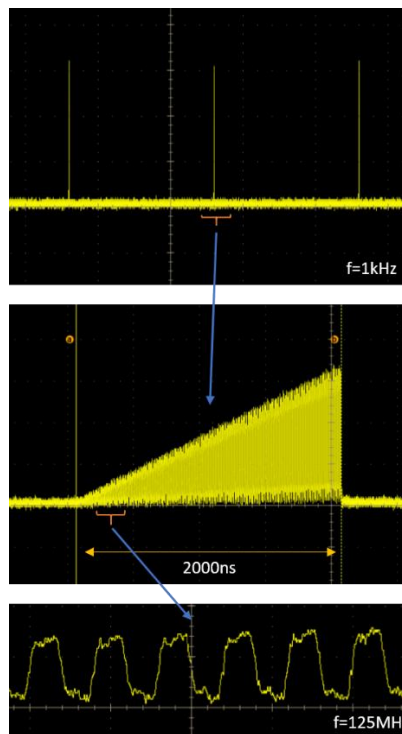
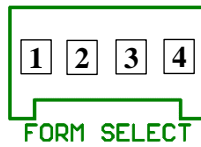


Figure 25 – Shape out oscilloscope

9.3. Use a gate signal to trigger shape pulses

The form select connector (see §7.3.1.2) could be used in order to gate pulses. As the connector is dedicated to switch between 4 different shapes, two shapes, for example Shape 1 and Shape 3 could be activated with not current (null shape) in one of the two.



- 1 Form Select 0
- 2 Form Select 1
- 3 Scan Duration
- 4 Ground

The Form select connectors have to be set as described in the following table. The signals impedance is 50 Ω .

Pin 2	Pin 1	Shape Number
0	0	1
0	1V	2
1V	0	3
1V	1V	4

A sequence length of 2 should be used and the mode for Shape selection selected to External.

A screenshot of the "Sequences" GUI. It features several input fields and dropdown menus. At the top, "Sequence A Length" is set to 2 and "Delay A/B" is set to 4 ns. Below, "Sequence A Trigger Source" is set to Internal and "Sequence A Frequency" is set to 1000 Hz. The bottom section, labeled "Sequence A", contains eight dropdown menus arranged in two rows of four. The first two are set to "1.External" and "2.External", while the remaining six are set to "3.Shape 1".

Figure 26 : GUI for Gate mode



One of the shape that will be selected by the Form Select connector should have no current and the other the shape that is required. Then when the connector selects the shape with no current (null shape), no pulses are emitted.



Figure 27 : Gate function example at 10kHz (Shape 1 is selected when 00 is applied, Shape 3 (null current shape) is selected when 01 is applied (0 on pin 1, 1V on pin 2))

10. Remote communication

10.1. Preexisting libraries

If a rapid development is desired, libraries can be delivered upon request. These libraries are compiled in C by default, so are compatible with any language that can integrate C. They take the form of a header file, a .lib file and some .dll files. A manual explaining the functionalities and a very simple example in C are also included.

11. Technical specifications

11.1. General Data

Length	172	mm
Width (edge to SMA connectors)	91	mm
Height (including laser diode sockets)	25	mm
Weight	300	g
Power connector (Jack, positive tip)	9	mm
Power supply (DC)(CE)	24VDC / 2A	
Safety Features	Interlock	
	Over Temperature Protection of laser diode	
	Over Temperature Protection on board	
	Laser Current Limit	

11.2. Detailed data

Shaper	Min	Max	Resolution	Impedance	Bandwidth
Operating temperature	+15 °C	+40 °C			
Storage temperature	-40 °C	+80 °C			
Operating Altitude	—	2000 m			
Laser Diode Temperature	15 °C	50 °C	0,1 °C		
Peak current (direct mode)	0	1.6 A	30 µA		
Voltage (full external and external mode)	0	1 V	15 µV	50 ohm	2 GHz
	0	5 V	15 µV	50 ohm	2 GHz
Pulse shaping duration	0	8 µs	500 ps (with a max duration of 2µs)		
Number of step in the shape	1	4000	1		

