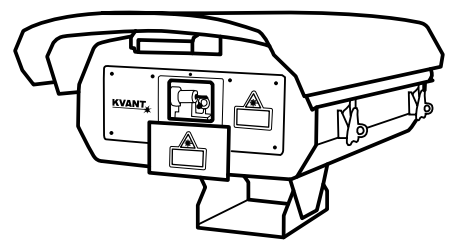


# MODEL SPECIFIC OPERATION MANUAL



---

LogoLas series

# Table of Contents

---

<b>1. Introduction</b>	<b>01</b>
<b>2. General information</b>	<b>02</b>
2.1. What is a laser and how does it work?	04
2.2. Laser Safety First!	06
2.3. Installation of the System	07
2.4. Control System	08
2.5. Scanning System	09
2.6. Connection Diagram	11
2.7. Switching ON sequence and User Interlock	12
2.8. Maintenance	16
<b>3. Item Checklist</b>	<b>17</b>
<b>4. Optional Accessories</b>	<b>19</b>
<b>5. System Overview</b>	<b>21</b>
5.1. Front View	22
5.2. Side View	23
5.3. Rear View	24
<b>6. Beam Alignment</b>	<b>25</b>
6.1. Beam Alignment [LogoLas 2000]	27
6.2. Beam Alignment [LogoLas 3000]	30
6.3. Beam Alignment [LogoLas 3400]	33
6.4. Beam Alignment [LogoLas 6000]	36
6.5. Beam Alignment [LogoLas 6800]	40
<b>7. Technical Specifications</b>	<b>44</b>
7.1. Technical Specification [LogoLas-2000 FB4]	45
7.2. Technical Specification [LogoLas-3000 FB4]	46
7.3. Technical Specification [LogoLas-3400 FB4]	47
7.4. Technical Specification [LogoLas-6000 FB4]	48
7.5. Technical Specification [LogoLas-6800 FB4]	49
7.6. Technical Specification [LogoLas-10 FB4]	50
7.7. Technical Specification [LogoLas-10 OP SL FB4]	51



# Introduction

---

**Thank you for purchasing this KVANT product.**

To ensure proper operation, please read this manual carefully before using the product.

After reading it, keep it in a safe place for future reference.

## General information



The following chapters explain important information about lasers in general, basic laser safety and some tips about how to use this device correctly.

Please spend some time reading these information as some of them are critical for safe and efficient operation of this laser display system.



### Caution



This laser entertainment system is rated as a **Class IV laser product** and manufactured in accordance to **EN 60825-1:2014**. Avoid eye or skin exposure to direct or scattered radiation. Wear protective goggles of suitable optical density if necessary.



If the laser is operated in a situation where health or property injury may occur the operation must be stopped immediately.



The manufacturer and its distributors cannot be held responsible for any damages caused by improper use or misuse of this KVANT laser system. The owner/user is fully responsible for using this product in accordance to laser safety regulations of the country or state where the system is being used.

Please note that some other optical devices such as cameras, camcorders, video projector etc. can be damaged if exposed to excessive laser radiation.

### **Handling precautions**

This laser system is a precision device that contains some sensitive opto-electronics components. DO NOT drop it or subject it to physical shock.

Do not leave the laser system in excessive heat such as in a car whilst in direct sunlight. High temperatures could cause some serious damage to the system.

The laser system contains precision electronic circuitry. Never attempt to disassemble the laser yourself.

If the laser is suddenly brought in from the cold into a warm room, condensation may form on the laser and internal parts. If condensation forms on the laser body, do not use the laser as this may damage the laser system. If there is condensation, wait until it has evaporated before using it.

## What is a laser and how does it work?

---

### What is a LASER?

The laser is a bunch of energy waves (streams of photons called radiation) with the same amplitude and phase that are flowing in the same direction; meaning they are coherent – they stick together and form a laser beam.

The width of a single wave is measured in nano-meters and defines the colour and visibility of the laser beam. The visible spectrum of the human eye is roughly between 400nm and 700nm, going from violet to a dark red colour. A human eye is most sensitive to a green light of around 555nm, meaning that a 1W of green laser will always appear more visible than 1W of any other colour laser. 1W of quality laser light is very powerful and although it doesn't sound like much it can burn eye retinas, skin and clothes or even start a fire!

### What makes the laser visible?

Mainly it is the particles of dust in the air that the laser beam hits on its path. That's why we "laserists" use haze or smoke machines to make lasers more visible. Too much of the haze or smoke will kill it, but the right amount will make all the difference between no show and a great show.

When outdoors, lasers mainly reflect off dust and mist in the air but due to unpredictable wind conditions we can never make sure the hazers or smoke machines will be effective enough. And that's why we use high power lasers for outdoor shows – to substitute for the lack of dust, haze and smoke.

### How far does it go?

Depending on the power output of the system and weather conditions, the laser can be visible for miles – that is why we need to be cautious about aircrafts when performing outdoor shows. And if you get a system that is powerful enough then yes, it can reach the Moon.

## Colours

Standard full colour analogue lasers use three primary colours: Red, Green and Blue. By mixing those together you can pretty much get any secondary colour:

**Red + Blue = Magenta**

**Red + Green = Yellow**

**Green + Blue = Cyan**

**Red + Green + Blue = White**

Of course the number and precision of the colours is determined by the modulation, stability and linearity of the system. If the system is not stable enough, it will produce different colours every time it is used, making it virtually impossible to match the colours of two systems at any one time. This is very often the case with systems from far east manufacturers and with re-branded lasers that are being presented as European makes.

## Scanning System

A scanning system is essentially two tiny mirrors, each moving on X or Y axis. By working together they can “scan” the laser beam in all directions. Once a shape is scanned more than 20 times per second, it appears static to the human eye. So any shape drawn by a laser is actually produced by one single laser beam being moved by these mirrors very quickly. Every scanning system has a mechanical limit of how fast it can move its mirrors and therefore how many points it can display at any one second and that is usually represented in Points Per Second at a certain scanning angle, i.e. 8 degrees.

# 2.2

## Laser Safety First!



Before proceeding any further, please read the following safety page very carefully. It could help you avoid dangerous and hazardous situations which could lead to serious injury or property damage.



Any laser system classified as a Class 4 laser must be used with caution. If you are an inexperienced laser operator, we strongly recommend that you attend a laser display safety course before you use this laser system in public areas. There are various places in Europe where you can attend quality training and even a one day course will give you a good amount of valuable information to safely start with.

Unless you are very competent with the use of lasers and about the laser safety, make sure you at least follow these basic laser safety rules:

1. Never look directly into a laser beam.
2. Never look directly into laser aperture if the laser system is switched on.
3. Be aware that lasers can burn the eye retina, skin or cause fires if not used correctly.
4. Never perform Audience Scanning – that's when laser beams and effects hit an audience directly. Always project with the laser above audience head level – at least 3m above floor level.
5. When performing outdoors, avoid pointing the laser at aircrafts, buses, trains, etc.
6. Never leave the laser system unattended when it's switched on.
7. Always check for reflective surfaces within the laser range – these can be very dangerous (i.e. mirror behind the bar in a club could bounce the beam into bar attendant's eye).
8. Never hesitate to use the Emergency STOP if you think there's a fault within the laser system or a potential danger to a person/object caused by the laser performance.



# 2.3

## Installation of the System

---



The manufacturer is not liable for damages or a injury caused by improper installation of the system. The installation should be carried by a qualified installer who should follow the Laser Safety Regulations of respective country.

Please follow these rules during the installation:

1. Do not connect the device to power supply during the installation.
2. Mount the system only to mounting point that is strong, secure and away from places where nonauthorised person could get an access to.
3. Always make sure the system is properly tighten down and that it cannot get loose and move as a result of sound vibrations, cable pull or similar.



This is extremely important for LogoLas laser display systems, especially if the system is set to automated operational mode.

4. Always use a safety rope.
5. Ensure that all the cables have enough leverage just in case they get caught.
6. Ensure that the system is placed at least 20cm away from walls or any other objects including drapes etc.
7. Ensure that the system is placed well away from any heat sources including spotlights, moving heads, radiators, etc. Make sure there is a sufficient air-flow around the laser system.
8. It is essential that the fan openings are never covered during the laser operation.
9. Always follow the Laser Safety Regulations of respective country where the laser is being used.

# 2.4

## Control System

---

The overall performance of any KVANT laser system is also dependent on the control system that you use for operating the laser as well as the correct device configuration in the laser control software.

Please make sure all the laser settings in your control system are set correctly before you start using your Kvant laser display system.

There is FB4 laser control system inbuilt in every standard LogoLas 2000, 3000, 3400, 6000, 6800 and G10. The communication (data transfer) between a control computer and inbuilt interface is done via ethernet.

# 2.5

## Scanning System

---

The product warranty does not cover the damages to the scanning system caused by improper use of the scanning system or by incorrect programming. Therefore it is essential to understand how the scanning works and where are the limits of it. In this manual we will explain only the basics of it but it is the responsibility of every user to educate themselves so they can avoid damage being caused to the scanning system and costly repairs.

A laser beam comes from a laser module and hits the two moving mirrors of the scanning system. These mirrors are mounted on the scanner shafts and are moved by the scanner rotors, one on X and one on Y axis.



An effect such as tunnel (circle) is displayed by a repetitive mechanical movement of the scanners. For each scanning system and effect, there's a maximal scan rate that is defined by mechanical load, scanner mirror size and weight, complexity of displayed picture and size of the projection (an angle under the laser beam is being projected). A different scanning systems have different scan- rate limits. It is essential to operate the scanning system at scan-rates within its maximal limit at all times to prevent it from overload damage.

## How to establish correct Scan-rate and maximal number of points in an effect

Each effect (picture) contains a different number of graphical points which defines the actual shape of the effect. The more points an effect contains, the lower the maximum scan rate will be in relation to the scanning angle.

As an example we'll work with the star effect shown below and with the parameters of quality scanning system:

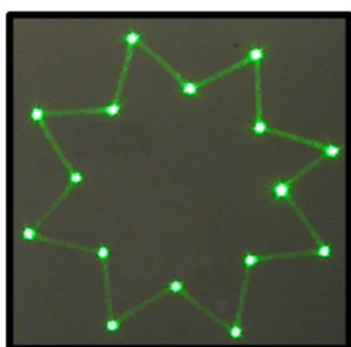
Let's say the star effect is made of 300 graphical points (including non-visible blanking points) and we know that the maximal scan-rate of our scanning system is 35kpps @ 8 degrees (= 35.000 points per second at 8 degrees projection angle). We also know that we display the star 35 times per second which is a default frame rate of the control software we are using.

So we need to display 300 points 35 times per second = 10.500 pps. This means that we could display 3 of these stars beside each other within one single laser effect and that it would be quite close to the scanner limit ( $3 \times 10.500 = 31.500$ pps). This however applies ONLY if the scanning angle is not more than 8 degrees on both axes! If we start to increase the size of the projection (scanning angle) it is necessary to either lower the number of points within the effect or drop down the scan-rate in the control software (FPS) to a safe level – which may result in flicker.

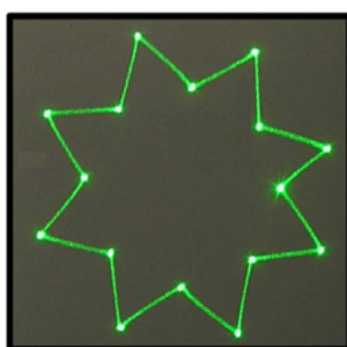
From the example above we can also determine how many points this scanning system is able to project if the scanning angle is not more than 8 degrees:

$35.000 \text{ points} / 35 \text{ Frames Per Second} = 1.000 \text{ pps}$ . This is the absolute maximum of how many points we should be using when programming an effect if the scanning angle is not more than 8 degrees.

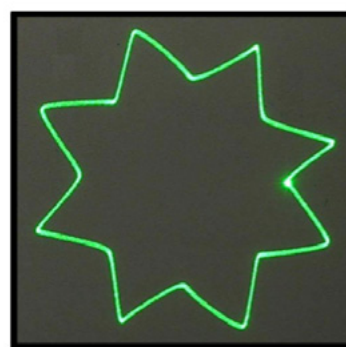
In the following pictures you see the same star effect scanned at different scan rates at full scanning angle (60 degrees).



picture 1



picture 2



picture 3

**Picture 1:** the scan rate and/or number of points is too low. The corner points are more visible than the lines between them and the whole effect flickers. The scan-rate and/or number of points needs to be increased.

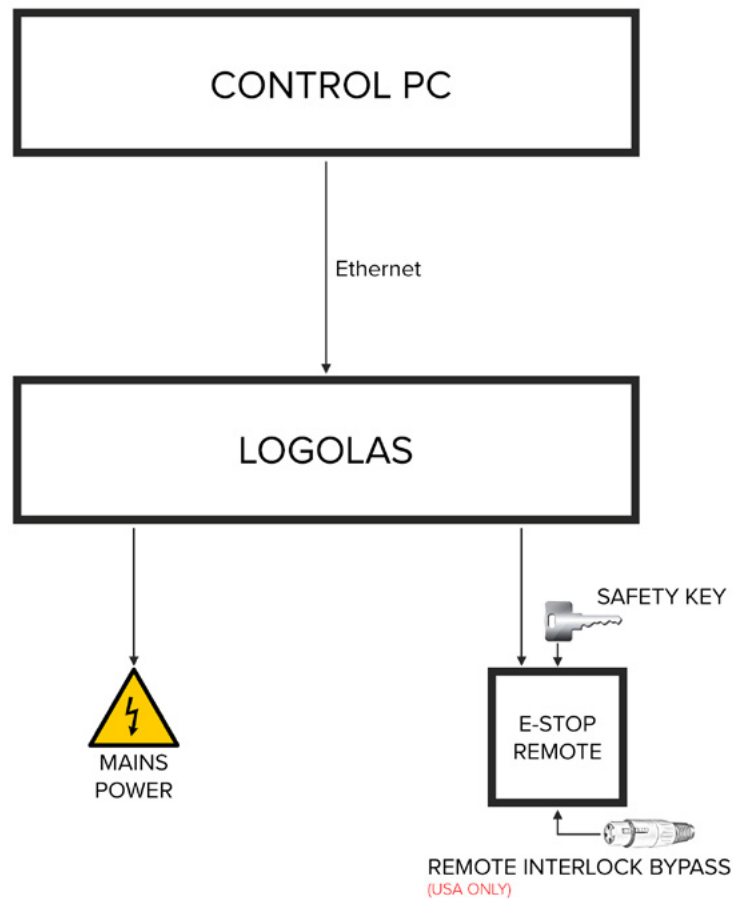
**Picture 2:** the scan-rate and/or number of points is about right. The whole effect has more or less the same intensity and does not flicker.

**Picture 3:** further increasing of the scan-rate and/or number of points results in the effect starting to distort, firstly around corners only. This indicates that you are exceeding the maximal scan rate of the scanning system! If you operate the scanning system at scan-rates higher than the maximum scan-rate of the scanning system the scanners will get damaged irreversibly due to overheated coils damaging rotor magnets.

# 2.6

## Connection Diagram

Please check that all the signal and power leads are correctly installed and that the safety keys are inserted in all necessary positions.



Both E-STOP Remote safety key and laser system safety key must be inserted and switched to ON position in order to disable the interlock.



USA ONLY: Remote Interlock Bypass must be inserted in the E-STOP Remote as well in order to disable the interlock.

# 2.7

## Switching ON sequence and User Interlock



Please make sure that all laser display safety requirements are fulfilled in accordance with laws of the country where this KVANT laser system is being used before switching the system ON.

1. Connect the system as showed on [Connection Diagram](#).
2. Turn E-STOP Remote safety key to ON position.
3. Release the E-STOP button by pulling it upwards.
4. Open the aperture window by loosening the two bolts at the bottom of the aperture, adjust the masking plate to desired position and tighten the bolts to secure it.
5. Press the START button on the E-STOP Remote.
6. After an Emission Delay Period the laser projector will be ready for use.

### Interlock Enabled, Laser Output Terminated

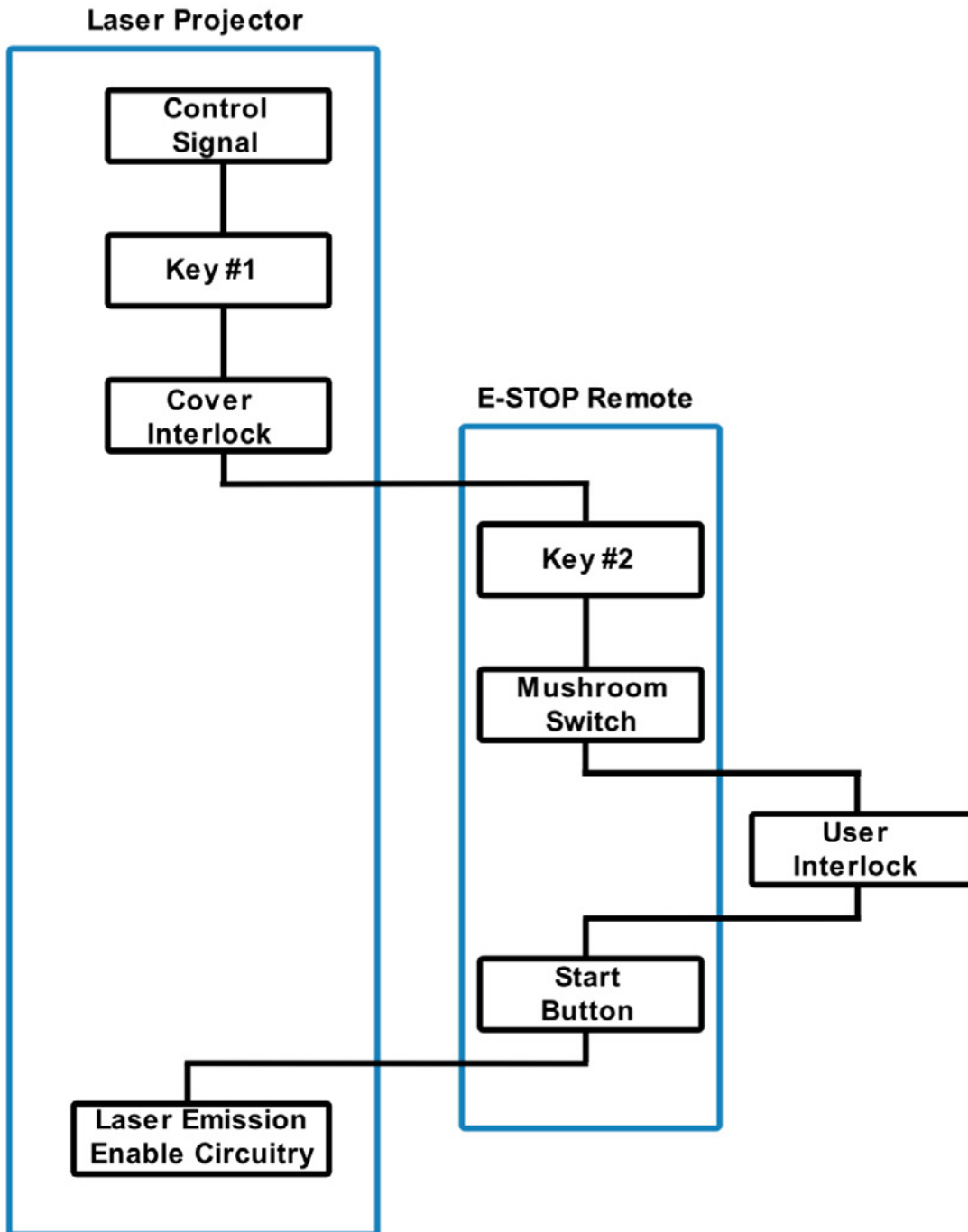
The Interlock is latched enabled and the laser projector's beam output will be terminated if any of the following events happen:

1. Power loss lasting greater than 2 seconds.
2. Mushroom emergency switch depressed.
3. Key Switch on E-STOP Remote turned to OFF position.
4. Any other interruption to line No.1 of the cable leading to the E-STOP Remote. This includes any user interlocks connected in series in the line No. 1 of this cable. Refer to Connection Drawing below.

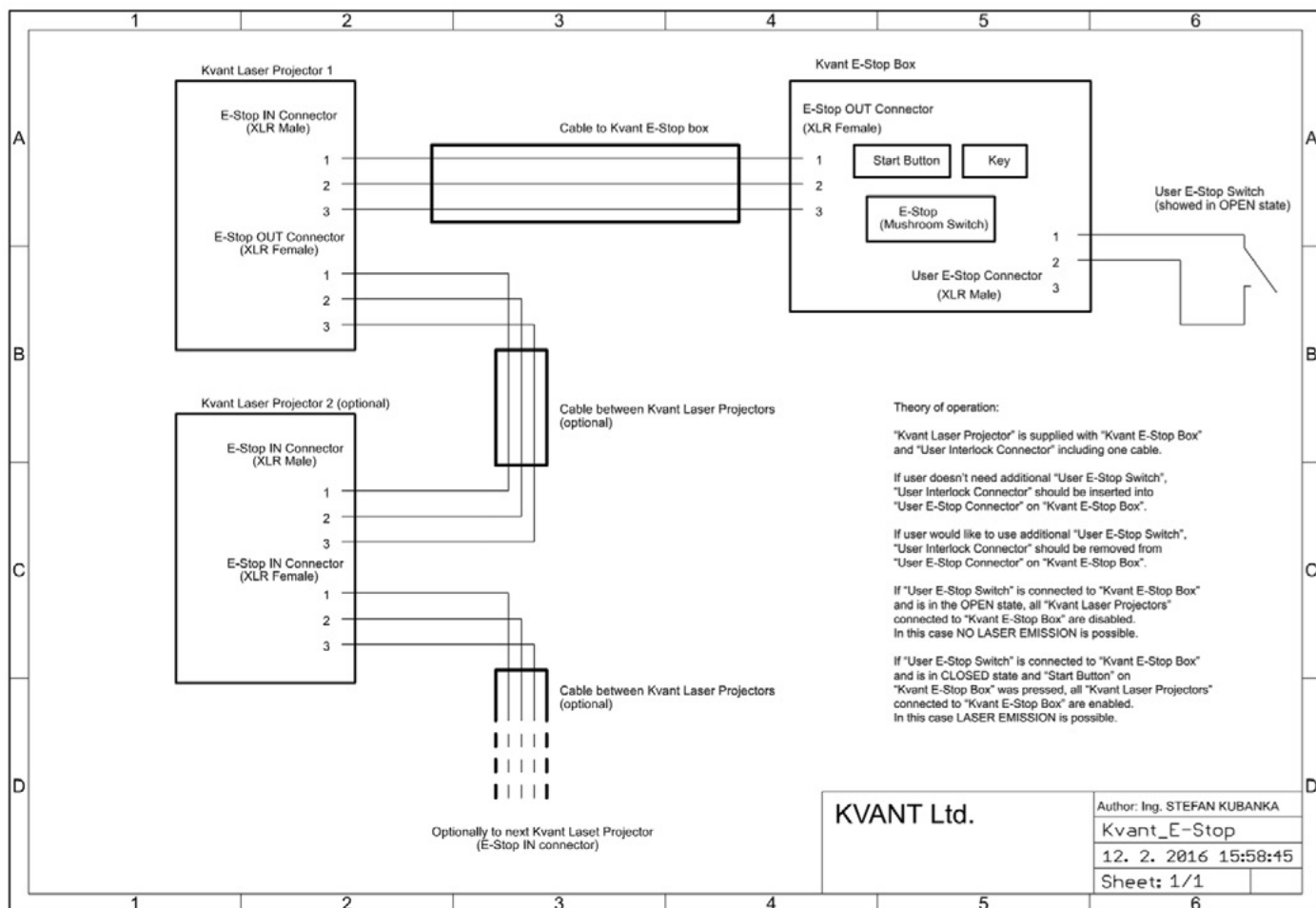
### Restarting Laser After Interlock or Power Failure Event

After the event has been corrected the START button on the E-STOP Remote must be pressed by the operator to disable the Interlock and after an Emission Delay period the laser projector will be ready for use.

## Interlock Connection Diagram



## E-STOP Connection Drawing including User Interlock option

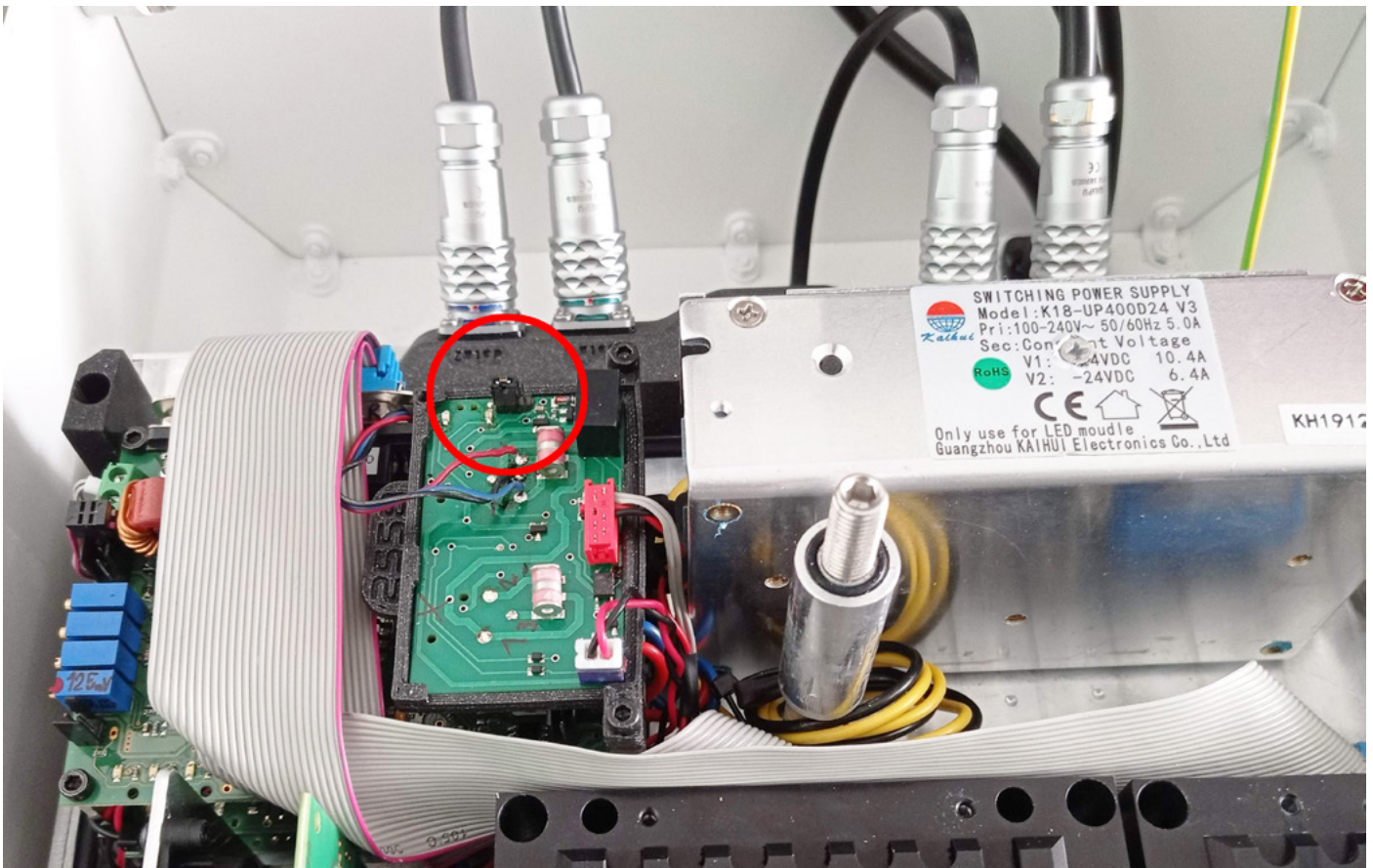
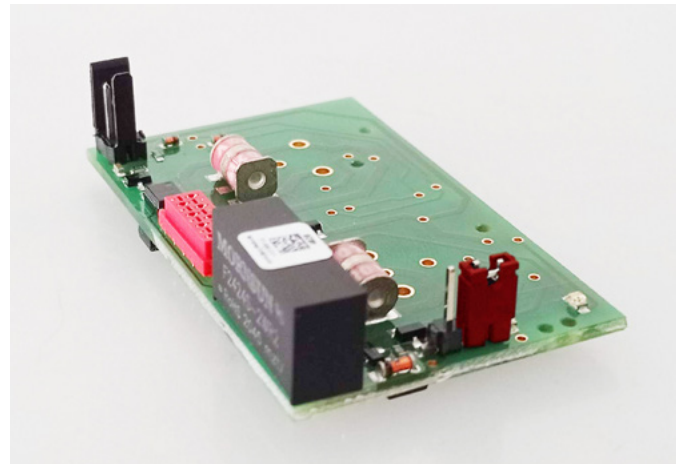
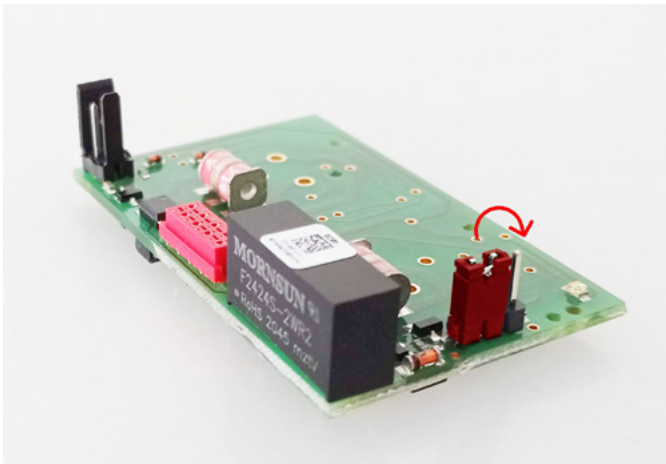


The E-STOP Remote is an integral part of the laser projector. It is there for the safety of the public as well as the operator. Modifying or using anything other than the E-STOP Remote provided, in the manner it was intended, may invalidate your laser projector's variance.



## E-STOP Connection on permanent installations

For permanent installations where LogoLas is operating in Auto-mode, it may be required to bypass the E-STOP Reset button functionality to avoid the necessity of a manual reset of the E-STOP during every startup. To bypass the Reset, move the jumper from its current position to the next available one, as shown in the pictures.



# 2.9

## Maintenance

---

### Aperture Window

To clean the aperture output window use a soft cloth and medical grade isopropyl alcohol.





### Internal Optics

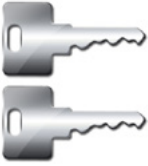


The cleaning of the internal optical components should be performed by an authorised technician only. Incorrect techniques or wrong choice of chemicals used for cleaning could cause serious damage to the laser system. Due to the fact that the optical compartment is split and sealed from the rest of the laser system it shouldn't be necessary to perform this procedure more often than once a year.

# 3

## Item Checklist

Before starting, check that all the following items have been included with your laser system. If anything is missing, contact your supplier.





Item	Number of units	Description
	1	KVANT LogoLas Laser Display System
	1	Emergency STOP Remote
	2	Safety lock key.
	1	Wall mount bracket.





Item	Number of units	Description
	2	Set of Safety Keys
	1	User manual USB drive
	1	Heavy duty flight case

# 4

## Optional Accessories

Here is a list of optional accessories that are compatible with LogoLas laser system.

Item	Description
	SafetyScan lens attachment bracket (lens is not included).
	DiscoScan lens attachment bracket (lens is not included).
	4-way masking plate.
	Mounting console for flagpoles.

Item	Description
	<p>Kvant's 7-15x laser beam expander for long distance projections with OPSL systems.</p>
	<p>Audience Safety System (PASS) is a patented system that can be integrated into a laser projector, for audience scanning certification.</p>
	<p>Motorised Dichroic Filters offer quick and easy colour alignment. The alignment can be done either from FB4 interface or via Beyond Laser control software.</p>
	<p>Custom length LogoLas cables.</p>

## System Overview

---

KVANT LogoLas is a full colour, semiconductor diode laser system designed primarily for a small-scale professional laser graphic displays.

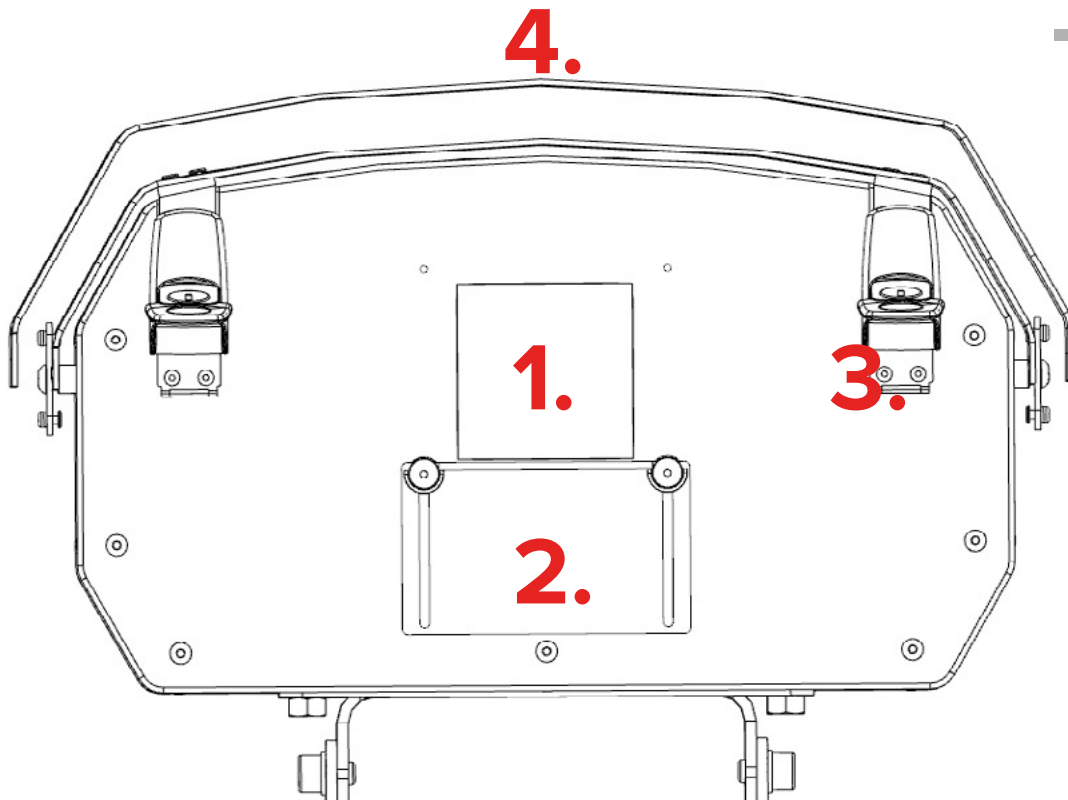
When operated correctly and in the right conditions the LogoLas laser system is able to deliver a strong performance on up to 200m (RGB) and up to 2km (G10 model) projection distances. The LogoLas can display virtually any colour within the basic RGB palette and its secondary mixed colours including white (except one colour models like G10).

The system is air-cooled and designed so that there is no airflow going through the optical compartment of the system. This ensures that all important optical parts of the system stay clean for longer, keeping the maintenance time down to a minimum. This is a real advantage for all the applications where lots of dust or haze is present on a daily basis.

This laser is IP rated to IP54, meaning that it is rain-proof.

# 5.1

## Front View

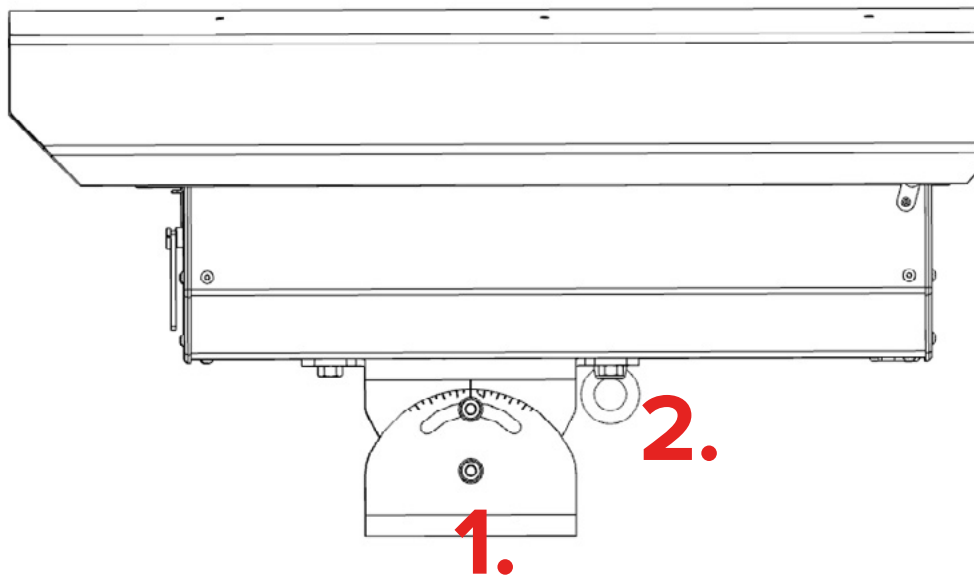


- 1. Laser aperture.** If needed, you can easily swap the aperture anti-reflex glass for a new one, by pushing old one out and clipping new one in.
- 2. Aperture masking plate.** This metal masking plate can be moved up and down when the locking bolt is loosened. This useful safety feature gives you an option to limit the bottom of the laser output area if necessary (for example to avoid audience scanning) and also protects the aperture glass during transport.
- 3. Top lid lockable hatches.**
- 4. Double-layer thermal lid.**



# 5.2

## Side View



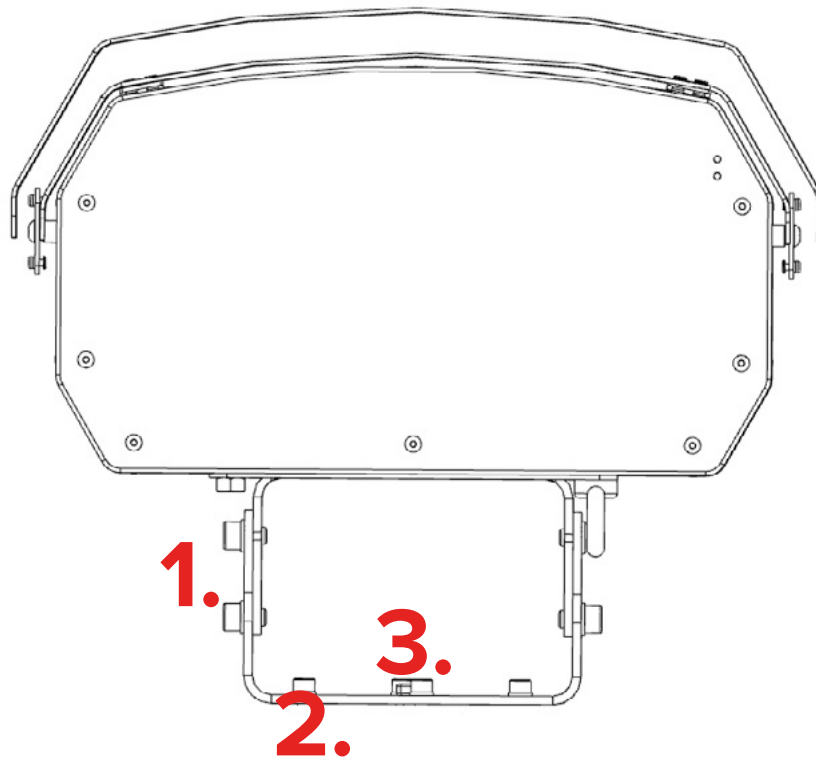
(Size of the chassis on the picture above can vary, depending on exact LogoLas model.)

1. **Tilt mechanism with degree gauge.**
2. **Safety eyelet** - can be also fitted to the front of the unit.

# 5.3

## Rear View

---



1. Din 912 M8 - Hex bolt - Use 6mm hex key
2. Din 912 M6 - Hex bolt - Use 5mm hex key
3. Din 933 M8 - Hex bolt - Use 13mm wrench key

# Beam Alignment

---

## Electrostatic discharge (ESD)

The laser diode cans in LogoLas systems are electrically connected with the laser module housing that encloses them. It means that ESD can destroy the laser diode(s) if the laser module is touched, even though we use the LASORB protection element per every single laser diode.



Please make sure you are correctly ESD grounded before you touch the laser modules.

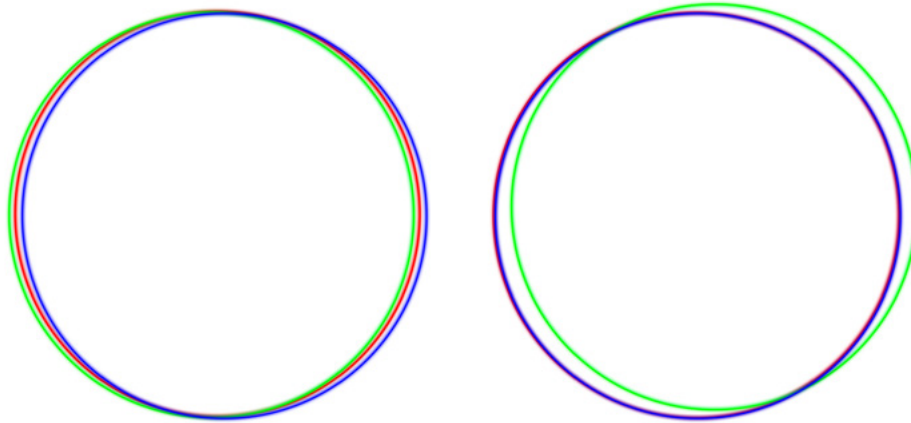


The riskiest of all is touching the electrical contacts on the small PCB mounted on the side of the laser module housing. Some of the contacts are directly linked to the laser diodes inside the module - aside from LASORB protection!

Note that the LASORB won't protect the diodes in all situations. Due to its response time, it doesn't always eliminate all the ESD current, but in some instances may only limit it to a certain level. Also, it won't protect against Charge Device Model (CDM) ESD, that may occur while using some tools.

It is possible that due to transportation, rigging, moving around or vibrations caused by various elements during a set up or laser performance some of the internal optical parts can move slightly resulting in colour misalignment.

The colour misalignment is when two or more colours (red, green and blue) physically do not overlay each other properly like on the picture below. This makes it impossible to get nicely mixed colours like yellow, cyan, magenta and white (including all their shades). If this occurs it is necessary to carry out the beam alignment procedure.



Be cautious when aligning the beams and wear sufficient laser safety protection to avoid accidental exposure to Class 4 laser radiation.

## Beam alignment principle

There are three basic RGB colours (red, green and blue) produced by a laser module (except one colour models such as LogoLas G10 and no need for beam alignment).

The goal of the alignment procedure is to align all three beams (colours) so they overlay each other nicely while they hit exact centre of the bottom scanning mirror.

An easiest way to do the alignment is to project a full size circle onto a wall (or any another suitable projection surface), change its colour as necessary and check the alignment of individual colours on both X and Y axes.



Remember that greater is the distance between the laser system and the projection surface during the alignment, more precise the alignment will be.

When doing the alignment on long distances it is always good to have someone with you who can point you in the right direction. Alternatively you can use binoculars.

# 6.1

## Beam Alignment [LogoLas 2000]



Although KVANT uses the latest technology to protect all the critical components inside this laser system against Electrostatic Discharge, the semiconductor laser diodes within this system are extremely vulnerable to it. This is due to some of the electronic components being exposed when the top cover is taken off.

If you decide to proceed with the Beam Alignment process yourself, it is absolutely essential that all the common ESD protection rules are strictly followed. We don't accept any responsibility for Electrostatic Discharge damages to laser diodes caused by customer.

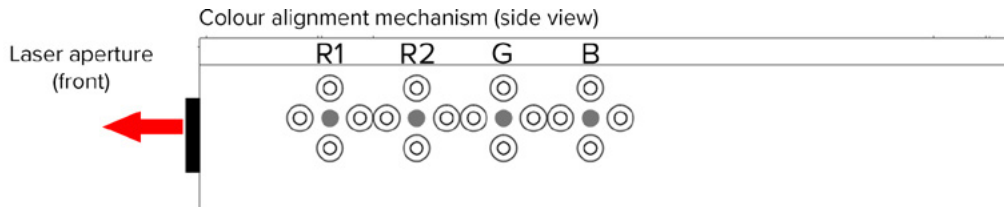
1. Open the external housing of the laser system by releasing [two latches](#) on the front and swivel the cover around the back end hinge.
2. To open the internal compartment of the laser system unscrew two star knobs and slowly remove the cover.
3. Removal of the cover will show the two internal defeatable magnetic interlocks. You must flip over the right side of the magnetic interlock until it touches the other side. You will be able to read the warning label "Interlock Defeated".



Placing the magnetic interlock in the defeated position prevent the cover to be closed.

- Power up the system as normal.
- Firstly, it is necessary to align a colour with the longest beam path between the laser module output and the scanning system in a way so it hits the exact centre of the bottom scanning mirror – in this case it is the blue laser beam.

Create a blue beam effect (point) and check visually whether the beam hits the exact centre of the bottom scanning mirror. If not, follow the diagram below to adjust the beam path accordingly (step 1 on the diagram).



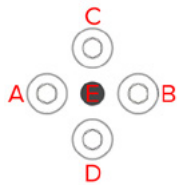
### Correct order of the colour (beam) alignment:

- 1) B : blue beam hits the centre of the bottom scanning mirror
- 2) G : align green beam to blue beam for unified cyan beam
- 3) R1 : align red (R1) beam to green beam for unified yellow beam
- 4) R2 : align red (R2) beam to red (R1) beam for unified red beam



Always loosen one of the screws in the pair first, before tightening the 2nd one down.

### How to use the beam alignment mechanism (to align each beam)



#### A + B | Adjusters for moving the beam UP & DOWN

- To move the beam UP: loosen screw A and then tighten screw B
- To move the beam DOWN: loosen screw B and then tighten screw A

#### C + D | Adjusters for moving the beam LEFT & RIGHT

- To move the beam LEFT: loosen screw C and then tighten screw D
- To move the beam RIGHT: loosen screw D and then tighten screw C

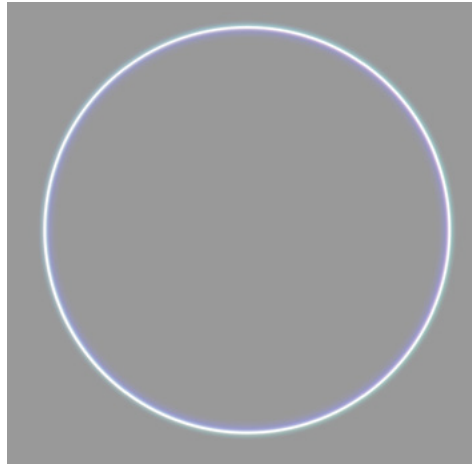
E - fixed position pivoting bolt - DO NOT USE!



All alignment screws A,B,C and D must be fastened at the end of each beam alignment procedure. Even if only one of them is loose, there will be not enough internal pressure on the pivoting bolt (E), which may result into misalignment of respective colour.

- Create a full size cyan circle (static tunnel effect) and check whether the green circle overlays the blue circle all the way around the shape. If not, adjust the beam path of the green circle accordingly (step 2 on the diagram above).
- Create a full size yellow circle (static tunnel effect) and check whether the red circle overlays the green circle all the way around the shape. If not, adjust the beam path of the red circle accordingly (step 3 on the diagram above).
- Create a full size red circle (static tunnel effect) and check whether the 2nd red circle overlays the 1st red circle all the way around the shape. If not, adjust the beam path of the 2nd red circle accordingly (step 4 on the diagram above).

9. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



# 6.2

## Beam Alignment [LogoLas 3000]



Although KVANT uses the latest technology to protect all the critical components inside this laser system against Electrostatic Discharge, the semiconductor laser diodes within this system are extremely vulnerable to it. This is due to some of the electronic components being exposed when the top cover is taken off.

If you decide to proceed with the Beam Alignment process yourself, it is absolutely essential that all the common ESD protection rules are strictly followed. We don't accept any responsibility for Electrostatic Discharge damages to laser diodes caused by customer.

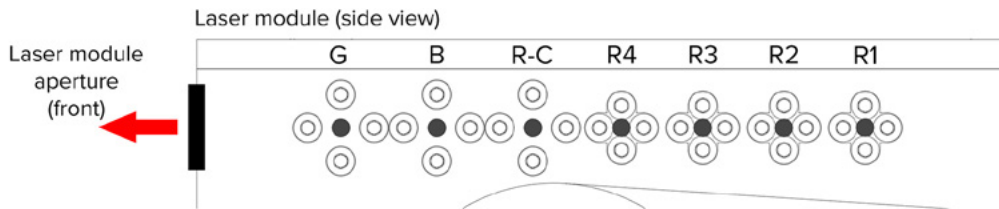
1. Open the external housing of the laser system by releasing [two latches](#) on the front and swivel the cover around the back end hinge.
2. To open the internal compartment of the laser system unscrew two star knobs and slowly remove the cover.
3. Removal of the cover will show the two internal defeatable magnetic interlocks. You must flip over the right side of the magnetic interlock until it touches the other side. You will be able to read the warning label "Interlock Defeated".



Placing the magnetic interlock in the defeated position prevent the cover to be closed.



- Power up the system as normal.
- Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram below to adjust the beam path accordingly (step 1 & 2 on the diagram).



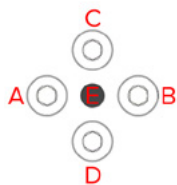
### Correct order of the colour (beam) alignment:

- R1 - R4: align four red beams to pairs; R1 with R2 and R3 with R4
- R-C : combine paired beams (R1&R2 with R3&R4) for unified main red beam
- B : align blue beam to red beam for unified magenta beam
- G : align green beam to magenta beam for unified white beam



Always loosen one of the screws in the pair first, before tightening the 2nd one down.

### How to use the beam alignment mechanism (to align each beam)



#### A + B | Adjusters for moving the beam UP & DOWN

- To move the beam UP: loosen screw A and then tighten screw B
- To move the beam DOWN: loosen screw B and then tighten screw A

#### C + D | Adjusters for moving the beam LEFT & RIGHT

- To move the beam LEFT: loosen screw C and then tighten screw D
- To move the beam RIGHT: loosen screw D and then tighten screw C

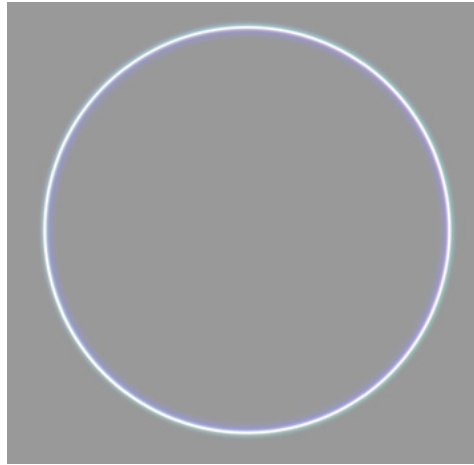
E - fixed position pivoting bolt - DO NOT USE!



All alignment screws A,B,C and D must be fastened at the end of each beam alignment procedure. Even if only one of them is loose, there will be not enough internal pressure on the pivoting bolt (E), which may result into misalignment of respective colour.

- Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
- Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 4 on the diagram above).

8. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



# 6.3

## Beam Alignment [LogoLas 3400]



Although KVANT uses the latest technology to protect all the critical components inside this laser system against Electrostatic Discharge, the semiconductor laser diodes within this system are extremely vulnerable to it. This is due to some of the electronic components being exposed when the top cover is taken off.

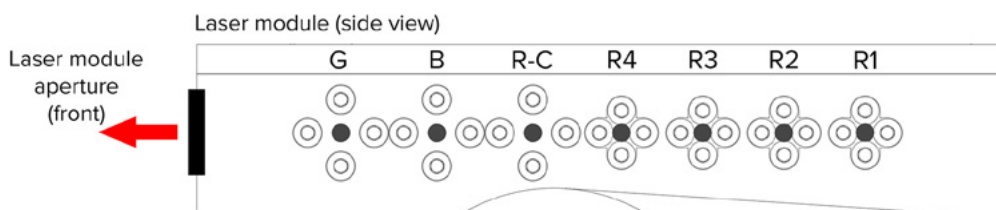
If you decide to proceed with the Beam Alignment process yourself, it is absolutely essential that all the common ESD protection rules are strictly followed. We don't accept any responsibility for Electrostatic Discharge damages to laser diodes caused by customer.

1. Open the external housing of the laser system by releasing [two latches](#) on the front and swivel the cover around the back end hinge.
2. To open the internal compartment of the laser system unscrew two star knobs and slowly remove the cover.
3. Removal of the cover will show the two internal defeatable magnetic interlocks. You must flip over the right side of the magnetic interlock until it touches the other side. You will be able to read the warning label "Interlock Defeated".



Placing the magnetic interlock in the defeated position prevent the cover to be closed.

- Power up the system as normal.
- Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram below to adjust the beam path accordingly (step 1 & 2 on the diagram).



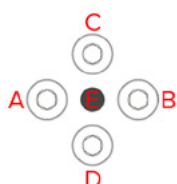
### Correct order of the colour (beam) alignment:

- R1 - R4: align four red beams to pairs; R1 with R2 and R3 with R4
- R-C : combine paired beams (R1&R2 with R3&R4) for unified main red beam
- B : align blue beam to red beam for unified magenta beam
- G : align green beam to magenta beam for unified white beam



Always loosen one of the screws in the pair first, before tightening the 2nd one down.

### How to use the beam alignment mechanism (to align each beam)



#### A + B | Adjusters for moving the beam UP & DOWN

- To move the beam UP: loosen screw A and then tighten screw B
- To move the beam DOWN: loosen screw B and then tighten screw A

#### C + D | Adjusters for moving the beam LEFT & RIGHT

- To move the beam LEFT: loosen screw C and then tighten screw D
- To move the beam RIGHT: loosen screw D and then tighten screw C

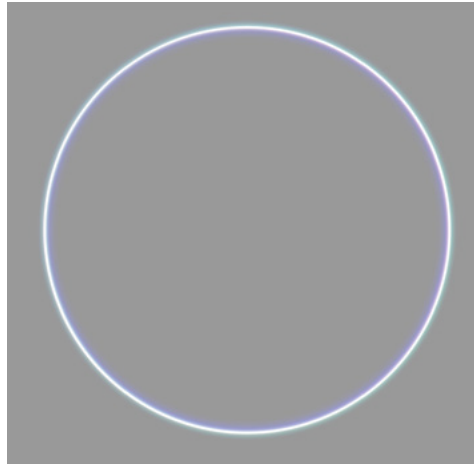
E - fixed position pivoting bolt - DO NOT USE!



All alignment screws A,B,C and D must be fastened at the end of each beam alignment procedure. Even if only one of them is loose, there will be not enough internal pressure on the pivoting bolt (E), which may result into misalignment of respective colour.

- Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
- Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 4 on the diagram above).

8. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



# 6.4

## Beam Alignment [LogoLas 6000]



Although KVANT uses the latest technology to protect all the critical components inside this laser system against Electrostatic Discharge, the semiconductor laser diodes within this system are extremely vulnerable to it. This is due to some of the electronic components being exposed when the top cover is taken off.

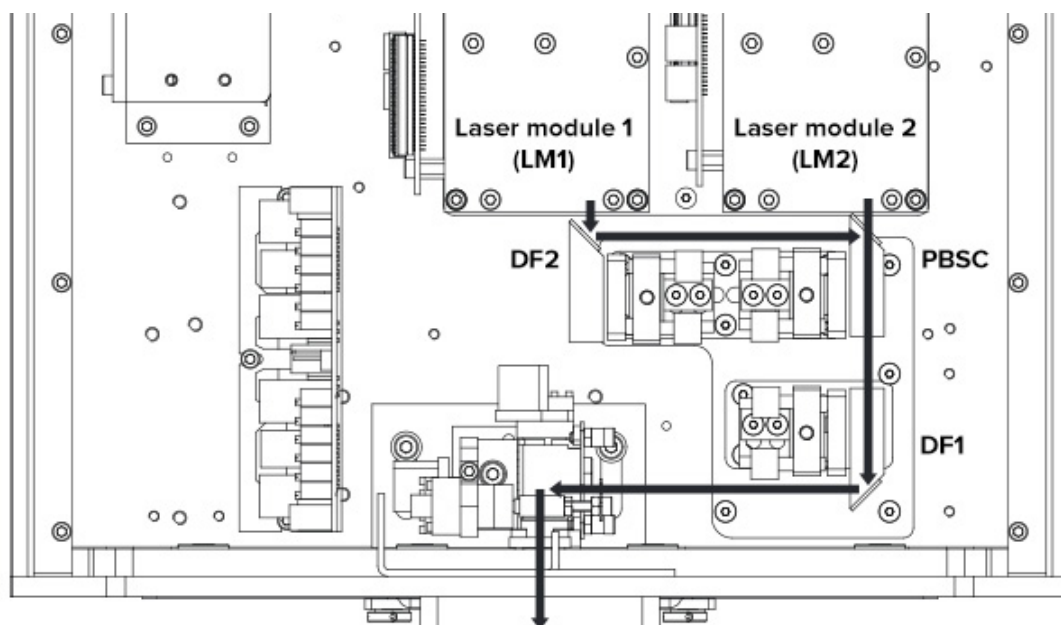
If you decide to proceed with the Beam Alignment process yourself, it is absolutely essential that all the common ESD protection rules are strictly followed. We don't accept any responsibility for Electrostatic Discharge damages to laser diodes caused by customer.

1. Open the external housing of the laser system by releasing [two latches](#) on the front and swivel the cover around the back end hinge.
2. To open the internal compartment of the laser system unscrew two star knobs and slowly remove the cover.
3. Removal of the cover will show the two internal defeatable magnetic interlocks. You must flip over the right side of the magnetic interlock until it touches the other side. You will be able to read the warning label "Interlock Defeated".

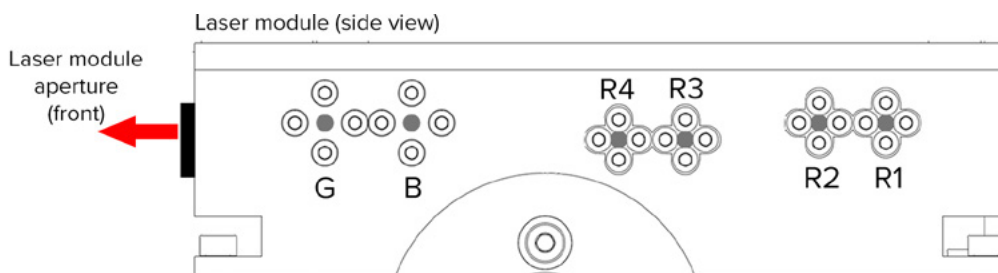


Placing the magnetic interlock in the defeated position prevent the cover to be closed.

4. Power up the system as normal.
5. Firstly, it is necessary to align the colour with longest beam path between the **Laser Module 2 (LM2)** output and the scanning system. The beam must hit the exact centre of the bottom scanning mirror and in this case it is the red laser beam (made of 4 individual red beams R4 – R1).
6. Cover the laser aperture of **Laser Module 1 (LM1)** with a small metal plate of some sort – this will allow you to work with the beams from **Laser Module 2 (LM2) only**.
7. Create a red beam effect (point) and check visually whether the beam hits the exact centre of the bottom scanning mirror. If not, use dichroic mount **DF1** to adjust the beam path accordingly (showed on the picture below). To adjust the dichroic mount use the two adjustment knobs – each one works for one axis.



8. Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram below to adjust the beam path accordingly (step 1 on the diagram below).



**Correct order of the colour (beam) alignment:**

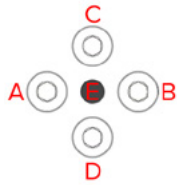
- 1) R1 - R4: align four red beams for unified main red beam
- 2) B : align blue beam to red beam for unified magenta beam
- 3) G : align green beam to magenta beam for unified white beam





Always loosen one of the screws in the pair first, before tightening the 2nd one down.

#### How to use the beam alignment mechanism (to align each beam)



**A + B** | Adjusters for moving the beam UP & DOWN

- To move the beam UP: loosen screw A and then tighten screw B
- To move the beam DOWN: loosen screw B and then tighten screw A

**C + D** | Adjusters for moving the beam LEFT & RIGHT

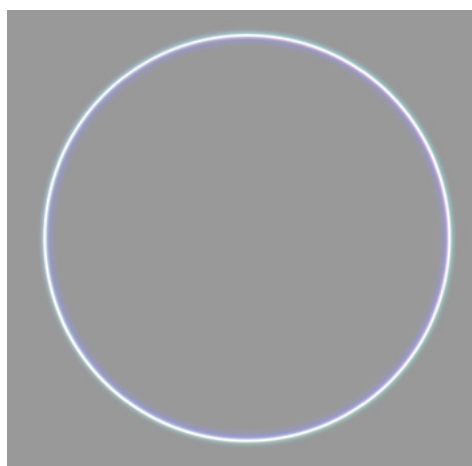
- To move the beam LEFT: loosen screw C and then tighten screw D
- To move the beam RIGHT: loosen screw D and then tighten screw C

**E** - fixed position pivoting bolt - DO NOT USE!



All alignment screws A,B,C and D must be fastened at the end of each beam alignment procedure. Even if only one of them is loose, there will be not enough internal pressure on the pivoting bolt (E), which may result into misalignment of respective colour.

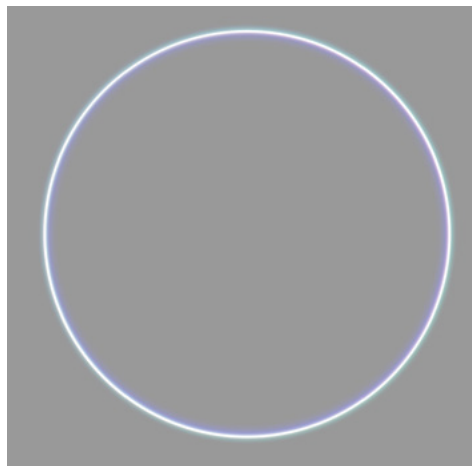
9. Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 2 on the diagram above).
10. Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
11. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.





The next step is to align the colours of **Laser Module 1 (LM1)**.

1. Cover the laser aperture of **Laser Module 2 (LM2)** with a small metal plate of some sort – this will allow you to work with the beams from **Laser Module 1 (LM1)** only.
2. Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 1 on the diagram above).
3. Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 2 on the diagram above).
4. Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
5. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



Finally we need to align the beams of both **Laser Module 1 (LM1)** and **Laser Module 2 (LM2)** together.

1. Create a full size white circle (static tunnel effect) and check whether the white beam from **LM1** joins the white beam from **LM2** at exactly the same point inside the **Polarisation Beam Splitter Cube (PBSC)**. If not, use dichroic mount DF2 to adjust the beam path accordingly.
2. Once both beams are joined together in **PBSC**, check whether the both white circles overlay each other all the way around the shape.
3. If not, use **PBSC mount** to adjust the beam path of **LM1** accordingly. If the alignment procedure was done successfully you can see both white circles nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture above.

# 6.5

## Beam Alignment [LogoLas 6800]



Although KVANT uses the latest technology to protect all the critical components inside this laser system against Electrostatic Discharge, the semiconductor laser diodes within this system are extremely vulnerable to it. This is due to some of the electronic components being exposed when the top cover is taken off.

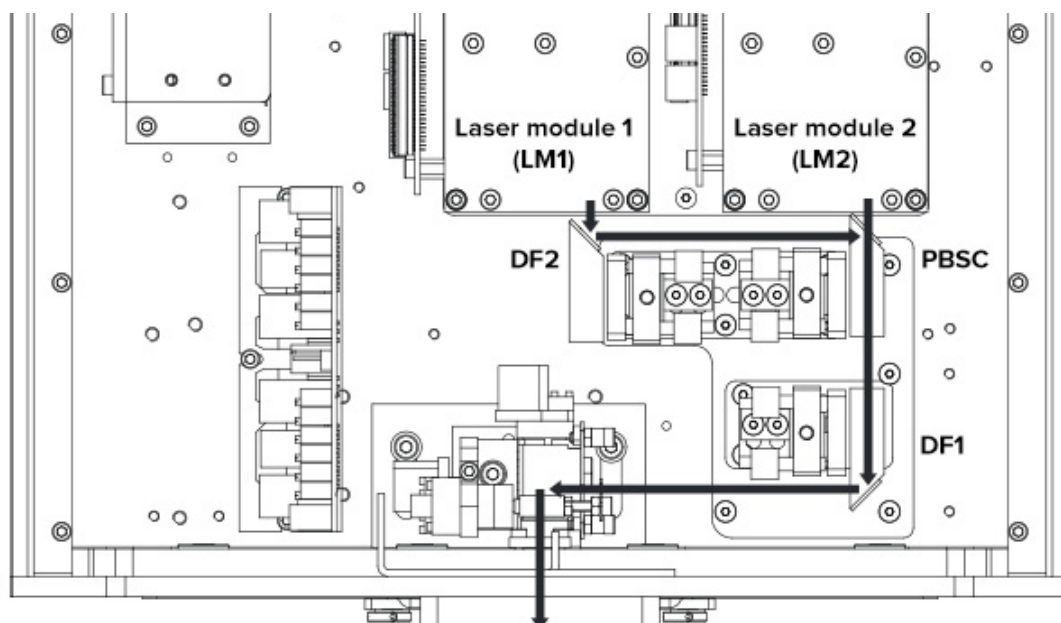
If you decide to proceed with the Beam Alignment process yourself, it is absolutely essential that all the common ESD protection rules are strictly followed. We don't accept any responsibility for Electrostatic Discharge damages to laser diodes caused by customer.

1. Open the external housing of the laser system by releasing [two latches](#) on the front and swivel the cover around the back end hinge.
2. To open the internal compartment of the laser system unscrew two star knobs and slowly remove the cover.
3. Removal of the cover will show the two internal defeatable magnetic interlocks. You must flip over the right side of the magnetic interlock until it touches the other side. You will be able to read the warning label "Interlock Defeated".

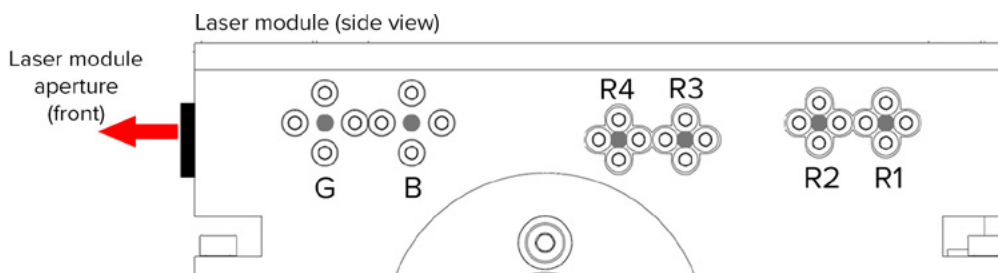


Placing the magnetic interlock in the defeated position prevent the cover to be closed.

4. Power up the system as normal.
5. Firstly, it is necessary to align the colour with longest beam path between the **Laser Module 2 (LM2)** output and the scanning system. The beam must hit the exact centre of the bottom scanning mirror and in this case it is the red laser beam (made of 4 individual red beams R4 – R1).
6. Cover the laser aperture of **Laser Module 1 (LM1)** with a small metal plate of some sort – this will allow you to work with the beams from **Laser Module 2 (LM2) only**.
7. Create a red beam effect (point) and check visually whether the beam hits the exact centre of the bottom scanning mirror. If not, use dichroic mount **DF1** to adjust the beam path accordingly (showed on the picture below). To adjust the dichroic mount use the two adjustment knobs – each one works for one axis.



8. Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram below to adjust the beam path accordingly (step 1 on the diagram below).



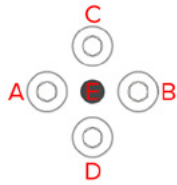
**Correct order of the colour (beam) alignment:**

- 1) R1 - R4: align four red beams for unified main red beam
- 2) B : align blue beam to red beam for unified magenta beam
- 3) G : align green beam to magenta beam for unified white beam



Always loosen one of the screws in the pair first, before tightening the 2nd one down.

#### How to use the beam alignment mechanism (to align each beam)



**A + B** | Adjusters for moving the beam UP & DOWN

- To move the beam UP: loosen screw A and then tighten screw B
- To move the beam DOWN: loosen screw B and then tighten screw A

**C + D** | Adjusters for moving the beam LEFT & RIGHT

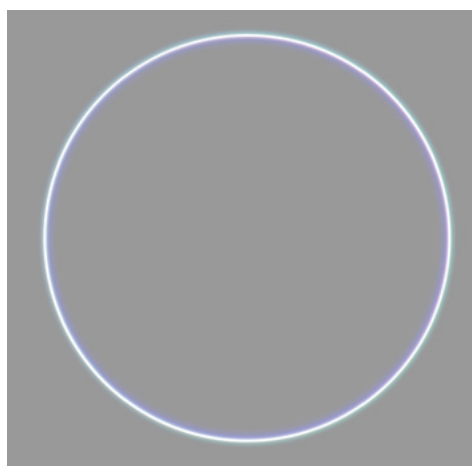
- To move the beam LEFT: loosen screw C and then tighten screw D
- To move the beam RIGHT: loosen screw D and then tighten screw C

**E** - fixed position pivoting bolt - DO NOT USE!



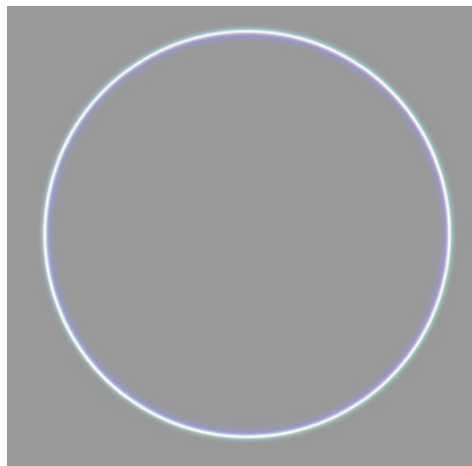
All alignment screws A,B,C and D must be fastened at the end of each beam alignment procedure. Even if only one of them is loose, there will be not enough internal pressure on the pivoting bolt (E), which may result into misalignment of respective colour.

9. Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 2 on the diagram above).
10. Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
11. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



The next step is to align the colours of **Laser Module 1 (LM1)**.

1. Cover the laser aperture of **Laser Module 2 (LM2)** with a small metal plate of some sort – this will allow you to work with the beams from **Laser Module 1 (LM1)** only.
2. Create a full size red circle (static tunnel effect) and check whether the red circles of all R4, R3, R2 and R1 overlay each other all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 1 on the diagram above).
3. Create a full size magenta circle (static tunnel effect) and check whether the blue circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 2 on the diagram above).
4. Create a full size yellow circle (static tunnel effect) and check whether the green circle overlays the red circle all the way around the shape. If not, follow the diagram above to adjust the beam path accordingly (step 3 on the diagram above).
5. Finally create a full size white circle (static tunnel effect). If the alignment procedure was done successfully you can see all the colours nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture below.



Finally we need to align the beams of both **Laser Module 1 (LM1)** and **Laser Module 2 (LM2)** together.

1. Create a full size white circle (static tunnel effect) and check whether the white beam from **LM1** joins the white beam from **LM2** at exactly the same point inside the **Polarisation Beam Splitter Cube (PBSC)**. If not, use dichroic mount DF2 to adjust the beam path accordingly.
2. Once both beams are joined together in **PBSC**, check whether the both white circles overlay each other all the way around the shape.
3. If not, use **PBSC mount** to adjust the beam path of **LM1** accordingly. If the alignment procedure was done successfully you can see both white circles nicely overlaying each other, resulting in even, bright and sharp circle like the one on the picture above.



# Technical Specifications

---

All the technical specifications are subject to change without prior notice.



# Technical Specification

## [LogoLas-2000 FB4]

### KVANT LogoLas 2000 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 2W\*

Maximum Output Power: 2.28W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>340mW
Green	520nm	>700mW
Blue	450nm	>1200mW
Total		>2240mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 306m

Beam diameter at laser aperture: 5.2 × 4.5mm

Beam divergence (half angle): Red: 0.3mrad      Green: 0.4/0.2 mrad      Blue: 0.4/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 40kpps@8°, max. scanning angle 60° on both axes

Saturn 1, 90kpps@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 264 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.

# 7.2

## Technical Specification [LogoLas-3000 FB4]

### KVANT LogoLas 3000 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 3W\*

Maximum Output Power: 3.48W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>680mW
Green	520nm	>900mW
Blue	445nm	>1500mW
Total		>3080mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 350m

Beam diameter at laser aperture: 4.5 × 4.5mm

Beam divergence (half angle): Red: 0.3mrad      Green: 0.4/0.2 mrad      Blue: 0.4/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 40kpps@8°, max. scanning angle 60° on both axes

Saturn 1, 90kpps@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCon TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 270 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.



# 7.3

## Technical Specification [LogoLas-3400 FB4]

### KVANT LogoLas 3400 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 3.4W\*

Maximum Output Power: 3.8W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>1000mW
Green	520nm	>900mW
Blue	445nm	>1500mW
Total		>3400mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 409m

Beam diameter at laser aperture: 4.5 × 4.5mm

Beam divergence (half angle): Red: 0.4/0.3 mrad      Green: 0.4/0.2 mrad      Blue: 0.4/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 40kpps@8°, max. scanning angle 60° on both axes

Saturn 1, 90kpps@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 270 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.

# 7.4

## Technical Specification [LogoLas-6000 FB4]

### KVANT LogoLas 6000 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 6W\*

Maximum Output Power: 6.79W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>1300mW
Green	520nm	>1800mW
Blue	445nm	>3000mW
Total		>6100mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 545m

Beam diameter at laser aperture: 4.5 × 4.5mm

Beam divergence (half angle): Red: 0.4/0.3 mrad      Green: 0.4/0.2 mrad      Blue: 0.4/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 40kpps@8°, max. scanning angle 60° on both axes

Saturn 1, 90kpps@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 353 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.

# 7.5

## Technical Specification [LogoLas-6800 FB4]

### KVANT LogoLas 6800 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 6.8W\*

Maximum Output Power: 7.4W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>2000mW
Green	520nm	>1800mW
Blue	445nm	>3000mW
Total		>6800mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 580m

Beam diameter at laser aperture: 4.5 × 4.5mm

Beam divergence(half angle): Red: 0.4/0.3 mrad      Green: 0.4/0.2 mrad      Blue: 0.4/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 40kp/s@8°, max. scanning angle 60° on both axes

Saturn 1, 90kp/s@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 353 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.

# 7.6

## Technical Specification [LogoLas-10 FB4]

### KVANT LogoLas 10 FB4 – full colour, semiconductor diode laser system

Total Optical Power (guaranteed): 9.7W\*

Maximum Output Power: 10.4W

*\*Due to Advanced Optical Correction technology used in our laser systems the optical power output of each laser colour within the system may slightly differ from the specification of respective laser module(s) installed. This does not affect the guaranteed total power output.*

Colour	Wavelength	Power installed
Red	637nm	>2500mW
Green	520nm	>2800mW
Blue	445nm	>4500mW
Total		>9800mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 578m

Beam diameter at laser aperture: 5 × 4.5mm

Beam divergence (half angle): Red: 0.5mrad      Green: 0.6/0.2 mrad      Blue: 0.7/0.2 mrad

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

ScannerMAX 506 Compact, 30kpps@8°, max. scanning angle 60° on both axes

Saturn 5, 50kpps@7°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 340VA/100-230V

Operation temperature: 10-40°C

Ingress protection rating: IP20

Dimensions (WxDxH): 339 × 353 × 168mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.



# Technical Specification

## [LogoLas-10 OPSL

**KVANT LogoLas 10 OPSL FB4 – Coherent OPSL module | single-colour [GREEN] laser projector**

Total Optical Power (guaranteed): 10W\*

Colour	Wavelength	Power installed
Green	532 OPSL	>10000mW
Total		>10000mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 578m

Beam diameter at laser aperture: 4mm

Beam divergence (half angle): 0.68 [at full angle, averaged value, \*see note A below]

Modulation: 0-5V analog, up to 100kHz

Module cooling: TEC

Scanning System:

CT-6215 | 30kpps @ 8°, max. scanning angle 60° on both axes (optional)

Control signal: Ethernet, DMX/ArtNet, ILDA, SD card (via inbuilt FB4 control interface)

Power requirements: 100-230V/50 - 60Hz / Neutrik powerCON TRUE1

Consumption: 600VA/100-230V

Operation temperature: 0-40°C

Ingress protection rating: IP65

Dimensions (WxDxH): 377 × 600 × 252mm

Weight: 21kg

Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety,

fast electromechanical shutter | reaction time <20ms, adjustable aperture masking plate. This laser system fully complies with the latest EN 60825-1:2014, FDA regulations and TUV Laser Safety.

\*Note A

The beam divergence total is calculated as an average arithmetic value of all individual colours. The divergence of each colour is calculated as:

1. FWHM of the beam cross-section for round beams, or
2. The arithmetic average of the beam's horizontal and vertical divergence for all rectangular beams.