

Diode Laser Station

Quick Start Guide



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Manufactured by

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What is in the box

The box contains the Diode Laser Station, and all accessories to connect it to a computer.



Package list



Quantity	Description		Identifier (*)
1	Diode Laser Station stand		A
3	Microscope objective		Box B
1	Tango 2 control unit (for XY-stage)		Box C
1	Spot-size reducer		Box D
1	XY-stage and baseplate		Box E
1	Microscope revolver		Box F
1	Light source (for camera)		Box G
1	Set of 2 diode lasers: red + near infrared		Box H
1	Set of 3 hex wrenches: M1.5 +M2 + M4		
-	This "Diode Laser Station - Quick Start Guide"		-

Box B contents checklist



Quantity	Description	Identifier (*)
1	Objective, magnification 5x (red marking)	shortest -
1	Objective, magnification 20x (green marking)	middle sized -
1	Objective, magnification 50x (blue lin marking)	longest -




Box C contents checklist



Quantity	Description	Identifier (*)
1	TANGO 2 Desktop control unit	-
1	TANGO XY-joystick	-
1	Power cable	country specific -
1	Serial communication cable	-
1	USB communication cable	-
1	XY-stage driver cable	-
1	CD-ROM with driver software	-

Box D contents checklist



Quantity	Description		Identifier (*)
1	Spot size reducer (with 2 protective caps)		-
1	Set of 3 optical filters - 0.1%, 1% and 10% remaining intensity		-
1	Communication cable - USB, USB-A – USB-mini	 USB-A mini-USB	USBmini
1	Set of 4 screws - to fix XY-stage to Diode Laser Station stand		-

Box E contents checklist



Quantity	Description		Identifier (*)
1	XY-stage		-
1	Rounded glass plate		-

Box F contents checklist



Quantity	Description		Identifier (*)
1	Microscope	with revolver and top camera	-

Box G contents checklist



Quantity	Description		Identifier (*)
1	Light source (illumination for top camera)		-
1	Flexible light guide		-
1	Power supply unit		-
1	Power cable	country specific	-

Box H contents checklist



Quantity	Description		Identifier (*)
1	Diode Laser, wavelength 808 nm, 14 W	Class-4 laser	-
1	Diode Laser, wavelength 1064 nm, 20 W	Class-4 laser	-
1	Power supply unit, 12 VDC input 100 V to 240 V AC, 50 Hz to 60 Hz		PSU
1	Power cable	country specific	-
2	Signal cables: - SMB-to-SMB, 50 Ω		SMB2SMB
-	Document "Quick Start Guide – Diode Lasers"		

Other components in the box

The delivery box may contain other boxes with add-ons as ordered. Those components have their own Quick Start Guide.

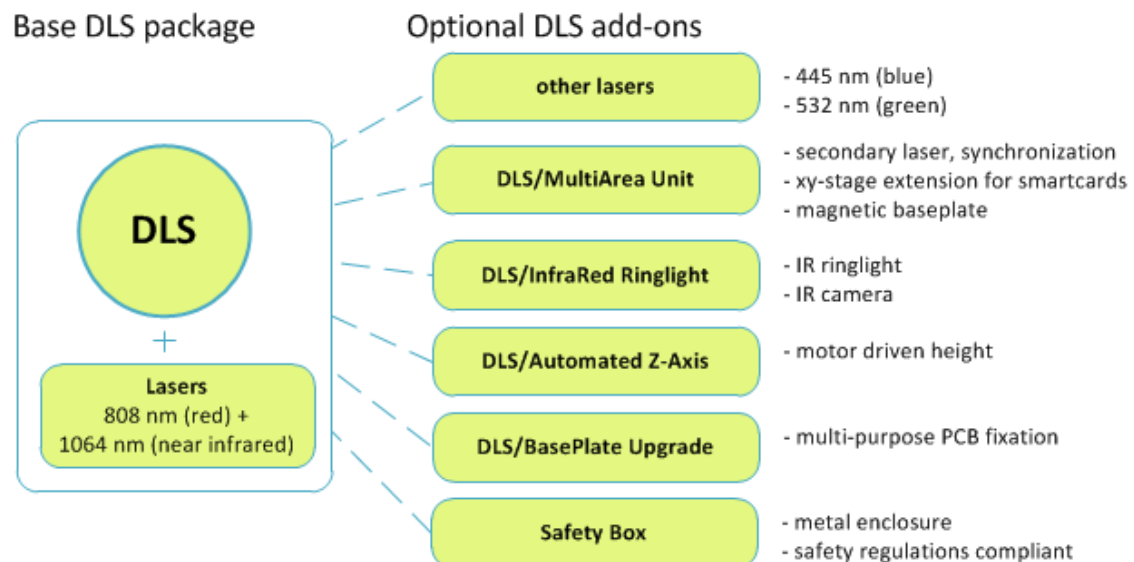


Figure 1 Extending the Diode Laser Station with add-ons.

What does it do

The Diode Laser Station is a workbench for optical Fault Injection (FI) attacks on semiconductors using a laser. The workbench consists of a microscope on a stand with an XY-stage.

The laser unit is mounted next to the microscope and laser light is inserted into the optical path of the microscope. Laser light is aimed and guided through a spot size reducer and an optical revolver to a spot area on the target. The optical revolver has switchable objectives for 5x, 20x, and 50x magnification.

The microscope has a top camera for visual confirmation of the laser spot on the target. An external light source provides additional illumination for the top camera view.

The XY-stage is controlled by a Tango controller unit, operated by an XY-joystick.

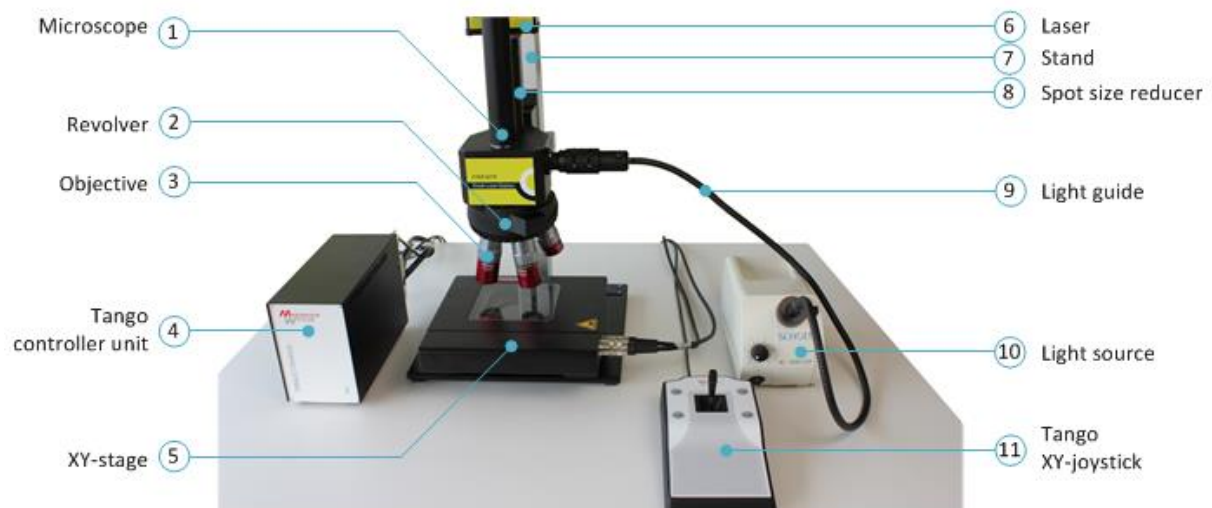


Figure 2 Diode Laser Station components.

This guide describes the base Diode Laser Station. For an overview of optional add-on components, see Figure 1 on page 11.

How to build a setup

Follow the next steps to assemble the Diode Laser Station.



DO NOT allow dust and dirt to enter the microscope and damage the objectives.

Create a clean environment before assembling the Diode Laser Station.

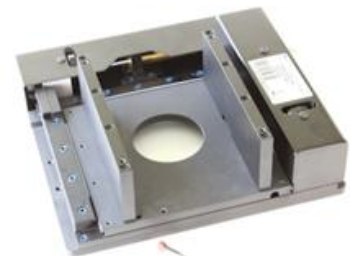
Tools required:

- hex wrench M1.5, M2 and M4



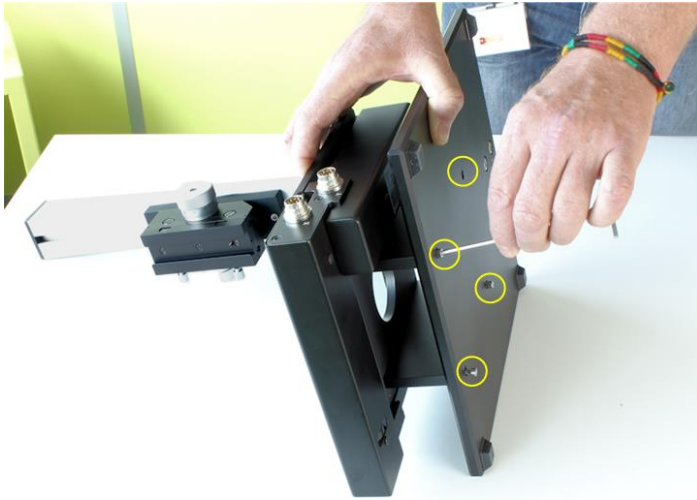
Installing the XY-stage

1. Place the XY-stage bottom side up.
2. Remove the red transport lock of the XY-stage.



DO NOT use the XY-stage with the transport lock fitted: it WILL break the XY-stage!

3. Connect the XY-stage with 4 screws to the diode laser stand baseplate. Use hex wrench M4.



4. Insert the glass plate by gently pushing it against the corner springs.



5. Place the stand upright.



Installing the XY-stage controller

6. Unpack the Tango controller.

7. Connect the XY-joystick to the Tango Desktop.



8. Connect the XY-stage to the Tango Desktop.

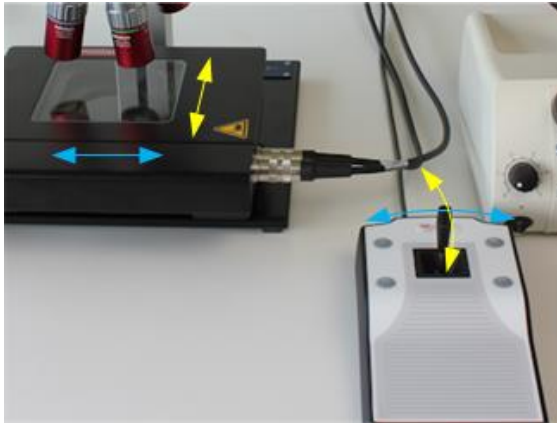
NOTE: Obey to the correct X and Y connections.



9. Connect the power cable to the Tango Desktop.

10. Intermediate test

- Switch the Tango Desktop ON with the power button on the back side.
- The LED on the XY-joystick will be ON.
- Move the joystick **forward**: the XY-stage moves inward to the stand.
- Move the joystick **right**: the XY-stage moves to the right.
- Switch the Tango Desktop OFF.



11. Connect the USB cable (or the RS232 cable) to the computer (with Inspector).



Installing the microscope optics

12. Unpack the microscope revolver.



13. Unpack the microscope objectives.



14. Fit the objectives into the microscope revolver.

Follow the markings to fit each objective into the right socket.



15. Remove the protective cap.



16. Slide the revolver into the stand and lock it with the two knobs on the side.



Adjusting focus distance

17. Use the hand wheel on the focus drive to adjust the height of the microscope above the XY-stage.



The focus adjustment wheel has a fine and a coarse setting area:

- within the first turn the wheel makes fine height adjustments;
- after the first turn the wheel requires some pressure to make coarse height adjustments.

The hand wheel has a scale with 100 divisions. In fine focus, each division represents 4.2 μm of height.

Installing the laser and the spot size reducer

18. Select the laser to be installed.


Note: Which laser to choose is outside the scope of this guide.



19. Unpack the spot size reducer. Remove the protective caps.



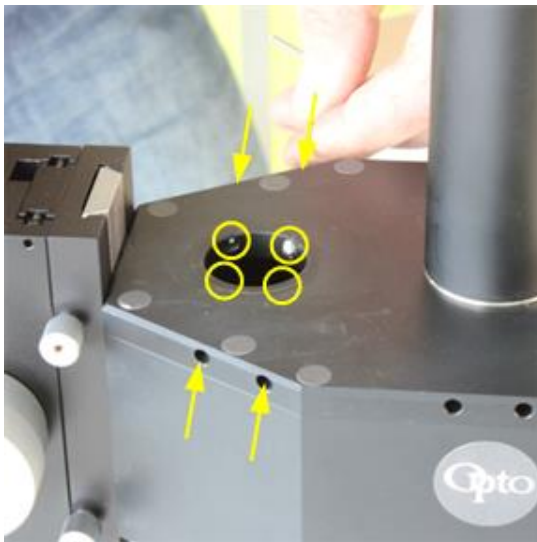
20. Adjust the spot size reducer for the wavelength of the laser.

	Laser wavelength	Gap width
	445 nm (blue)	0 mm
	532 nm (green)	0 mm
	808 nm (red)	0 mm
	1064 nm (near infrared)	2 mm

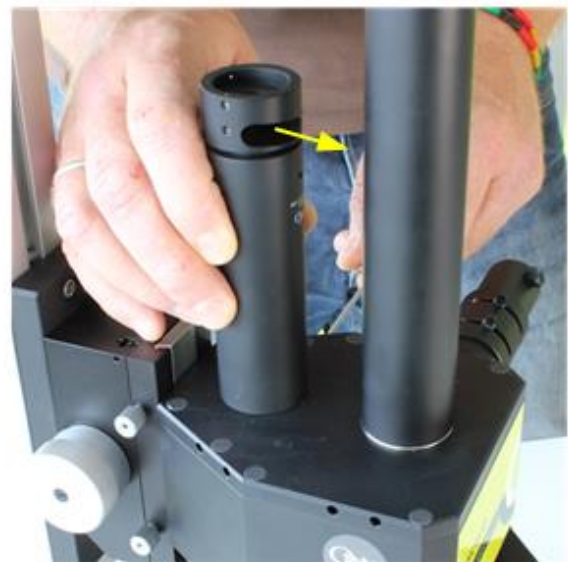
- Unscrew the head lock to release the spot size reducer head. Use hex wrench M1.5.

- Turn the reducer head clockwise to reduce the gap width.
- Fasten the head lock to secure the reducer head.

21. Loosen the 4 inner screws in the revolver body to make room for the spot size reducer. Use hex wrench M2.



22. Insert the spot size reducer with filter gap towards the front side of the stand. Fasten the 4 inner screws to lock the spot size reducer.

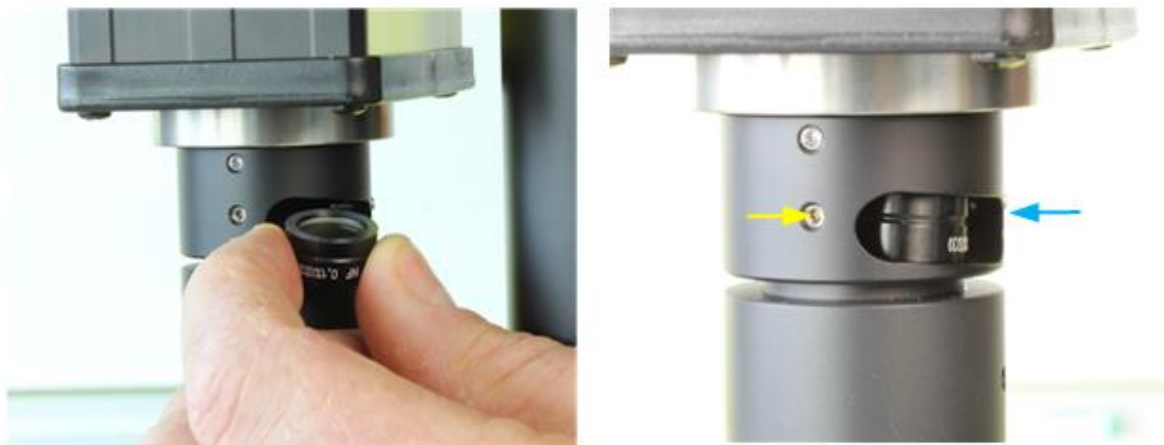


23. Insert the laser on top of the spot size reducer. Fasten the upper 2 lock screws to secure the laser. Use hex wrench M1.5.



24. Select an optic filter. With the groove ring on top, insert the filter into the heart of the reducer.

Secure the filter with the 2 filter lock screws. Use hex wrench M1.5.



The choice for an optic filter is outside the scope of this guide.

By design, filter and gap are placed at a small tilt angle, to prevent laser light from reflecting back into the laser. The reflected (pulsed) power is absorbed by the metal casing.

Each filter is labeled with the percentage of remaining light intensity (0.1 %, 1% or 10%).

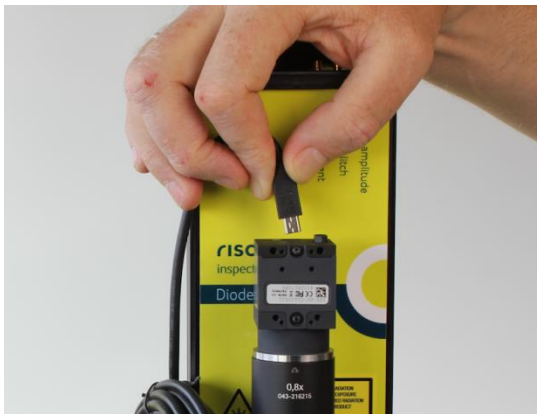
For easy removal of the filter, use the back side hole on the spot size reducer.



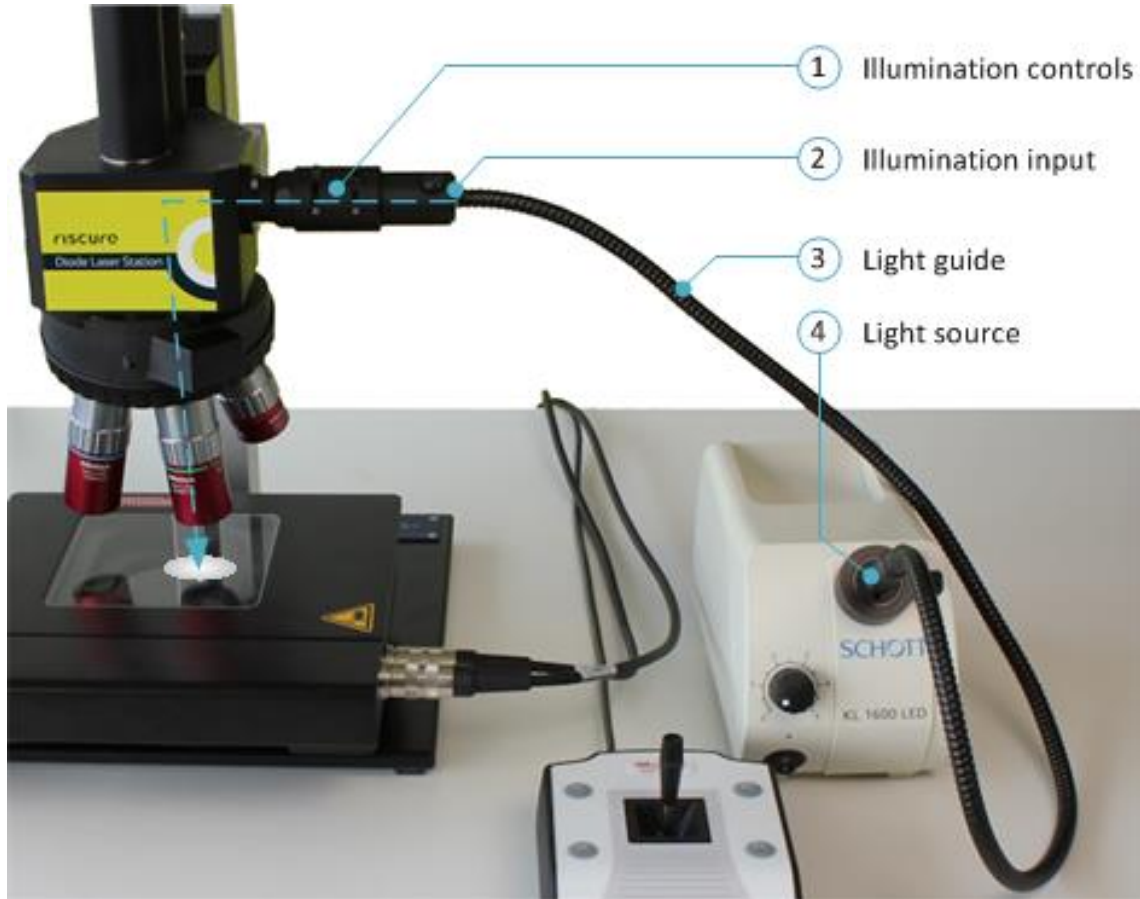
Installing the camera and light source

25. The microscope is pre-assembled with a top camera for visible light.

Connect the camera with the USB cable to the computer.



26. Connect the light source with the flexible light guide into the side of the revolver.



This light is used to illuminate the target.

The illumination input adapter has a slider for adjusting the spot size and a slider for adjusting the intensity of the illumination.

Verification of the setup

Follow the next checks to verify you have built a working setup.

1. Is the Diode Laser Station powered?
2. Is the Diode Laser Station connected?
3. Is the Diode Laser Station responding to commands?

Please ensure that a check is successful, before proceeding to the next check.

If a check is not successful, refer to section “Common problems”.

Check 1 - Is the Diode Laser Station powered?

If the Tango Desktop unit is powered and the XY-joystick connected, the LED on the XY-joystick will be ON and the XY-stage responds to movement of the joystick.

If the Light Source is powered and the light guide connected, the target under the objective is illuminated.

Check 2 - Is the Diode Laser Station connected?

The Diode Laser Station is connected to the computer by:

- The USB camera.
- The USB (or RS232) link with the Tango controller unit

The USB camera is recognized by Windows as a generic video capturing device. Video can be recorded and viewed by any suitable application, and does not depend on Inspector.

The Tango 2 controller unit comes with its own driver software. After installing the driver software, Windows will identify the unit on USB (or serial port) as “*Serial @ COMxx*” device. The Inspector Hardware Manager will classify the device as category “XYZ Device”.

Check 3 - Is the Diode Laser Station responding to commands?

Inspector FI and Inspector SCA/FI can operate the Tango controller unit to perform scan operations, and thereby override the manual positioning of the XY-stage.

To move the XY-stage with Inspector:

1. Select **Perturbation** >> **Single XYZ** >> any target type.
A perturbation configuration dialog opens.
2. Select tab **XYZ Device**.
3. Set **Device Selection** to "<your tango device>" from the list.
4. In property group **Controller and Settings**, press buttons **N**, **E**, **S**, **W**.
The XY-stage moves into the four directions.

Inspector can show the live camera view, to help positioning the XY-stage:

5. Select tab **Camera**.
6. Set **Device Selection** to "<your camera device>" from the list.
A number of properties are added, depending on the camera. Keep the settings at their default values.
7. In group Device Control Panel, go to **Live Feed**, press button **Open**.
A panel opens with live images from the selected camera.

Help and troubleshooting

Common problems

There are no issues reported.

Still have questions?

Visit the Riscure Support portal: <http://support.riscure.com>.

Technical specifications – Diode Laser Station

Operational conditions

- Room temperature 20 - 30 °C, (68 – 86 F).



Maintain stable environmental conditions (temperature, humidity, airflow etc.) in order to reliably repeat tests and compare test results.



Unplugging the PSU from the product is not required, but recommended when not used for an extended time.

Power supply input



Use of a PSU other than supplied by Riscure is not supported. Power spikes may cause internal damage and loss of accuracy.

XY-stage

- Travel range: max. 75 x 50 mm
- Max. travel speed: 445 mm/s
- Step size: 0.05 μm
- Accuracy: $\pm 3 \mu\text{m}$
- Repeatability: $< 1 \mu\text{m}$

Camera

- 1/2" Sony CCD, color
- Resolution: 1280 x 1024, SXGA
- Video frame rate: 15 fps

Optic system

- 3 objectives; magnification 5x, 20x and 50x
- 3 filters; remaining intensity 0.1%, 1% and 10% of laser power produced
- Spot size: 6 x 1.4 μm @ 50x objective
- Approximate die image size @ 5x objective: 1.2 x 1 mm
- Approximate die image size @ 20x objective: 300 x 250 μm
- Approximate die image size @ 50x objective: 120 x 100 μm

Remote connections

- USB 2.0 camera connection to PC.
- USB 2.0 or RS232 Tango control connection to PC.

Product dimensions

- DLS Base + Stand (Width x Depth x Height): 300 x 300 x 530 [mm], 11.8 x 11.8 x 20.9 [inch]

Technical specifications – Diode Laser

Operational conditions

- Room temperature 20 - 30 °C, (68 – 86 °F), preferred

Power supply input

- 12 V DC, max 2.5 A

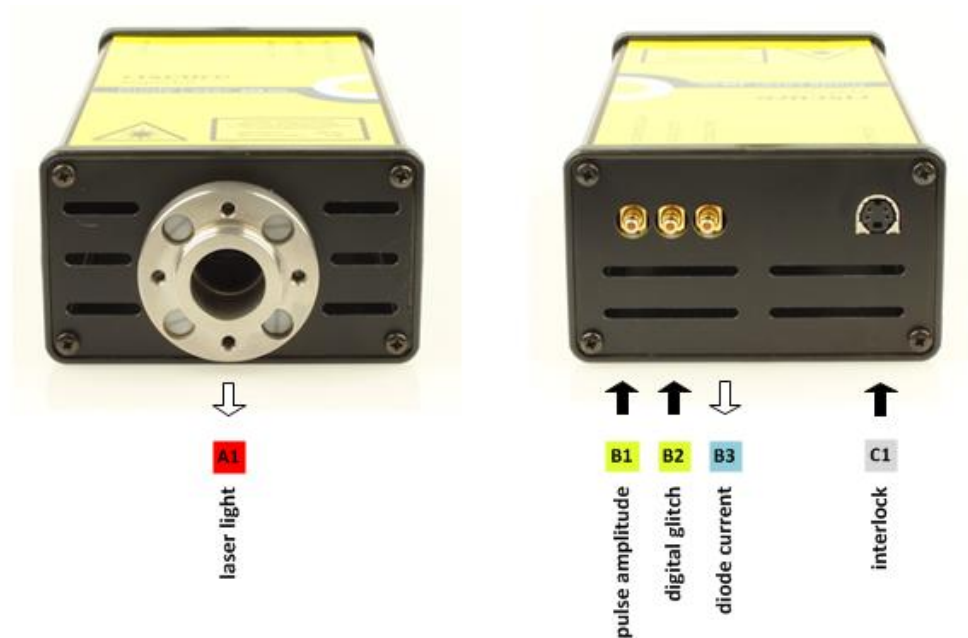
Laser

- Diode laser Class-4, wavelength 808 nm (red), 14 W
- Diode laser Class-4, wavelength 1064 nm (near infrared), 20 W
- Activation frequency, max. 25 MHz
- Activation pulse duration, min. 20 ns, max 100 µs.
- Pulse amplitude full range settling time 1 s.
- Diode current feedback test signal, -20 A/V @ 50 Ω.

Product dimensions

- Length x Width x Height: 200 x 95 x 56 [mm], 7.8 x 3.7 x 2.2 [inch]

Connectors



Port	Label	Description
A1	-	Diode laser light output
B1	pulse amplitude	SMB, 1 k Ω . Analog input 0.0 – 3.3 V Laser power level control: 0.0V = 0%, $\geq 3.3V$ = 100% (max).
B2	digital glitch	SMB, 50 Ω . Binary input 0.0 – 3.3 V. Laser light activation: Active high.
B3	diode current	SMB, 50 Ω . Analog output -1.5 – 1.5 V. Feedback signal proportional to diode current. Negative on activation.
C1	interlock	12 V DC Power supply connection from Safety Box PSU.

Safety instructions

Laser safety

The Diode Laser Station contains laser sources which are power compatible with a Class 4 laser product as defined in international Standard IEC 60825-1.



The operator of the Diode Laser Station should observe the general precautions:



DO NOT attempt to use the laser sources outside the Safety Box.



DO NOT disassemble the laser source or the Safety Box, while the Safety Box is connected to a power supply



DO NOT attempt to disable the door interlocks of the Safety Box.



ONLY operate the laser

- when the diode laser source is mounted on the microscope together with the camera, light guide and objectives
- or when the laser fiber is attached to the micromanipulator of the DLS/Multi Area Unit.



Caution: Use of controls or adjustments or performance of procedures other than those specified may result in hazardous laser radiation exposure.

Recommendations for safe use of lasers

The standard reference for laser safety is the American Standard for the Safe Use of Lasers, Z136.1-2000, developed by the American National Standards Institute (ANSI). This reference is the basis for many of the federal regulations for laser and

laser system manufacturers, and for the Occupational Safety and Health Administration (OSHA) laser safety guidelines. It contains detailed information concerning proper installation and use of laser systems.

While the ANSI standard itself does not have the force of law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be compulsory under local workplace regulations when operating laser systems above Class I. It is the operator's responsibility to ensure that the installation and operation of the laser source with safety box is performed in accordance with all applicable laws.

Copies of ANSI Standard Z136.1-2000 are available from:

Laser Institute of America
12424 Research Parkway, Suite 125
Orlando, FL 32826
(407) 380-1553

The safety features of the Riscure Safety Box are described in section Safety Features and Regulatory Compliance.

Electrical safety

The safety box is powered by a 12V power supply unit. The AC input to the 12V power supply unit is potentially lethal and is fully contained with the power supply unit.



DO NOT open the 12 V power supply unit while the unit is plugged in. Opening the power supply unit may expose the operator to the unit's AC input power.



DO NOT open the laser source while the laser source is plugged in. Opening the laser source may expose the operator to the internal voltage to drive the laser diode.



DO NOT open the laser source while the laser source is connected via the interlock plug to the safety box. Opening the laser source may expose the operator to the internal voltage to drive the laser diode.



DO NOT make or break any electrical connections to the system while the unit is switched on.

Fire safety

High power laser systems represent a fire hazard in combination with light absorbing surfaces and flammable or ignitable materials.



DO NOT use any flammable or combustible materials, explosives or volatile solvents such as acetone, alcohol or gasoline inside the safety box



ALWAYS keep a properly maintained and inspected fire extinguisher at hand.

Safety Features and Regulatory Compliance

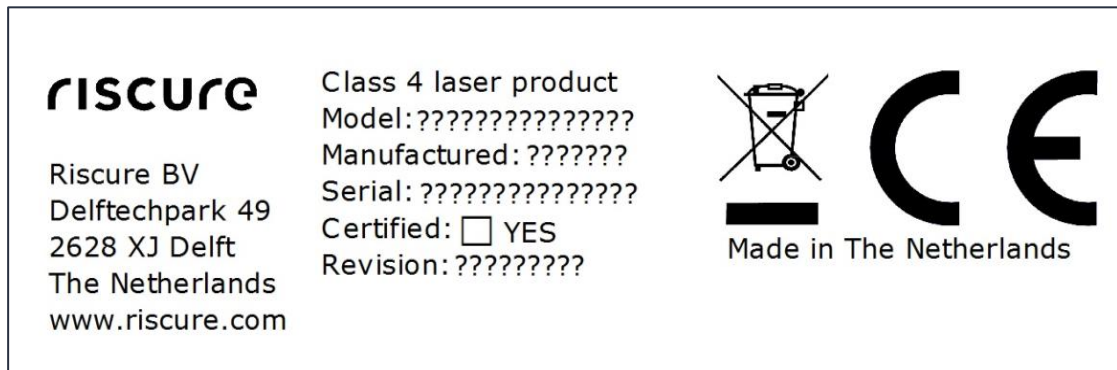
Riscure has incorporated specific safety features into the Diode Laser Station to meet the requirements of 21 CFR 1040 and the International Standard IEC 60825-1.

These safety features included in 21 CFR 1040 and IEC 60825-1 require that certification, identification, and warning labels be placed on laser products.

Reproductions of labels on the Riscure laser sources and Riscure safety box follow, with their locations specified:

1. Certification/Identification Label:

This label is located on the back side of the safety box.



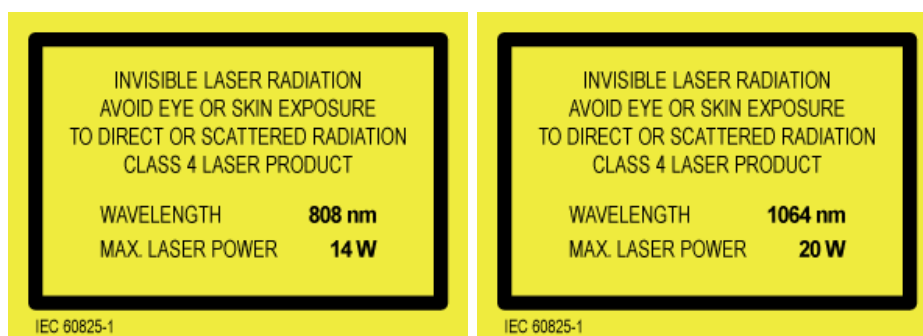
2. Warning label:

This label is located on the front of the laser source.



3. Explanatory labels:

These labels identify the classification of the laser sources in accordance with IEC 60825-1. The labels are located on the side of the laser source:



Interlocked protective housing safety label. This label is located on the door

of the safety box.



4. Aperture safety label:

This label is located at the bottom of the laser source, next to the laser beam exit.



Declaration of conformity

EC-DECLARATION OF CONFORMITY

Suppliers Details

Name

Riscure B.V.

Address

Frontier Building, Delftechpark 49, 2628 XJ Delft, The Netherlands

Product Details

Product Name

Inspector

Model Name(s)

Diode Laser Station

Trade Name

Riscure

Applicable Standards Details

Directives:

- MD (2006/42/EC) - LVD (2006/95/EC) - EMC directive (2004/108/EC)

Standards:

- IEC 60825-1; IEC 320 C8; IEC 60950-1; 21 CFR 1040; ANSI/ESD S20.20:2007; BS EN 61340-5-1:2007; EN55022-B; EN61000-4-2, 4-5; EN-ISO 12100:2010; CISPR 11; CISPR22-B; UL 1950

Supplementary Information

The appliance fulfils the relevant requirements of the above mentioned directives according to our technical documentation TCD-Diode Laser Station. Riskassessment according to the EN-ISO 12100:2010.

Declaration

I hereby declare under our sole responsibility that the product(s) mentioned above to which this declaration relates complies with the above mentioned standards and Directives

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Name

Dr.ir. F.G. de Beer /
Technical Director

Issued Date

02 / 05 / 2013



Signature of representative

NOTES: