CW Fiber Amplifier
User's Manual

Products CEFA-C/L-PB-HP
CEFA-C/L-PB-LP
CEFA-C/L-WDM-LP
CEFA-C/L-BO-HP
CEFA-C-HG
CYFA-PB/BO
CEFL-MEGA

Platform B130

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WARNING

This product might be a class III-B or class IV fiber laser. Refer to the front panel label (or the lid) of your device.

Invisible laser radiation when the product is operating with fiber disconnected.

AVOID DIRECT EXPOSURE TO THE BEAM: Never operate with a broken fiber or with fiber disconnected.

DO NOT OPEN THE DEVICE, WARRANTY VOID IF THE MODULE HAS BEEN OPENED.

BEFORE ANY USE OF THE DEVICE, ENSURE YOU HAVE READ THE USER MANUAL AND SPECIALLY THE SAFETY CONSIDERATIONS.

Table of Content

1. General Information

1.1. About this manual

1.1.1. Purpose

This documentation is provided as an instruction manual to Keopsys' customers and potential customers only.

The contents of this publication may not be reproduced in any part without prior written permission of Keopsys.

This documentation is provided "as is" without any express or implied warranty of any kind.

It includes general safety considerations, optical and electrical connections for installing the product.

Keopsys company is committed to conduct its business with the ISO 14000 environmental program.

For this, we design our product and service to minimize use of hazardous materials and to enable recycling and re-use.

This manual is constituted with matters which can be recycled.

1.1.2. Prerequisites

It is assumed that the user is familiar with fiber optic technology and laser safety issues.

1.2. General safety considerations

1.2.1. Terms and symbols in this manual

The following terms and symbols may appear throughout this manual:

WARNING	Warning statements identify conditions or practices that could certainly result in injury.
WARNING	Caution statements identify conditions or practices that could result in damage to this product or other property.

1.2.2. Terms on the product

The following terms may appear on the product:

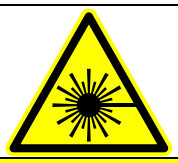
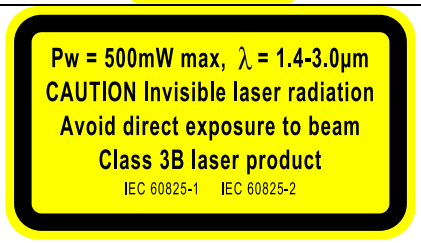
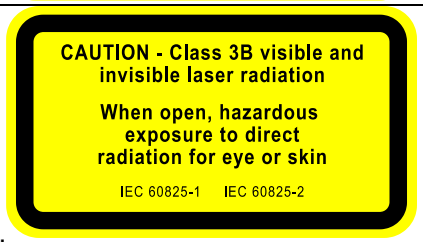
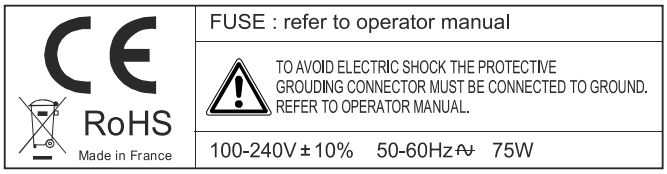
DANGER	The label indicates the presence of danger.
CAUTION	Indicates an injury hazard not immediately present when you read the label.
WARNING	Indicates a hazard to property, including the product itself.

1.2.3. Class III-B Laser product

The KEOPSYS products comply with the European and International normalization about laser safety and optical fibers telecommunication systems safety:

- IEC 60825-1
- IEC 60825-2

So following symbols appear on the product:

	LASER WARNING Label (located on the front panel or the lid)
	EXPLANATORY Label LASER RADIATION WARNING Label (located on the front panel or the lid)
	Label for panel (located on the cover or the lid)
	Electrical Warning and Compliance located on the right side of the rear panel

Class III-B Laser safety:

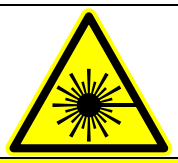
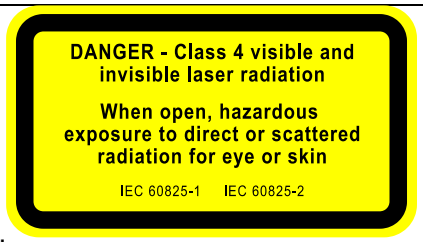
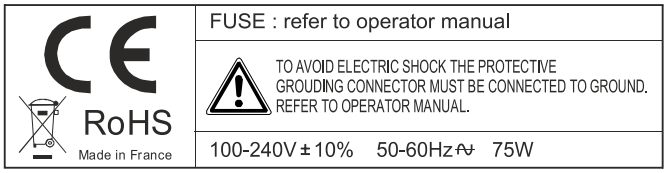
WARNING	**Class III-b laser product** may emit 500 mW max of light in the 1000 nm -1700 nm range.
WARNING	The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure
WARNING	Use appropriated and standardized laser glasses.
WARNING	**The use of optical instruments with this product will increase eye hazard**. Do not under any circumstances look directly into the fiber end of an optical cable attached to the optical output while the device is in use.This may cause permanent eye or skin damages and possible loss of eyesight.
WARNING	**Disable the laser output before connecting or disconnecting an optical fiber cable on the instrument.**
WARNING	**Do not open the device.** Invisible laser radiation could affect the operator if this condition is not respected.
WARNING	**Any check of the optical connectors** must be processed when the laser source is unplugged and by using filtering observation optical systems.
WARNING	The device must operate without any impact or vibration.

1.2.4. Class IV Laser product

The KEOPSYS products comply with the European and International normalization about laser safety and optical fibers telecommunication systems safety:

- IEC 60825-1
- IEC 60825-2

So following symbols appear on the product:

	LASER WARNING Label (located on the front panel or the lid)
	EXPLANATORY Label LASER RADIATION WARNING Label (located on the front panel or the lid)
	Label for panel (located on the cover or the lid)
	Electrical Warning and Compliance located on the right side of the rear panel

Class IV Laser safety:

WARNING	**Class IV laser product** may emit more than 500 mW of light in the 1000 nm -1700 nm range.
WARNING	The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
WARNING	Use appropriated and standardized laser glasses.
WARNING	**The use of optical instruments with this product will increase eye hazard**. Do not under any circumstances look directly into the fiber end of an optical cable attached to the optical output while the device is in use for this may cause permanent eye or skin damages and possible loss of eyesight.
WARNING	**Disable the laser output before connecting or disconnecting an optic fiber cable on the instrument.**
WARNING	**Do not open the device.** Invisible laser radiation could affect the operator if this condition is not respected.
WARNING	**Any check of the optical connectors** must be processed when the laser source is not supplied and by filtering observation optical systems.
WARNING	The device must operate without any impact or vibration.

1.2.5. Electric Safety

The KEOPSYS products comply with the European and International normalization EN 61010 d03.

WARNING	Before connecting your device make sure that the socket outlet is properly grounded
WARNING	Before connecting your device make sure that your line voltage agrees with the voltage given on documentation and sticker on the unit and that the right fuse has been inserted

WARNING	Before applying power to your device make sure that the protective connector of the 3 conductor mains power cord is correctly connected to the protective earth contact of the socket outlet. Never use a mains power not supplied by KEOPSYS. IMPROPER GROUDING CAN CAUSE ELECTRIC SHOCK with damage to your health and even death.
WARNING	Never use a unit without its complete package including all covers ; ask if necessary for a replacement part.
WARNING	The disconnection of the equipment from the mains can be performed by the disconnection of the AC input power cord connected to the equipment..

1.2.6. Other safety considerations

The KEOPSYS products comply with the European and International normalization EMC IEC 61326.

WARNING	The device has been designed according the standard relative to "Safety requirements for electrical equipment for measurement, control and laboratory use" Do not use the device out of this type of application.
WARNING	The device is designed for an inside application.
WARNING	The device must be properly located on a flat horizontal surface.
WARNING	The device must be located in order to keep free the fan air outlets at the rear of the box.
WARNING	The environmental conditions during the use of the device must comply with those described in the technical specification.

1.2.7. Environmental conditions

- Equipment dedicated to measurement, control and laboratory use only.
- Voltage range: 100-240V +/-10%.
- Maximum input current is limited to 3.15A.
- The presumed short-circuit current of the mains power connection interface shall be limited to 1500A.
- The Overvoltage Category : Cat II
- Temperature rating : (5°C to 40°C)
- Maximum altitude: 2000m.
- Relative Humidity range: 0% to 80% until 31°C with linear decrease down to 50% until 40°C.
- Pollution degree : 2
- Maximum input current is limited to 3.15A, the presumed short-circuit current of the mains power connection interface shall be limited to 35A.

2. Installation and Service

2.1. Unpacking

The package should be opened in an electrostatic discharge (ESD) free environment. The operator should be properly grounded at the same level as the working surface. The device should be unpacked on an ESD free surface. The laser source electronics and pump diodes can be seriously damaged by electro-static discharge. Even if damage is not immediately apparent, it may shorten the lifetime of the unit, in particular the pump laser.

Handle the device with care when unpacking. Hold the box in one hand and the fiber in the other hand when pulling out the unit from its packaging. Lay down the device and the fiber on a horizontal surface.

Before any operation, make sure the device is free from mechanical damage, which may have occurred during transportation.

The device is supplied by Keopsys completely assembled and tested.

Keep the original shipping container for use in case the instrument needs to be returned to Keopsys for repair or servicing.

2.2. Standard accessories

The product comes with the following standard accessories:

- User's manual (this manual)
- Test report
- 2 fuses
- 2 "On/Off" keys
- Main wall-plug power cord

WARNING	Plug the device to a properly certified and grounded power supply using the power cord provided by KEOPSYS

2.2.1. Fuse List

Location	Fuse type	Example
Main Socket	3.15A Time delay fuse 250V breaking	Cooper Bussmann S500-3.15-R

2.2.2. Exchange of main fuse

WARNING	This operation has been made sure by appropriate design of the power cord and the device mains plug so never change the cord delivered by KEOPSYS to another type

This operation is normally due to an external solicitation of the device for instance an over-load on the power line.

Remove the power cord: the power connector on the device has been designed in a way it is impossible to change mains fuses when power cord is plugged in.

Lift up the plastic cap using the end of a flat screwdriver.

Remove the fuses and change to exact types as described in fuse chart (please note that there are 2 fuses on the mains).

If the amplifier does not work properly after this operation, ensure the line and the fuses are correct. If it is the case, enquire about this problem to KEOPSYS.

2.3. Installation

WARNING	A professional familiar with optical fiber technology and laser equipment must perform the installation.
WARNING	Before any installation, make sure that you have completely read the general safety considerations.
WARNING	Use appropriate and standardized laser glasses.

2.3.1. Connecting fibers

WARNING	Invisible laser radiation. Avoid direct exposure to the beam. Direct viewing of the beam may cause serious eye and skin damages and possible vision loss; never operate system with fiber disconnected or a broken fiber. Do not view fiber end directly when optical instrument is powered.

Follow the steps to connect optical fiber:

1. Ensure that the device is not powered up.
2. Remove protection caps from optical connectors.
3. The device is delivered with fiber connectors (defined in the technical specification). To connect this device to others equipment, please ensure that the type of connectors is compatible with your device ones.
4. Clean both optical connectors (see §2.3.3).
5. Connect cleaned optical connectors to the device.

2.3.2. Connect a collimator (optional)

WARNING	Invisible laser radiation. Avoid direct exposure to the beam. Direct viewing of the beam may cause serious eye and skin damages and possible vision loss; never operate system with fiber disconnected or a broken fiber. Do not view fiber end directly when optical instrument is powered.

Follow the steps to connect optical fiber:

1. Ensure that the device is not powered up.
2. Remove protection caps from optical connectors.
3. Clean the optical connector (see §2.3.3).
4. Connect cleaned optical connector to the collimator.

2.3.3. Cleaning optical connector

WARNING	Make sure the device is switched OFF.

With lint-free paper:

- Use lint-free paper
- Fold it into a corner
- Drop the paper into ethanol
- Clean delicately the polished surface of the connector in a circular motion
- Blow dry air in order to remove any remaining dust

With optical Fiber Connector Cleaner (CLETOP) *:

- See user instruction enclosed with Cletop cleaner

Make sure that the connector does not touch any surface when connecting it.

Check with a fiber connector microscope

Available at Keopsys:

* Connector Cleaner CLETOP.

Order with reference CS-OUT-028-00 to your sales contact.

For spares patch cords, contact our sales team.

2.4. Maintenance operation

If the replacement of the input fuse is required, use a fuse which comply with the characteristics given on the table §2.2.1. In order to avoid injury, this operation shall follow the following steps:

1. Turn Off the device.
2. Disconnect the device from power supply by the disconnection of its input power cord.
3. Remove the fuse holder from the input power socket.
4. Replace the fuse.
5. Plug back the fuse holder on the input power socket.
6. And use the "First time power up" procedure listed below to power up the device.

2.5. Power Up

2.5.1. First time power-up

To power up the device, you should follow those steps (see §3.1 for device elements location, and §7 for IHM description):

1. Check the device is powered off and your seed laser too.
2. Plug the device to a properly certified and grounded power supply using the power cord provided by Keopsys.
3. The amplifier is equipped with a safety interlock. When the interlock circuit is opened (interlock connector removed), the On/Off key on the front panel is disabled. Use the interlock according to your local regulations.
4. Check and clean your seed laser output pigtail and the amplifier input pigtail. Make sure that the connector surface is carefully cleaned. Do not operate the laser or amplifier with a damaged connector.
5. Connect both pigtails.
6. Connect the output pigtail to a power meter or bolometer device which can support laser nominal power (see device test report). **Beware of the cleaning of the optical connector** (see §3.1). Make sure that the connector surface is carefully cleaned. Do not operate the laser with a damaged connector.
7. Switch on Line button. Before switching ON the Line button, Key must be on the OFF position. The display shows a welcome message with the laser model and its serial number. The CPU initializes. This will take a few seconds.
8. Turn on your seed laser and set its output power to the nominal amplifier input power (see test report). **Attention you may have some power on amplifier output.**
9. It's recommended to first check the output power at nominal current. Select ACC mode (see §3.1) and set the pump current readings at nominal values (see device test report).
10. Use the Display / Enter / Exit / Knob interface to set the laser current to 0A.
11. Turn the Key On.
12. Press the pump button. A blue LED lit when pump laser diodes are ON. **Attention the amplifier now emits power.**
13. Increase slowly the diode current. The laser output power will increase slowly. Output power measured in these conditions at the end of the starting sequence should correspond to the output saturated power of the device indicated in device test report.
14. Let the device running the warm up duration before use (see test report for exact value).
15. The amplifier emission can be switched OFF with pump button. Remember that the CPU will keep in memory the last setting.

2.5.2. Shut down

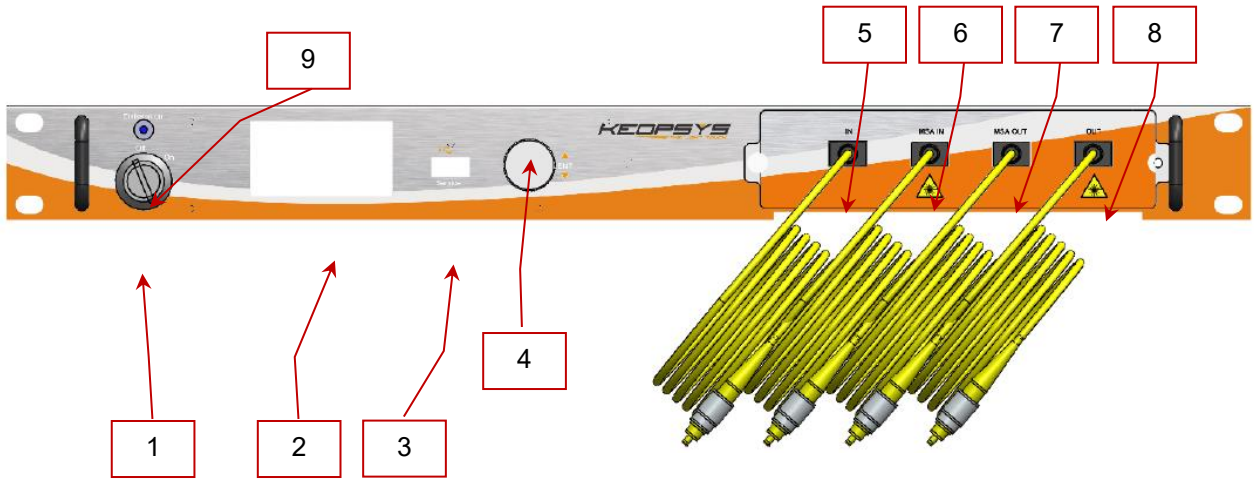
To shut down the device, you should follow those steps:

1. Stop amplification using pump button.
2. Turn Off the key.
3. Turn Off the seed laser
4. Turn Off the device.
5. Unplug de device from power supply.
6. Protect optical connectors.

3. Design of the Device

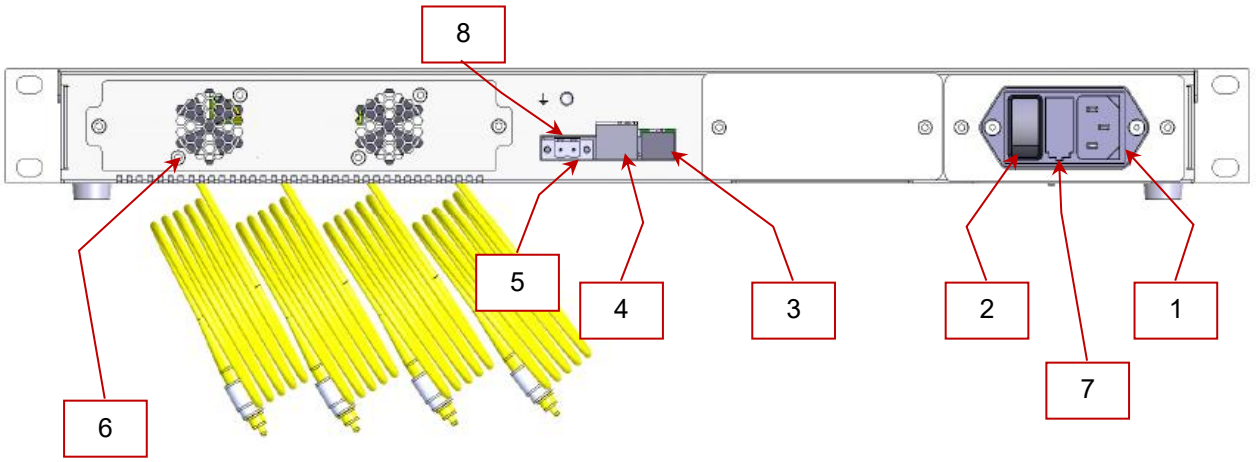
3.1. Device overview

3.1.1. Front Panel



N#	Designation	Description
1	On/Off Key	Enable laser emission. Use this key to disable laser emission in case of emergency
2	Display	Displays status and control information to the user
3	USB	Reserved
4	Knob	Setting dial
5	Input	Input pigtail (amplifier only)
6	MSA Input	Middle Stage Access Input Pigtail (optionnal)
7	MSA Output	Middle Stage Access Output Pigtail (optionnal)
8	Output	Output pigtail
9	Led	Laser Emission

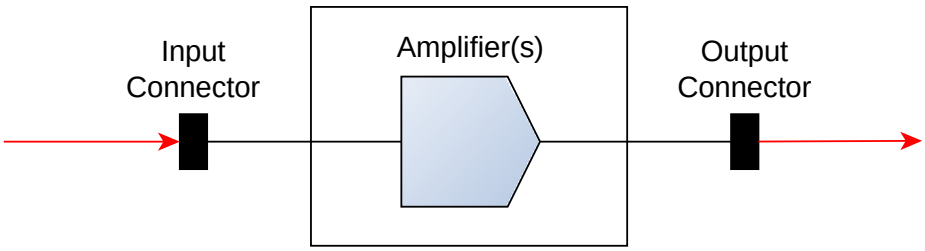
3.1.2. Rear panel



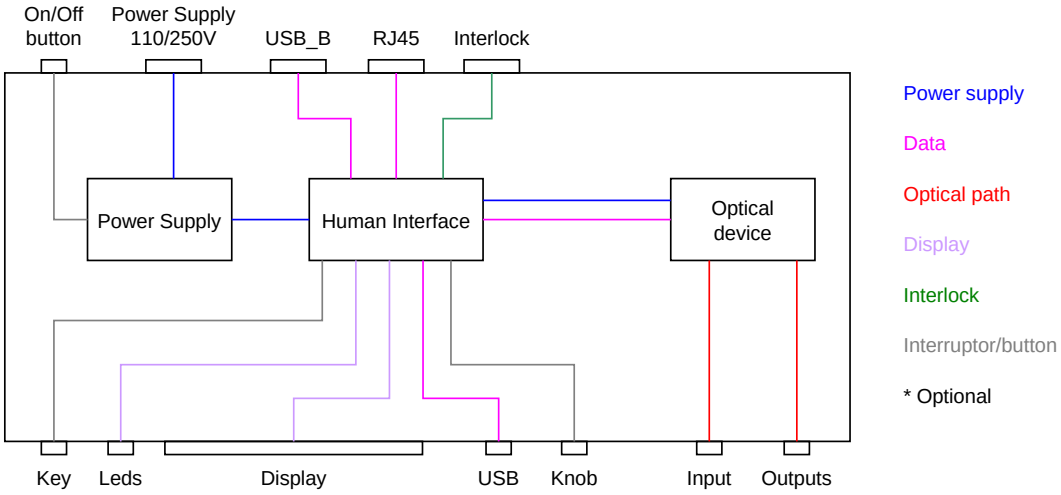
N#	Designation	Description
1	Line	AC power supply
2	On/Off Power	Turn On and Off the main power supply
3	RS232 USB	Device remote control using serial protocole. See §5
4	Ethernet	Device remote control using Web Server Interface See §6.2.
5	Interlock	Safety. See §7.4
6	Fans	Air cooling
7	Input fuse	AC input fuse : S500-3.15 Current : 3.15A Current breaking 35A
8	Ground	To connect case to the ground.

3.2. Design of the Device

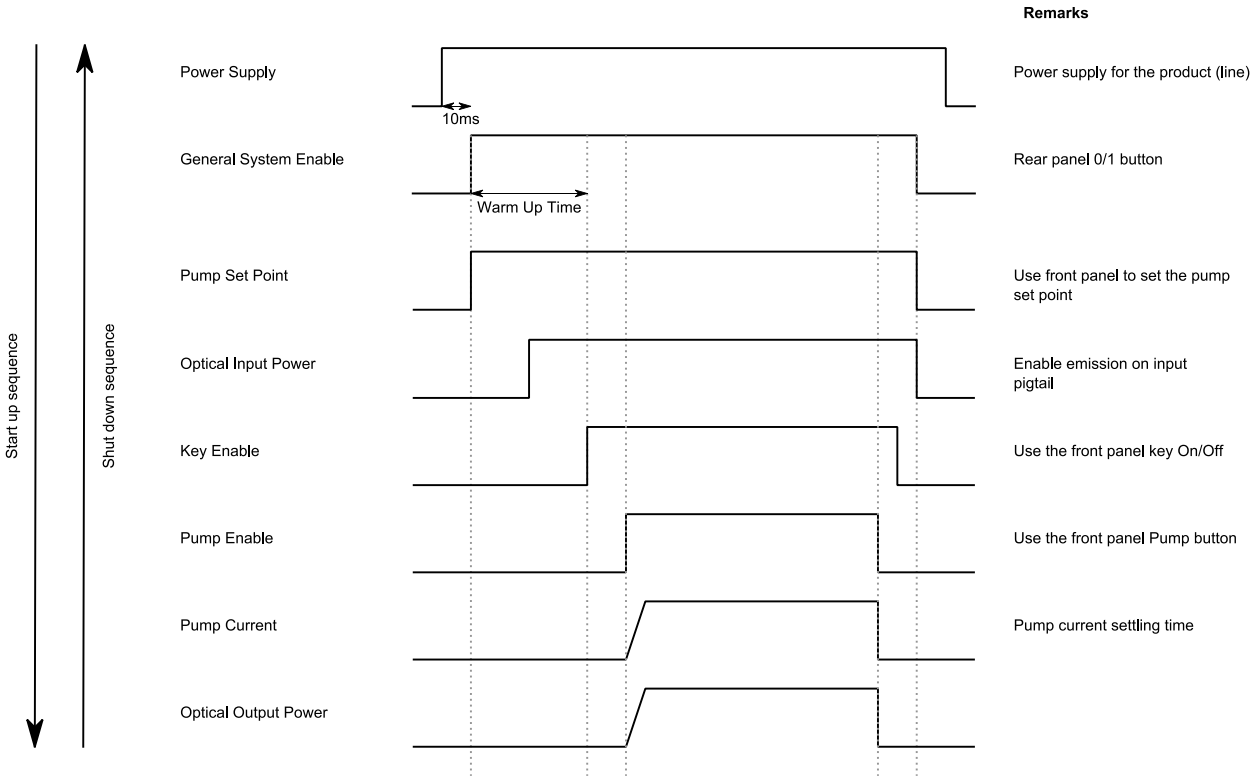
3.2.1. Optical Design



3.2.2. Electrical Design



3.2.3. Timing Diagram



Warm up time corresponds to the benchtop start up. Can reach several seconds.

3.2.4. Automatic Shutdown

To prevent any damage on the device we have implement some automatic shutdown. When one of these conditions is activated, the device immediately shutdown and cannot be start up while the problem is not solved.

Description	*Activation condition*	*Availability*
	Power	
Internel Power supply out of range		All devices
Optical Input power too low	If optical input power is lower than specified values (see test report)	Only if input monitoring is available and automatic shutdown activated
Optical Output power too low	If optical output power is lower than specified values (see test report)	Only if output monitoring is available
	Temperature	
Diode temperature is out of range	If diode temperature is 5°C away from set point.	All devices

3.3. Principle of regulation

The device offers several modes of operation:

- Automatic Current Control (ACC)
- Automatic Power Control (APC) – Optional

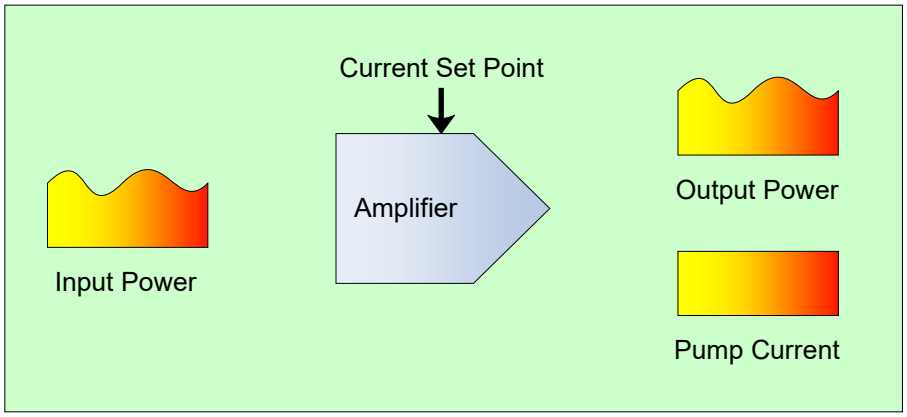
The ACC mode is available on all devices. The availability of other modes depends on the device, see device's test report or specifications for more information.

Following paragraphs describe these modes and the way that the electrical board drives the pump diodes.

3.3.1. Automatic Current Control (ACC)

In **Automatic Current Control** mode, the amplifier is controlled from the diodes current set point. The device is running in order to maintain a constant current through the pump laser diodes. A variation of internal optical parameter (due to temperature for example) will induce a variation of output power.

The maximum current of pump diodes is indicated on product test report.

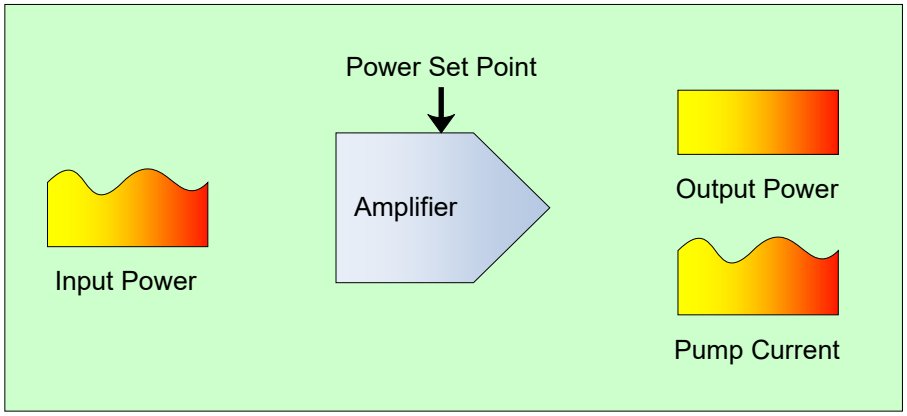


3.3.2. Automatic Power Control (APC) – Optional

In **Automatic Power Control** mode, the amplifier is regulated at a fixed output power set point.

The device is running in order to maintain a constant optical output power monitored with a photodiode. The current of the pump laser diode is adjusted to drive a constant output power. Depending of the number of pump laser diodes, electronic regulation is quite different for one pump diode and two pump diodes configuration.

The maximum output power set point is indicated on product test report.



4. Device specification

4.1. Electrical specification

4.1.1. Power Supply

DESIGNATION	Comment	MIN	TYP	MAX	UNITS
Power Supply Voltage	Positive power supply	88		264	V
Power Supply Comsumption	Internal supply maximum power		72		W
Power Supply Frequency	Line Frequency	47	-	63	Hz

4.1.2. Input

No electrical input is available on this device.

4.1.3. Output

No electrical output is available on this device.

4.2. Mechanical Specifications

Fig. 1: Device Overview

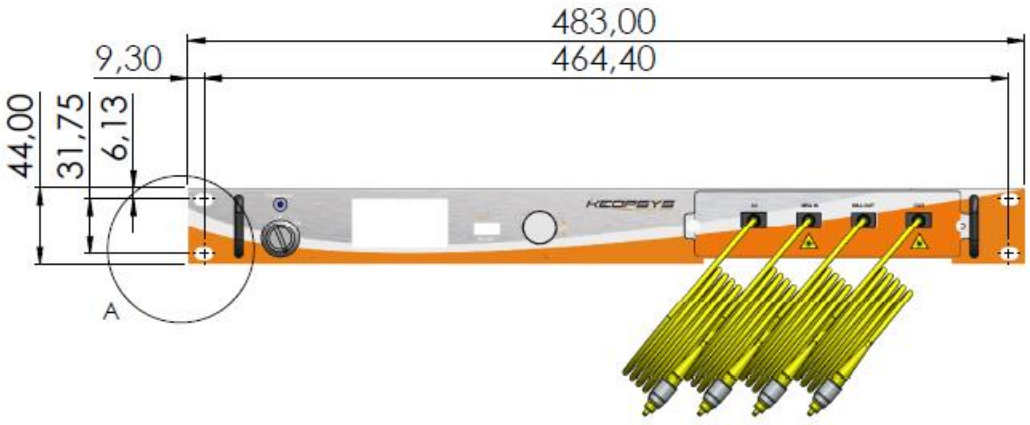


Fig. 2: Front view

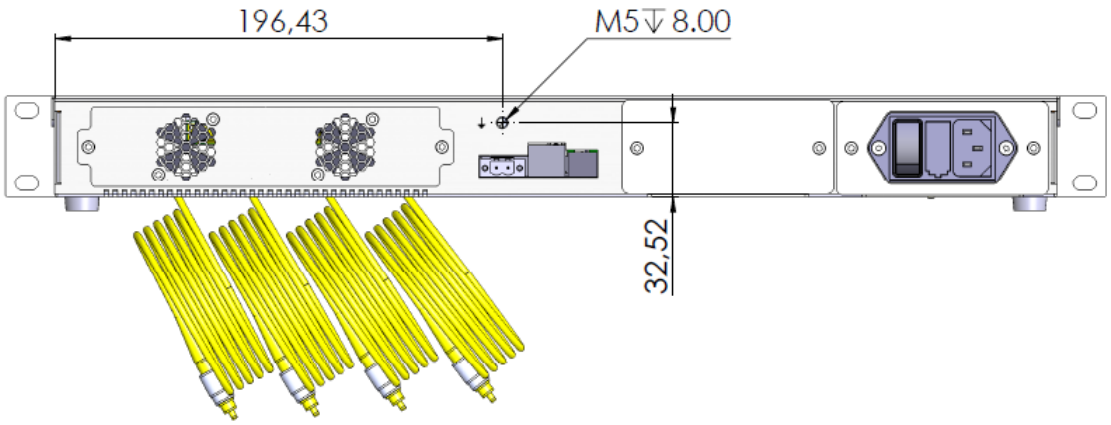


Fig. 3: Rear view

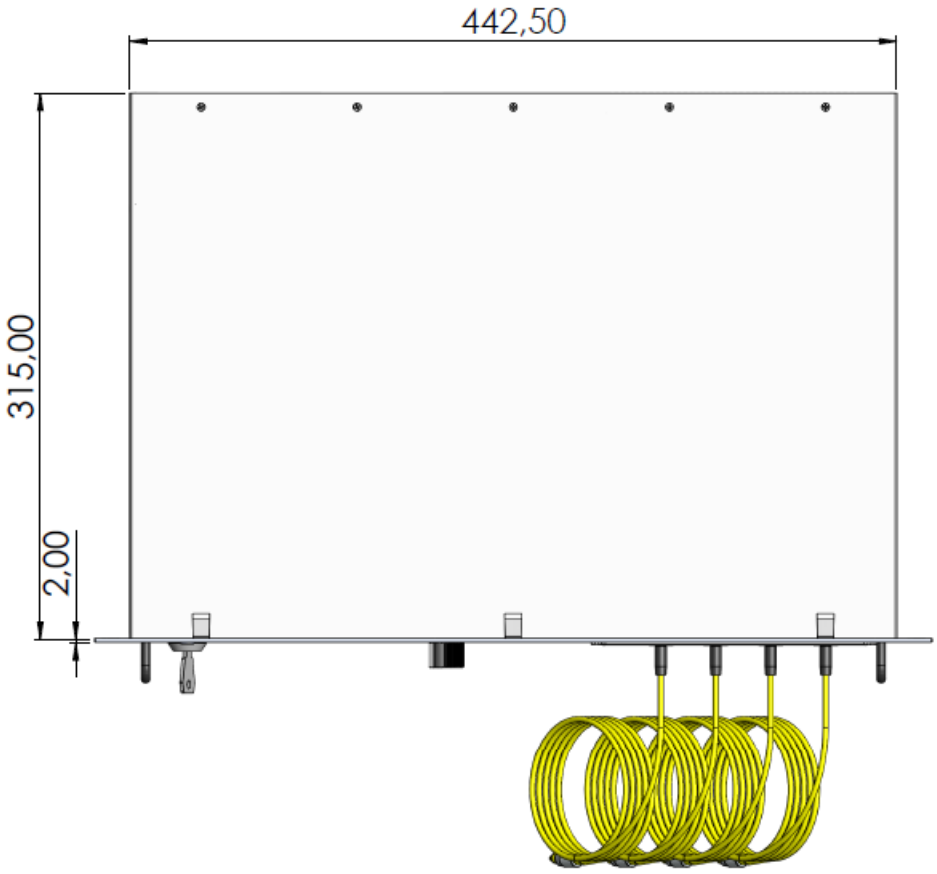


Fig. 4:Top view

5. Remote control RS232

This section describes the serial communication with the device. All information refers to the firmware version 4.12, if your device has a different firmware version, some differences may happen.

5.1. RS232 Protocol

To be able to communicate with the device you have to configure the RS232 connection like:

Parameter	Value
Baud rate	19200bps
Number of bits	8bits
Stop bit	1
Parity	None
Handshaking	None
Delimiter	\r (Carriage Return)
Prefix *	SLx_, where *x* is the module number (1, 2 or 3)

*If there is more than one optical module mounted in the benchtop you need to prefix all described commands by the prefix corresponding to the module: SL1_, SL2_ or SL3_.

5.2. Commands

The following commands are available for the device:

RS232 Commands

Cmd.	Description	Nb Char	Example	Ex. Answer	Unit	Information
			Global Commands			
SNU?	Read Serial Number	7	SNU?	SNU=1234567		
DES?	Read the description of the device	127	DES?	DES=CEFA-…		
SNC?	Read the customer serial number	15	SNC?	SNC=Text		
SNC=	Write the customer serial number	15	SNC=	SNC=Text		
VER?	Read Firmware Version	8	VER?	VER=K2SE_1.0		
FWI?	Read Firmware Information		FWI?	FWI=Text		
STS?	Read State of pump	1	STS?	STS=1	0/1	
ASS?	Read the control mode	1	ASS?	ASS=1		See §5.3
ASS=	Write the control mode	1	ASS=1	ASS!		
CAT?	Read the case temperature	5	CAT?	CAT=2500	1/100°C	
RKP=1	Recover factory settings	1	RKP=1	RKP!		
			Diode Control & Monitoring			
IC1?	Read the preamp diode current set point	4	IC1?	IC1=350	mA	
IC1=	Write the preamp diode current set point	4	IC1=350	IC1!	mA	See test report for maximum value
ID1?	Read the actual preamplifier diode current	4	ID1?	ID1=350	mA	
TD1?	Read the actual preamplifier diode temperature	4	TD1?	TD1=2500	1/100°C	

IC2?	Read the booster diode current set point	4	IC2?	IC2=350	mA	
IC2=	Write the booster diode current set point	4	IC2=350	IC2!	mA	See test report for maximum value
ID2?	Read the actual booster diode current	4	ID2?	ID2=350	mA	
Monitoring seed laser						
X_STS?	Read state of seed laser	1	X_STS?	X_STS=1	0/1	0 means OFF, 1 means ON
X_IC1?	Read the seed laser diode current set point	4	X_IC1?	X_IC1=150	mA	
X_ID1?	Read the seed laser diode current	4	X_ID1?	X_ID1=143	mA	
X_TC1?	Read the seed laser diode temperature set point	4	X_ID1?	X_ID1=143	1/100°C	Optional
X_TD1?	Read the seed laser diode temperature	4	X_ID1?	X_ID1=143	1/100°C	Optional
X_TD1=	Read the seed laser diode temperature	4	X_ID1=2500	X_ID1=2500	1/100°C	Optional
Power Control & Monitoring (Optional)						
PON?	Read the nominal output power	3	PON?	PON=300	1/10dBm	
SOP?	Read the output power set point in APC mode	4	SOP?	SOP=3000	1/10dBm	
SOP=	Write the output power set point in APC mode	4	SOP=300	SOP!	1/100dBm	See PON command for maximum value.
IPW?	Read the actual input power	6	IPW?	IPW =20	1/10dBm	
OPW?	Read the actual output power	6	OPW?	OPW=300	1/10dBm	
Alarms & Security						
ALA?	Read Alarms	8	ALA?	ALA=0xAAAAAAAA	Hexa	See §5.4
ALA=	Reset Alarms	1	ALA=0	ALA!		
WAR?	Read Warnings	8	WAR?	WAR=0xAAAAAAAA	Hexa	
IPT1?	Read the automatic shutdown threshold for low input power	5	IPT1?	IPT1=-100	1/10dBm	
OPT1?	Read the automatic shutdown threshold for low output power	5	OPT1?	OPT1=-100	1/10dBm	
LCM2?	Read the threshold for the automatic shutdown in case of high laser diode current	5	LCM2?	LCM2=800	mA	
PWL?	Read the max power available if the power limitation is activated	4	PWL?	PWL =50	1/10dBm	
PWM?	Read the max power when power mute is activated	5	PWM?	PWM =50	1/10dBm	
TCL?	Read the automatic shutdown threshold for low case temperature	5	TCL?	TCL=-420	1/100°C	
TCH?	Read the automatic shutdown threshold for high case temperature	5	TCH?	TCH=7200	1/100°C	
External modulation optional						
SFMOD?	Read the threshold for low external modulation frequency					
MOD?	Read external modulation activated	1	MOD?	MOD=1	0/1	
MOD=	Write external modulation activation	1	MOD=1	MOD!	0/1	
RCMOD?	Read the duty frequency of the external modulation	5	RCMOD?	RCMOD=800	%	
FMOD?	Read the frequency of the external modulation	5	FMOD?	FMOD=800	Hz	

The electrical board answer is ended by:	
!	OK
*	Command unknown
#	Not authorized
$	Command not valid

5.3. Mode of operation

Mode of operation meaning		
Value	***Name***	***Description***
0	OFF	Pumps diodes are off. Attention: it doesn't mean that laser emission is disabled.
1	ACC	Automatic Current Control. See §3.3.1 for more information.
2	APC	Automatic Power Control. See §3.3.2 for more information. *Optional*

5.4. Alarms and Warning description

The answer returned by ALA command is an hexadecimal value of 8 characters. You have to convert it in binary and read the activated alarms using following table:

Alarms meaning			
Bit N#	***Type***	***Description***	***"ON" conditions***
31		Not used	
30		Not used	
29		Not used	
28			
27			
26			
25			
24			
23			
22			
21		Board temperature error	CAT < TCL or CAT > TCH
20		Power supply error	power supply too low or too high
19		GPIO Key OFF activated	Key pin on the interface is low
18			
17			
16			
15		Low input power	IPW < IPT1 for ID1 > I1T
14		Low output power	OPW<OPT1 for ID2 > I2T
13			
12			
11		Preamp current error	ID1>LCM1
10		Booster current error	ID2>LCM2
9			
8			
7			
6			
5			
4			
3		Preamp temperature error	TD1 < 15°C or TD1 > 45°C
2			
1			
0			

Alarm = pump diodes are shutdown

Warnings meaning			
Bit N#	***Type***	***Description***	***"ON" conditions***
31		Not used	
30		Not used	
29		Not used	
28		Not used	
27		Not used	
26		Error with the external modulation	FMOD < SFMOD
25		Autostart is activated	Depend of the factory board configuration
24		Not used	
23		Power limitation is activated	Outpout power is limited to PWL? Value
22		Power mute is activated	Low signal on power mute interface. Output power is limited to 5dBm
20		Not used	
19		Not used	
18		Not used	
17		Not used	
16		Not used	
15		Not used	
14		Not used	
13		Not used	
12		Not used	
11		Not used	
10		Not used	
9		Not used	
8		Not used	
7		Not used	
6		Not used	
5		Not used	
4		Not used	
3		Not used	
2		Not used	
3		Not used	
0		Not used	

Warning = Information only

Remark : bit #31 is the Most Significant Bit (MSB) and bit #0 is the Least Significant Bit (LSB).

6. Network communication

6.1. Network configuration

By default, the DHCP protocol on the device is enable. his mode the device requests to your network for an appropriate IP address, so the benchtop should find automatically a working IP on your network.

To get the device IP, go to *Options* > *IP Settings* menu on the man-machine interface (see §7).

If the DHCP protocol is not enable or if your network doesn't provide DHCP protocol, go to *Options* > *IP Settings* menu on the man-machine interface (see §7) and select *Configuration* to setup IP settings.

6.2. The Web Server Interface (WSI)

The Web Server Interface is not available on all device, please check device specifications.

6.2.1. Access to the WSI

To access to the WSI, you need a computer:

- With any operating systems
- Connected to the network
- Internet Navigator (like IE 8, Edge, Firefox, Chrome) with the support of JavaScript.

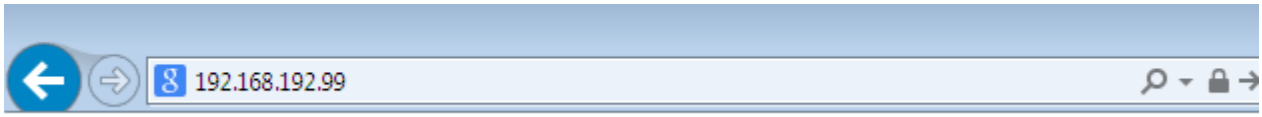
If your computer is connected to the same local network of the device: you just have to type the IP address of the device in your navigator (get the IP address of your device from the menu *Options* > *IP Settings*).

If your computer is connected on another network, you may ask to your IT manager the public IP address of the device network and to redirect http request to the device. Type in your navigator the public IP address.

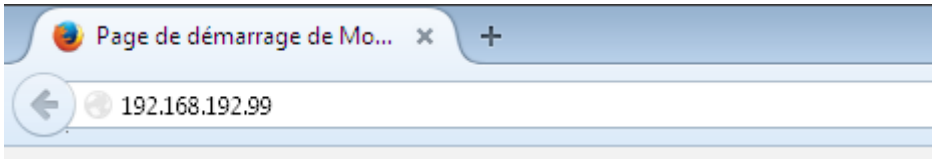
If the device is already configured with a public IP address, from any computer connected to internet, you can access to the WSI by typing the public IP address in your navigator.

Here are some examples of several navigators with the IP address typed in the navigation bar:

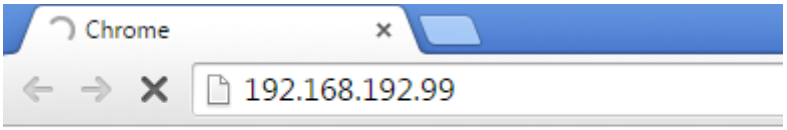
With Internet Explorer:



With Firefox:



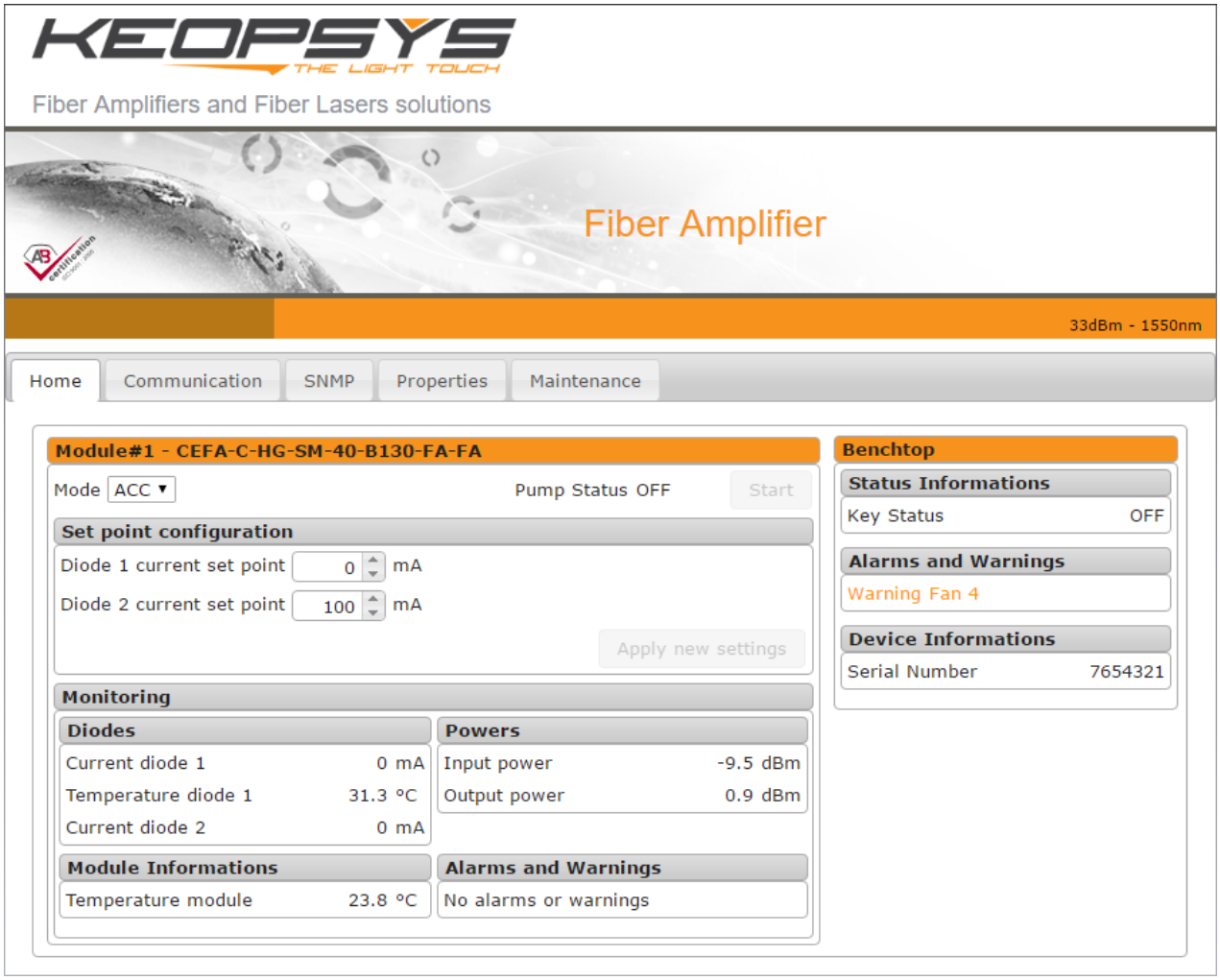
With Chrome:



6.2.2. Home Page

When you access to the WSI by typing the IP address, the first page of the WSI displayed is the "Home" page:

This page displays all current alarms and all important information from the device (called Monitoring).



The Home page is divided in several parts: Modules section (one or more) and Benchtop section. A Module correspond to an optical device mounted into the benchtop, the most of time there is one module, but some reference may more than one. In each Module section, you will find all information and configuration on the corresponding optical device.

The Benchtop section provides information about the benchtop itself: key status, serial number, specific alarms and warnings.

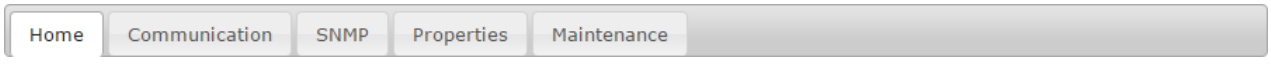
In a Module section, you can select the operating mode (ACC, APC, …) and start/stop the module. Start button is available only when the front panel key is ON and there is no alarm. You can also change current or power set point, depending on the selected operating mode.

Lastly, you have access to several information: diodes current, temperatures, optical power, alarms and warnings. Information availability may vary with the device reference.

Remark: when the device is in remote mode (USB or RJ45, see section 7.1.2) values on this page cannot be changed.

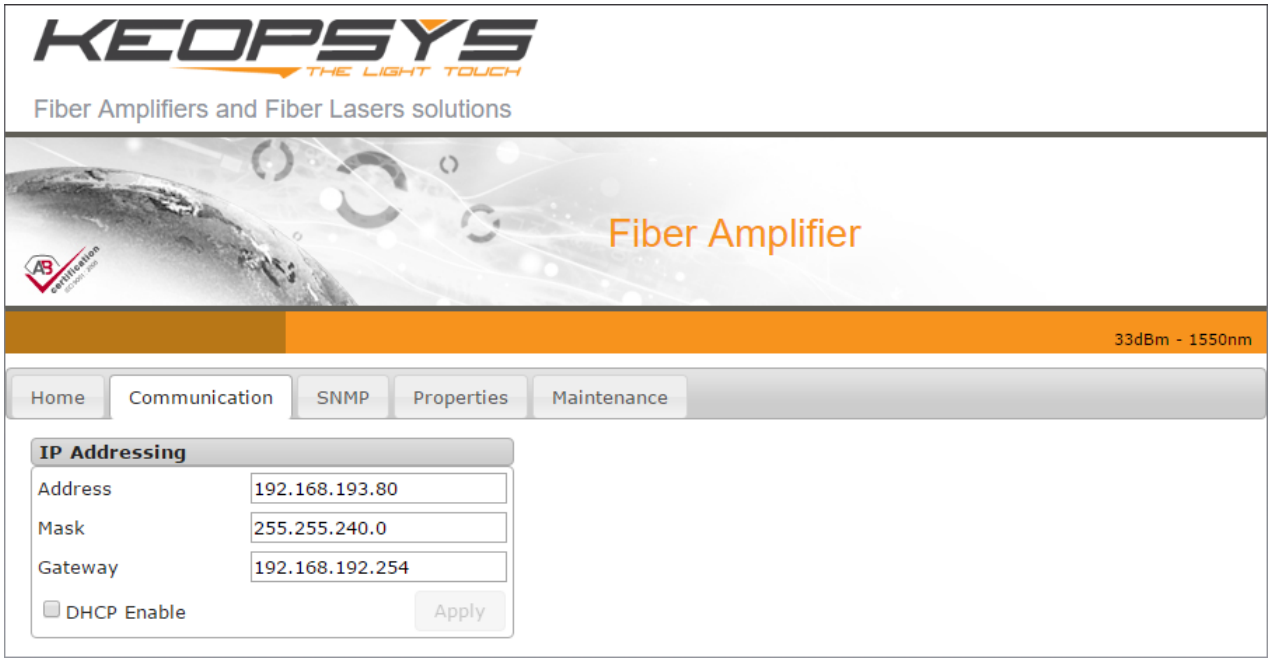
6.2.3. How to navigate in others pages

The WSI provides several web pages. To access to other page, use navigation tabs on the top of the page. These tabs are available in each web page.



Remark: The SNMP tab is available only if SNMP option is available.

6.2.4. Communication Page



The communication page is used to configure the network of the device. Static IP address can be set or DHCP option is also available by checking the DHCP checkbox.

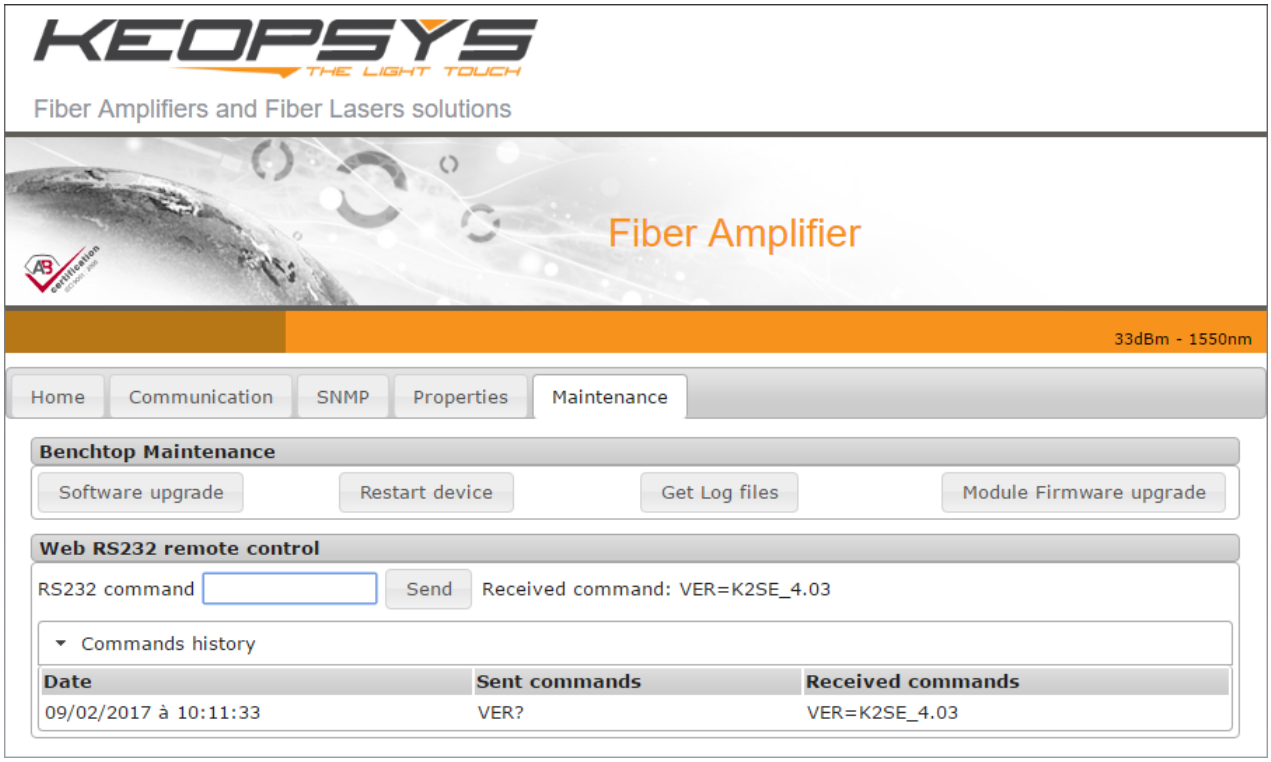
Validate your modification by clicking on the "Apply" button.

Remark: After changing the network configuration, the current page may become unavailable, you will have to type in the browser address bar the new defined IP.

6.2.5. Properties Page

This page reports the main specific properties of the benchtop. These data are not modifiable.

6.2.6. Maintenance Page



This page provides several tools for device maintenance:

- *Software upgrade*: to upgrade benchtop firmware. The button open a new window on which you have to select a file (provided by Keopsys) and click on "Upgrade" bouton to start the process. Please do not shutdown the device or do any other action during the upgrade process.
- *Restart device*: to simply restart the device remotely. The WSI will be unavailable for a while, just the time for the benchtop to finish its starting sequence.
- *Get Log files*: to download log files for each optical module.
- *Module Firmware upgrade*: to upgrade the firmware of an optical module. The button open a new window on which you have to select a file (provided by Keopsys), select the module you want to upgrade (from a list), and then click on "Start upgrade" button to start the process. Please do not shutdown the device or do any other action during the upgrade process.

You have also access to a RS232 emulator to communicate with any of the optical modules. Just type RS232 command (see §5.2) in the text box and press Enter or click on "Send" button to send the command to the module. The answer is printed on the right, and you have below an history of the current session.

When there is more than one device, don't forget SLx_ prefix on the command to address the right module (see §5).

Remark: when the device is in remote mode (USB or RJ45, see section 7.1.2) this page becomes read only.

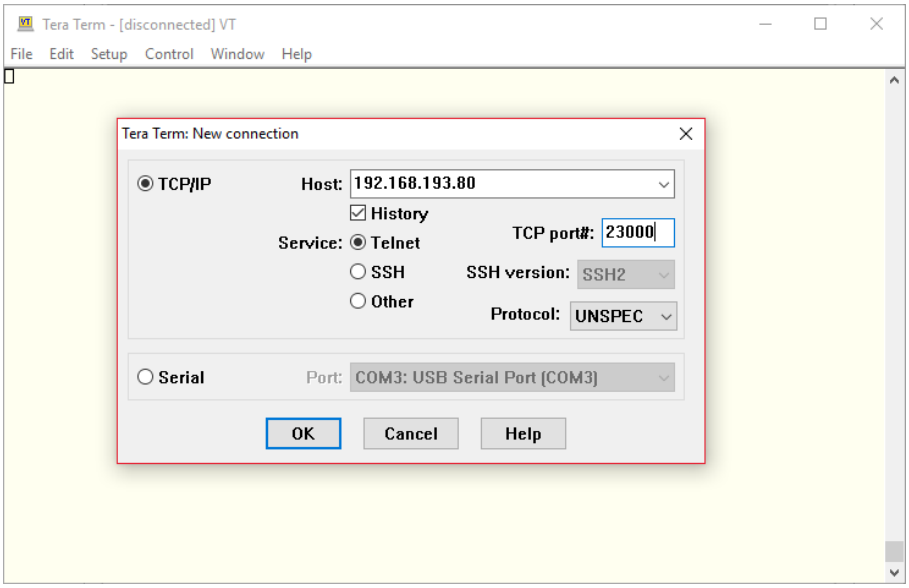
6.2.7. SNMP Page

Available only if SNMP option is available, see §6.5.2 for more details.

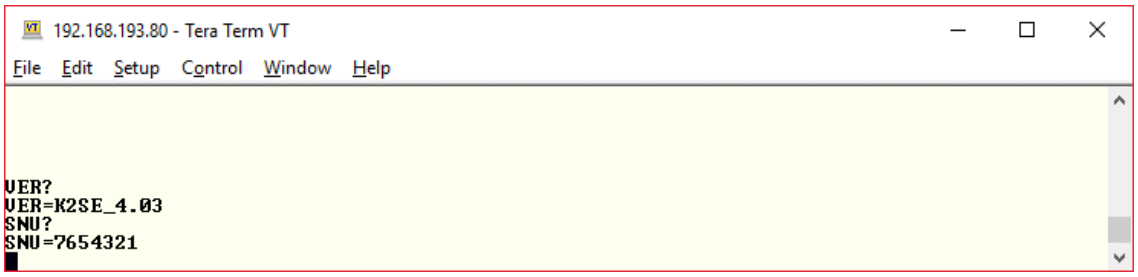
6.3. Telnet protocol

The Telnet protocol is not available on all device, please check device specifications.

You can communicate with the device using Telnet protocol throw RJ45 connector. The IP is same as for Web Server Interface, and the port is 23000. For the communication, you can use any software which support the Telnet protocol like Tera Term:



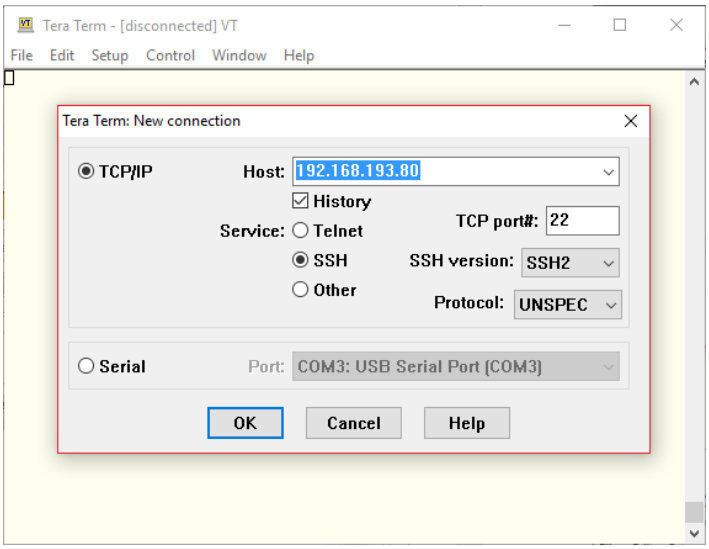
When you are connected, you can use same command as RS232 (see §5.2):



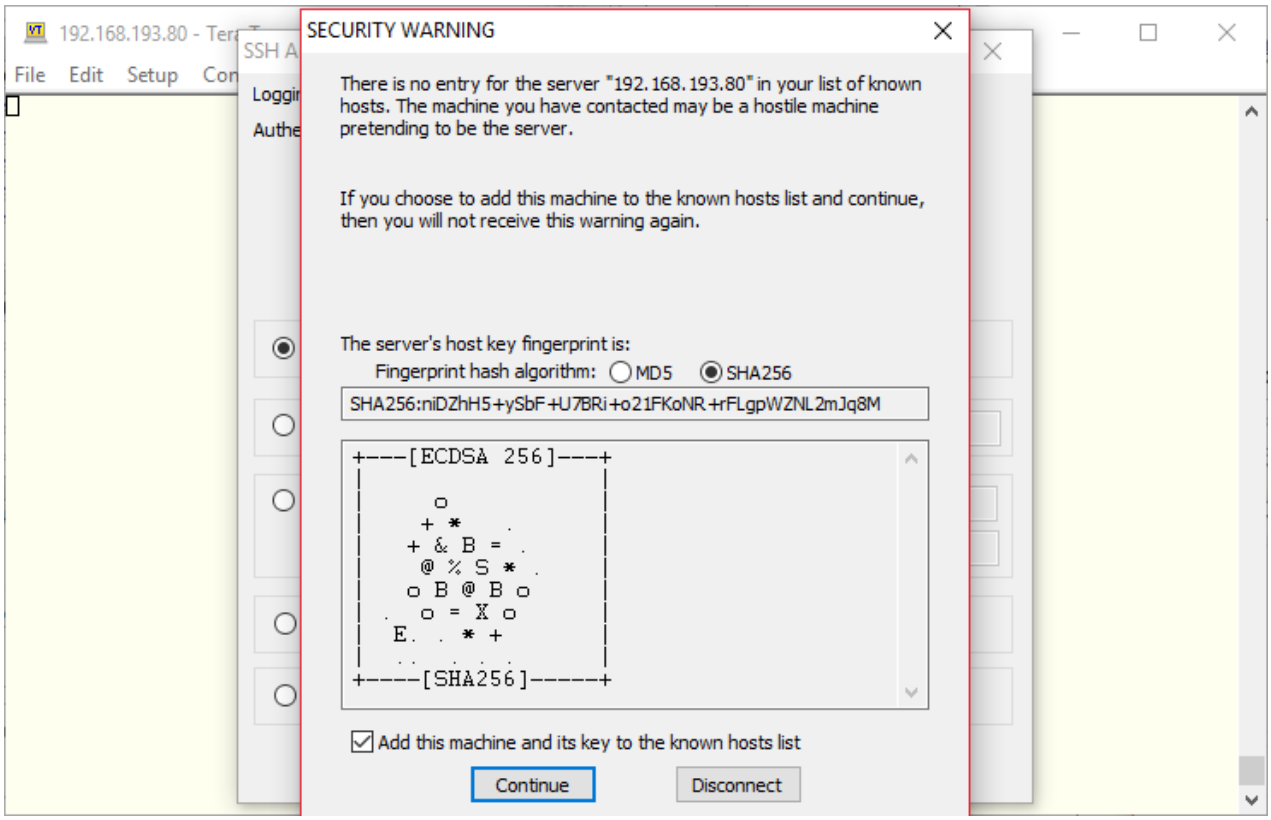
6.4. SSH protocol

6.4.1. Connection

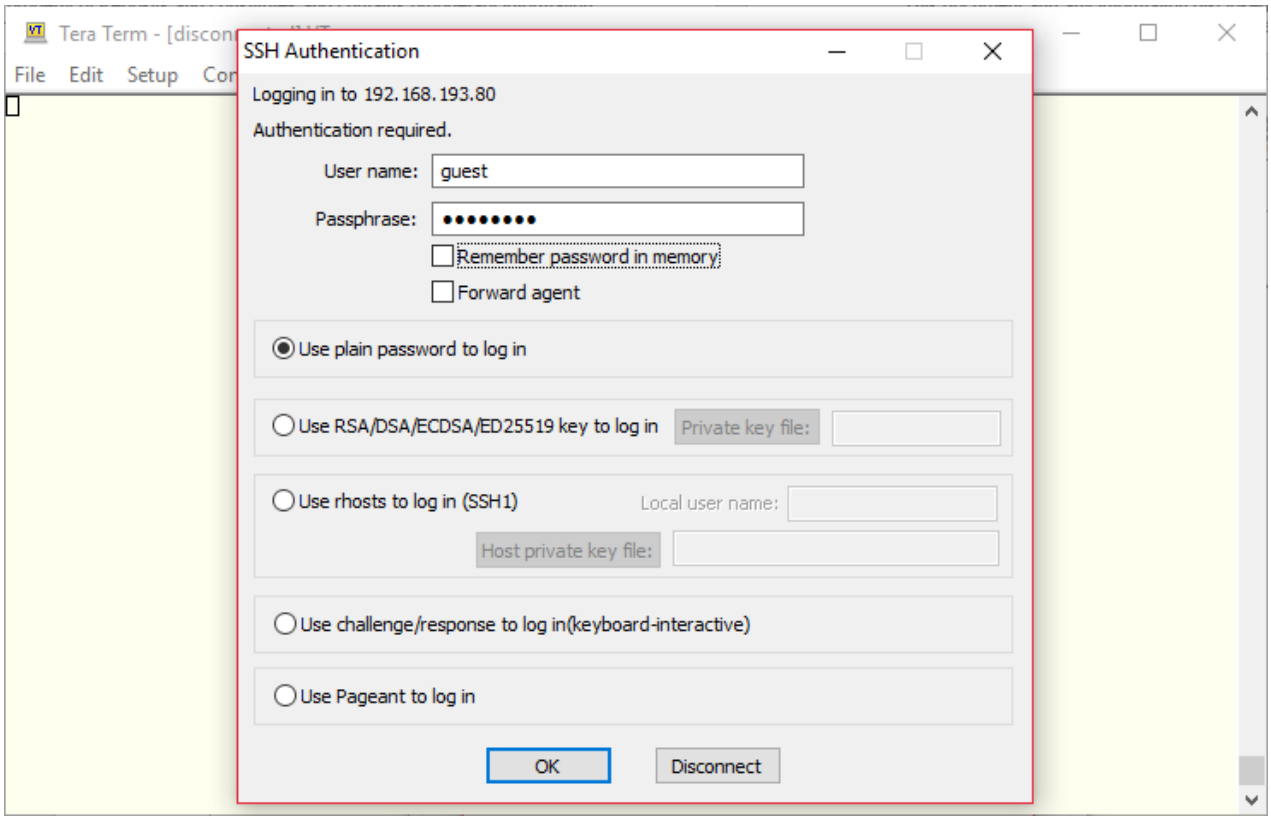
You can connect to the device using SSH protocol throw RJ45 connector. The IP is same as for Web Server Interface, and the port is the default SSH port: 22. For the communication, you can use any software which support the SSH protocol like Tera Term:



For your first connection, you may be asked to save the device public key:



Accept the connection and then you will be asked for an authentication:



By default:

- Login: guest
- Password: password

You should be now connected to the device.

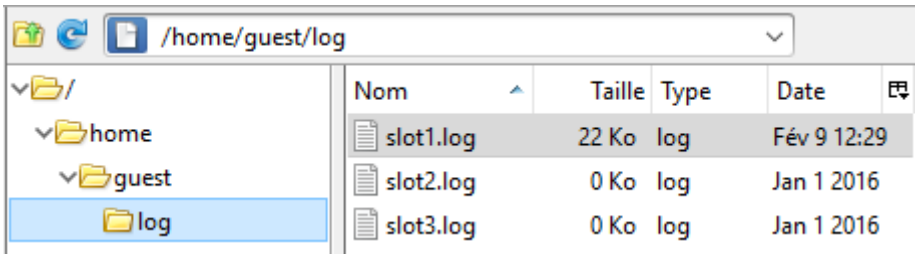
6.4.2. Change password

To keep SSH connection secured, we recommend to change the default guest password. As the benchtop is based on Unix system, you can use the command *passwd*. It will ask you the old password and the new one.

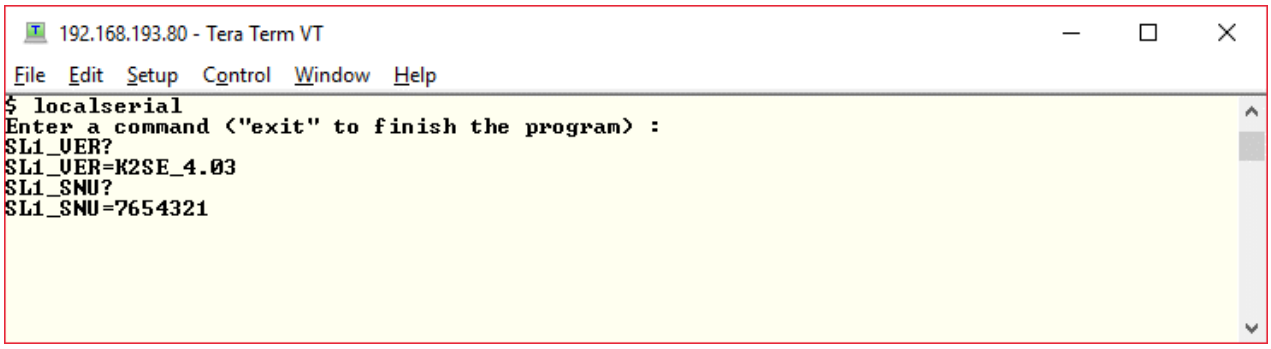
6.4.3. Tools

Using SSH connection you are logged on the Unix system, so you have access to some folder and application.

In your user's folder, there is a sub folder named "log". You can find inside the log files of each optical module. These files are exactly same as file gotten with man-machine interface or WSI:



You can also communicate with optical module using SSH using the *localserial* application. When you are logged, just type *localserial* and press Enter. Then you can use RS232 commands (see §5.2):



Remark: even if there is only one optical module you need to use the prefix SLx_ before the RS232 command.

6.5. The SNMP Server

6.5.1. Basics

The device provides a complete SNMP server. This is a standard network protocol used to manage remotely the device.

By using a SNMP manager, the user is able to get status and information about the device through the network.

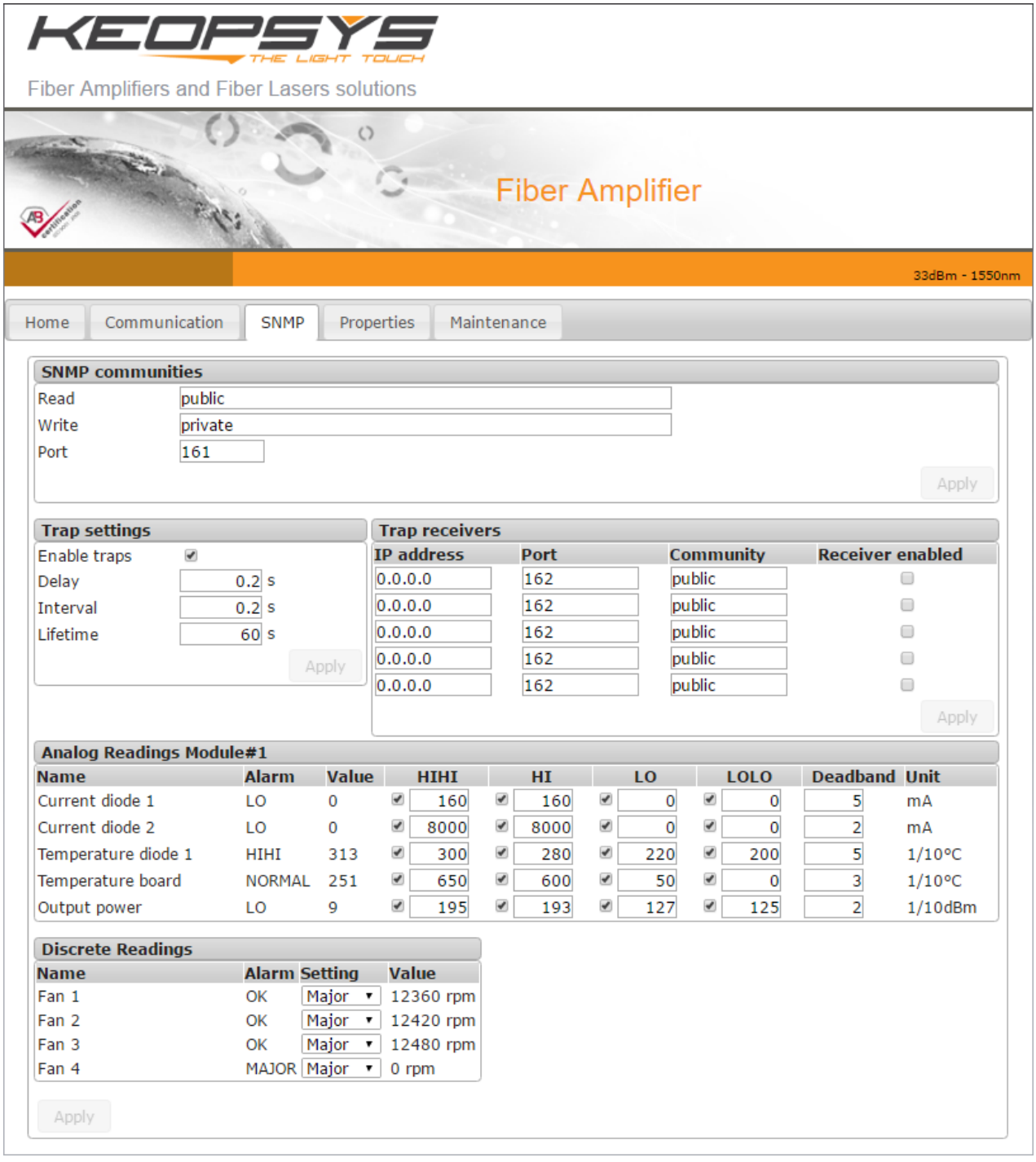
The main information available through SNMP server is:

- Lasers Temperatures.
- Lasers currents.
- Device temperature.

This server provides many other data. The complete list of parameters is available in MIB files (provided by Keopsys)

6.5.2. SNMP page on WSI

If the SNMP option is available on the device, a new page is available on the WSI:



You have access here to the SNMP configuration. It's a simple SNMP interface, and you can use an SNMP browser (like MIB Browser) to manage the SNMP configuration.

The first section allows you to configure the device communities and the port.

Trap sections, is used to enable/disable traps, and set servers on which traps are sent.

Readings sections list all data monitored and their current status. You can also set alarms levels (HIHI, HI, LO, LOLO).

6.5.3. SNMP manager utilization

A SNMP manager software can communicate with the device by using the SNMP protocol. The user may have some knowledge about SNMP to use it.

Free SNMP manager software

Some free SNMP managers are available over internet.

A free one is: "iReasoning MIB Browser". Have a look on the website: "http://www.ireasoning.com/". You can download the free one.

Configure the SNMP manager

To configure your SNMP manager to communicate with the device, you need to get the IP address of the device and set following parameters:

- The read community: "public"
- The write community: "private"
- The SNMP port: "161"
- SNMP version: "v2"

Now your manager should be able to communicate with the device.

7. Human Interface

7.1. Operating through the front panel

The laser shall be configured and set with **Key OFF**. In this state, the following menus are available:

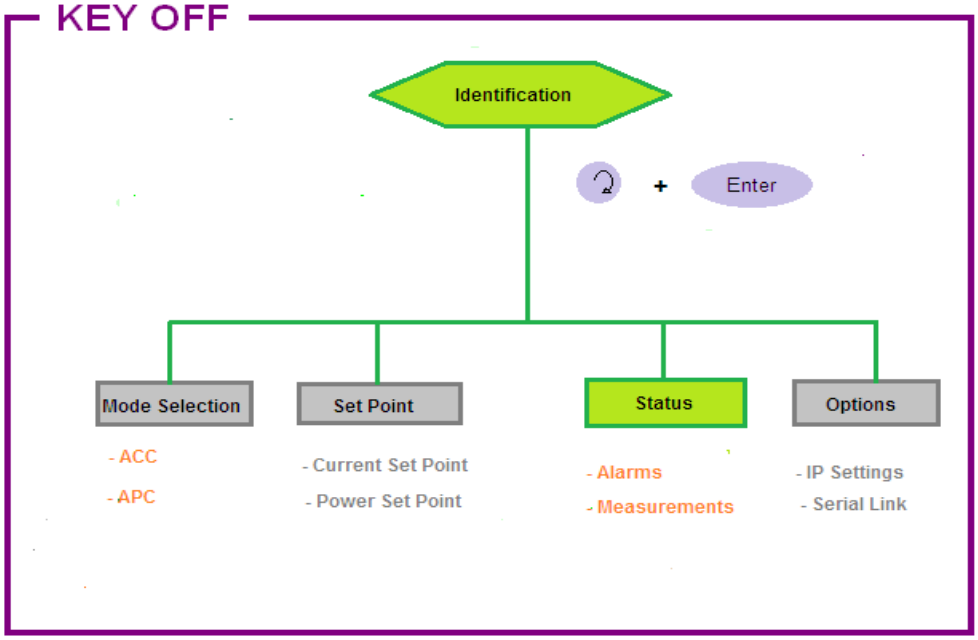
- Control mode (ACC or APC)
- Set point
- Alarm status (such as power measurements and temperatures)
- Options (RS232, IP Settings)

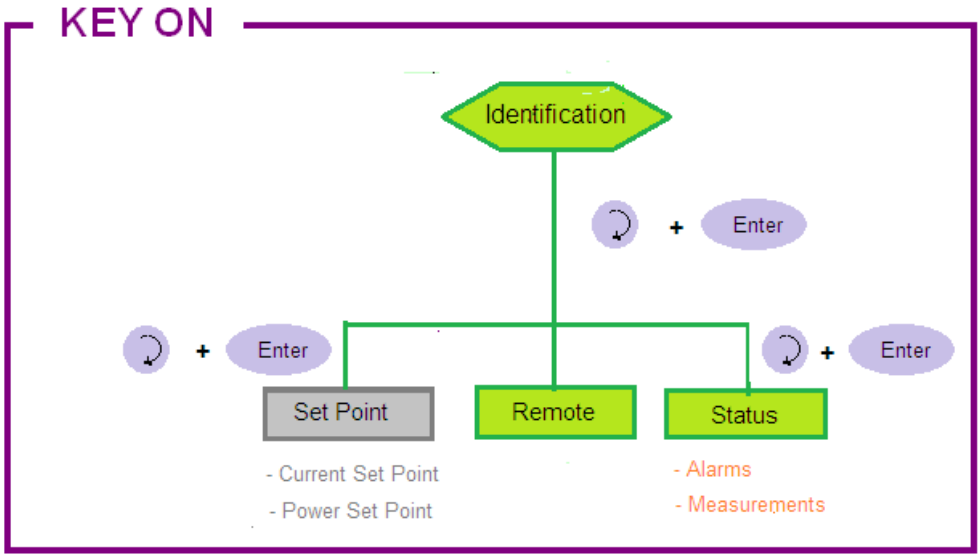
Regardless the configuration, the pump current is enabled only when the **Key is ON and the pump parameter is ON.**

7.1.1. Menu architecture

The following windows specifies the architecture of the device.

The green items represent the available menus
The grey items represent adjustable parameters
The orange items represent defined parameters

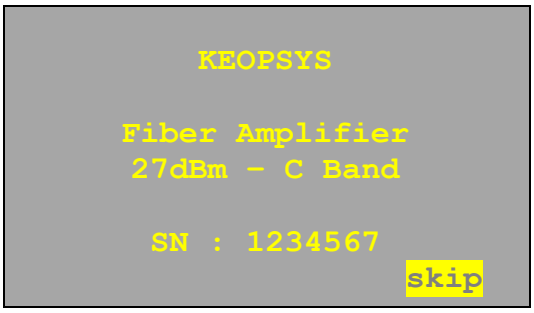




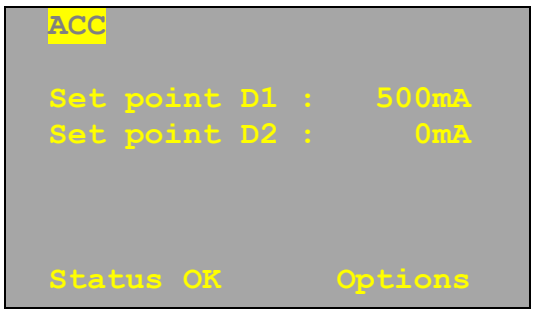
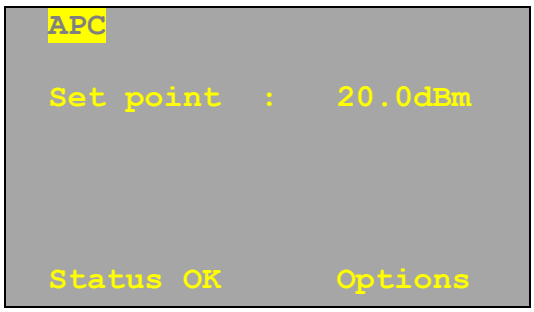
7.1.2. Example of navigation through the front panel

The following sequence occurs after plugging the main supply. Connect the Interlock connector on the rear panel and make sure the laser pump key is switched OFF (recommended).

For laser with only one diode, only the second diode (Laser Diode 2) is printed on front panel.

Starting Less than 1 minute is required for boot sequence.	
Presentation **Nominal power** and **serial number** are displayed. Presentation screen is removed after about 20 seconds.	

KEY OFF

Control mode Shows the configuration. The highlighted field is moved as the knob is turned and correspond to the currently selected field. Control mode is set to **ACC** or **APC** by pushing the knob where the field **ACC** or **APC** is highlighted. To change the corresponding **set point**, turn the knob to select the value, push the knob on the actual value and select the new set point by turning the knob. New set point is saved by pushing the knob. **The Alarm Status** panel as well as the **Options** menu can also be selected when highlighted (see below).	ACC Mode  APC Mode 

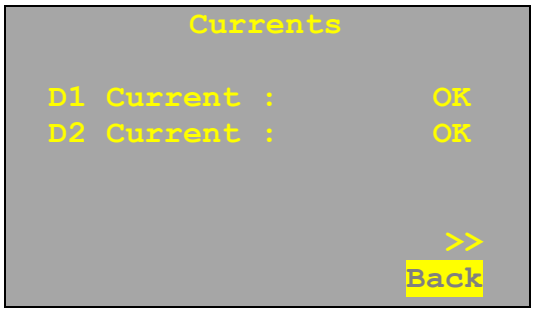
Alarm Status

Once the **Alarm** menu has been selected, the list of the alarms is shown. It corresponds to the ALA hexadecimal word (see remote command set).

Different alarm types are displayed on different pages. To browse these pages just turn left or right the knob:

- Diode laser current
- Input and Output Power
- Laser diode and Board Temperatures.
- Benchtop fans
- Others

Just push the knob to back to the previous window.

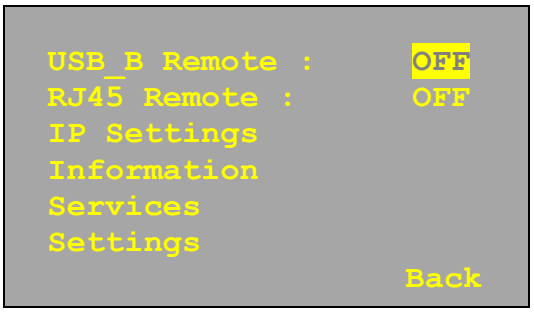


Option menu

Options menu pops up the following items:

- Enable or disable the USB Remote Mode
- Enable or disable the RJ45 Remote mode
- Display IP parameters for remote access through the network (RJ45 Remote)
- Display Benchtop Information
- Access to services window

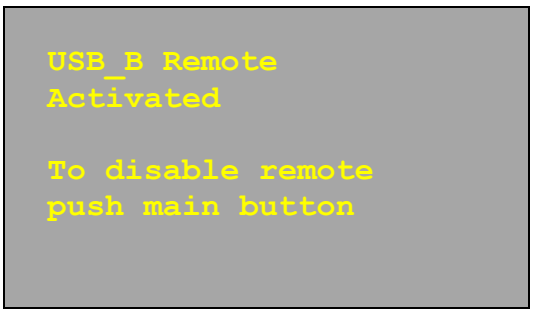
Highlighted field is selected by pushing the knob.



USB Remote mode

On choosing the USB remote mode, the front panel interface enters lock mode. Front panel access is restored by pushing the knob (USB remote mode disabled).

In this mode you are able to communicate with the device using RS232 protocol with rear panel USB connector.

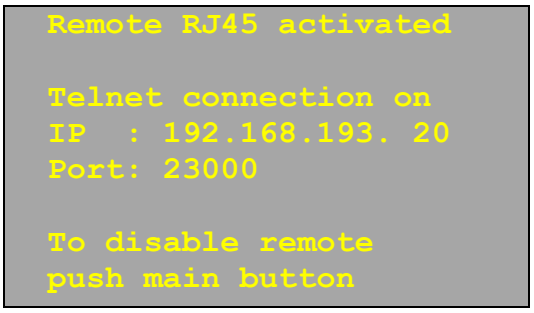


RJ45 Remote mode

On choosing the RJ45 remote mode, the front panel interface enters lock mode. Front panel access is restored by pushing the knob (RJ45 remote mode disabled).

In this mode you are able to communication with the device using Telnet protocol with rear panel RJ45 connector.

Available only if Telnet option is available.



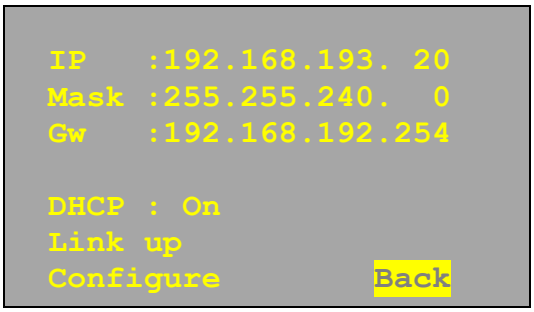
IP Settings

IP configuration can be set by selecting the **Configure** field.

IP address, Mask, and Gateway are automatically assigned when **DHCP** field is ON. Fixed configuration can also be chosen (static IP) by setting **DHCP** to OFF position.

Push knob on the validate field to save the configuration.

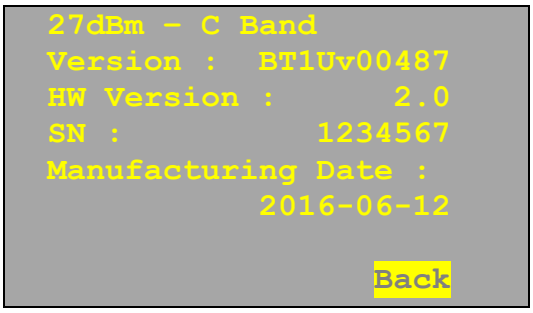
Link up or **Link down** indicates if the device is connected to the network.



Device Information

The **Information** field provides data related to the device for identification purposes:

- Laser production family (ex. 33dBm C-Band)
- Software Version
- Hardware Version
- Serial Number
- Manufacturing Date



Services

This page is used to update software of the device using USB key. In this case, you may use only firmware provided by Keopsys.

You can also save device logs on an USB key

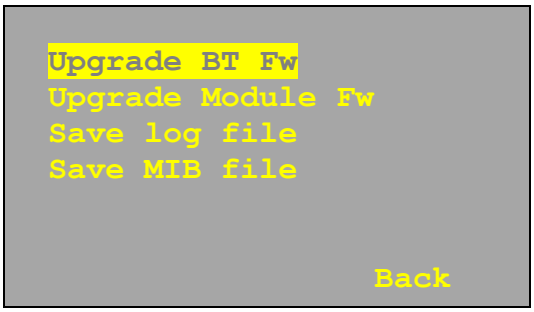
Before use any of these entries, an USB key need to be connected.

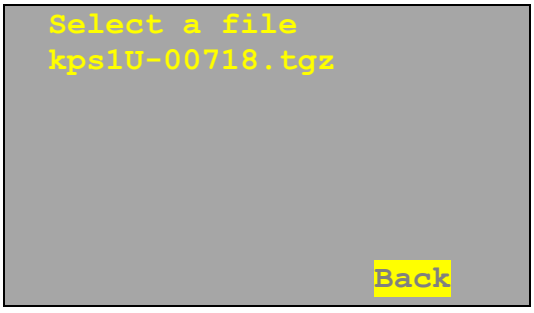
Upgrade BT Fw

This entry allows you to upgrade the benchtop interface firmware.

Selecting it, a new page asks you to select the correct firmware file among all *.tgz files found on the root of your USB key.

Select a file will immediately start benchtop firmware upgrade process.

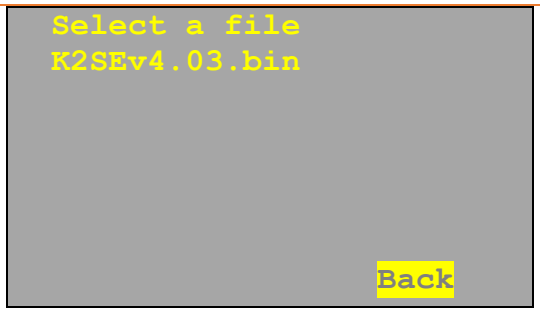




Upgrade Module Fw

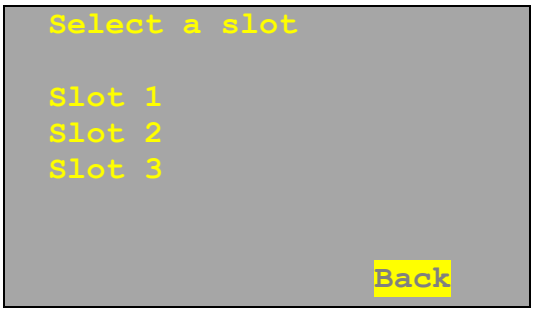
This entry allows you to upgrade the firmware of an optical module.

Selecting it, a new page asks you to select the correct firmware file among all *.bin files found on the root of your USB key.



After selecting a file, a new page asks you to select the module on which you want to perform the upgrade. Commonly only one module is used and it's the slot 1.

Select a slot will immediately start module firmware upgrade process.



Save log file

Selecting this entry will immediately save on your USB key all log files (up to 7).

Save MIB file

This entry is available only if SNMP option is available. Selecting it will immediately save the MIB file for SNMP on your USB key.

Settings

You can access here to additional user configurations.

Brightness

Set the screen brightness from 0 (dark) to 255 (bright).

KEY ON and pump button ON

WARNING	Ensure you have completely read the general safety considerations.
WARNING	Key ON position doesn't start laser emission but allows it. Beware, laser emission can now be started remotely (WSI, RS232, Telnet, SSH).
WARNING	Key ON position and Start Button pressed on, lead to switch on the laser pump.
WARNING	When an optical signal is applied in the input fiber, even if one of the diode is shut down, invisible laser radiations are present in the output fiber.
AVOID DIRECT EXPOSURE TO THE BEAM	

When the key is switched ON, the first led on front panel lit to warn that laser emission is now allowed and can but started with the front panel, or WSI or remotely (RS232, Telnet, SSH).

Control mode

The control mode selection is only available when KEY is OFF.

To change the corresponding **set point**, turn the knob to select the value, push the knob on the actual value and select the new set point by turning the knob. New set point is saved by pushing the knob.

Power monitoring are displayed only if they are available on the device.

The Alarm Status panel as well as the **Options** menu can also be selected when highlighted (see below).

To start the laser emission, select **START** field and push the knob.

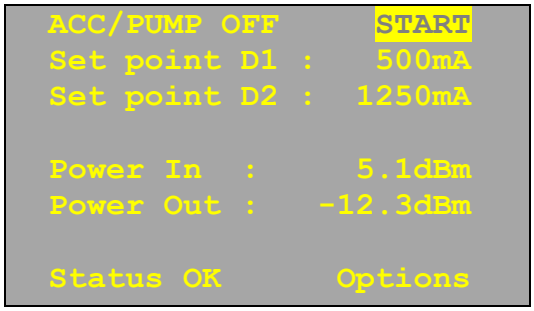
In **START** mode, displayed current are now the current measured not the set point.

In **ACC** mode, to see the set point and change it, select the corresponding value turning the knob, push it, the label change and the value become the set point. To validate the new value just push the knob.

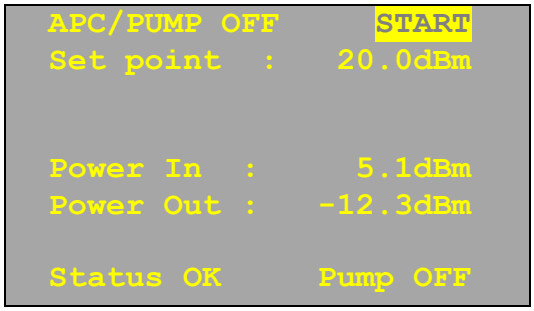
The second led on front panel should now blink.

To stop laser emission, just select the **STOP** field and push the knob.

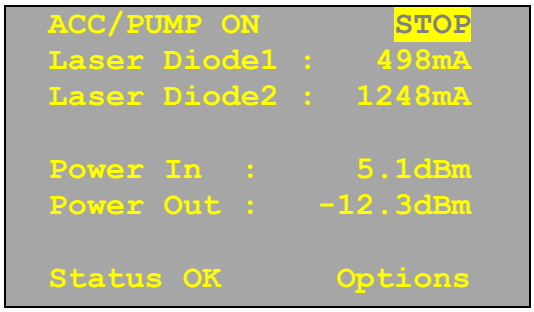
ACC Mode



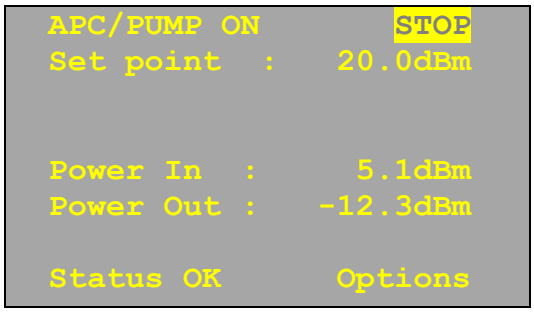
APC Mode



ACC Mode



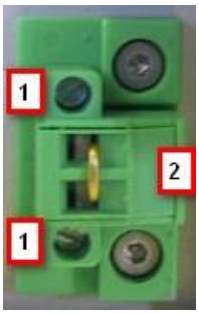
APC Mode



Alarm pop up When an alarm rises or when you turn ON the key whereas an alarm is present a pop up appears to list all activated alarm on the device.	

7.4. Use of Interlock

The device is equipped with a safety interlock, located on the rear panel. When the interlock circuit is open (interlock connector removed), pump power is disabled as well as the ON/OFF key. Use the interlock according to your local regulations.



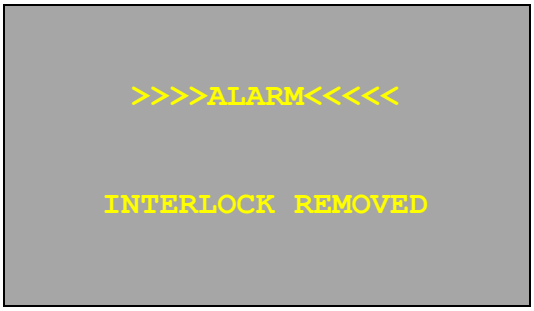
To remove the interlock connector :

1. Remove the two small screws
2. Remove the strap

The interlock is an electrical closed contact which allows the device to run. When the contact is broken, laser current decrease to 0 A.

WARNING	Open the interlock contact in set up menu will not display the message Interlock

After an interlock shutdown, Press 'Exit' and 'Enter' to reset the device.

Interlock As long as the interlock is disconnected, an alarm window is displayed and the pump current is switched OFF.	

8. Warranty

8.1. Default Warranty

This Keopsys product is guaranteed against defects in material and workmanship for 12 months from the date of shipment. Keopsys will either repair or replace products that prove to be defective.

For warranty or repair, return this product to Keopsys. The buyer will prepay shipping charges to Keopsys, and Keopsys will pay shipping to return the product to the buyer. However, the buyer will pay all shipping charges, duties and taxes for products returned to Keopsys from any foreign country.

8.2. Limitation of warranty

WARNING

WARRANTY VOID if the device is opened

- Never use the device to application not described in this manual.
- Never open or modify the product.
- Use the device with properly cleaned connector (refer to safety recommendations when cleaning the fiber connectors).
- Store and use the device in an ESD free environment for unpacking, assembly, maintenance and shipment for warranty.

The foregoing warranty will not apply to defects resulting from abuse, misuse, neglect, improper installation or application by the buyer.

Keopsys will not be responsible for the damage caused to the device as a result of employing dirty or incompatible fiber connectors.

9. Assistance

Should a problem occur, contact Keopsys. A Return Material Authorization (RMA) number will be issued for any faulty unit that needs to be returned. Note this number on the shipping container and on all correspondence.

For assistance, or before any shipments, please contact Keopsys:

Contact

www.keopsys.com

after-sales@keopsys.com

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