MODEL SPECIFIC OPERATIONAL MANUAL

EPIC SERIES

KVANT®

www.kvantlasers.sk

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1 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.

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2 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.

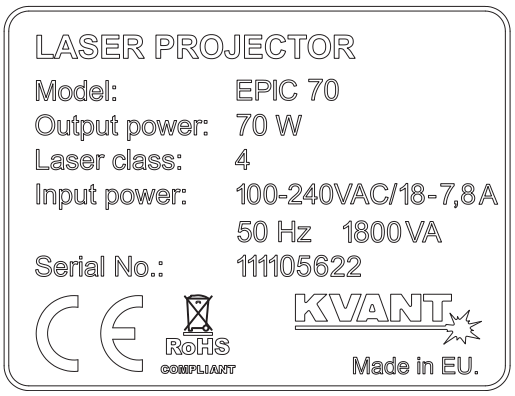
KVANT

This product is in conformity with performance standards for laser products under 21 CFR Part 1010.4 and 1040.11 except with respect to those characteristics authorized by
Variance Number: 2012-V-0620
Effective Date: Dec.31 . 2018

Date of Manufacture 03 (Month) 2021 (Year)

KVANT spol. s.r.o.
Opavska 24, 831 01 Bratislava 37,Slovakia
Made in Slovakia

Max current at 110V: 3A
Max current at 230V: 3A



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Caution

This laser entertainment system is rated as a **Class 4 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.

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.

This laser system is not waterproof or dust-proof. Make sure to use an appropriate cover or enclosure if it is used in the rain, snow or similar severe environment conditions.

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.

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.

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2.1 WHAT IS A LASER AND HOW DOES IT WORK?

What is a LASER?

The laser is a device that creates continuous visible light energy waves (streams of photons that are referred to as “laser 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 in mid-air?

Mainly it is the particles of dust in the air that the laser beam hits on its path, scattering the light. This dust or fog is called a “scattering medium”. That’s why we “laserists” use haze or smoke machines to make lasers more visible. Too much of the haze or smoke will greatly attenuate the visibility, 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.

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.

How far does it travel?

Technically, the laser light will travel forever until it strikes a surface and is absorbed. A better question is – how far will the light travel and still be useful? 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.

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 over a wide angle in front of the projector. The scanning system can not only direct the laser beam to specific, static locations, but it can also create shapes by rapidly moving the laser beam over a path. 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.

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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.

The laser projector should be operated by an adult person who passed their training as a Laser Display Operator of Class 4 laser devices. The operator should be aware of and follow all the regulations, requirements, and laws regarding a country where operating the Class 4 laser system.

The manufacturer holds no responsibility for injuries or damages caused by the use of this laser display equipment.

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. Audience Scanning is a technique that involves projecting laser effects directly into an audience. Never perform Audience Scanning unless you: a) are trained to do Audience Scanning; b) use a projector that has the proper safety systems built in (such as PASS); and c) have verified that the projected light levels do not exceed the applicable MPE for the jurisdiction. Otherwise, always project with the laser above audience head level – at least 3m above floor level.
5. When projecting the laser outdoors, avoid pointing the laser at aircrafts, buses, trains, etc. Never leave the laser system unattended when it 's switched on.
6. 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).
7. 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.

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2.3 INSTALLATION OF THE SYSTEM

Please follow these rules during the installation:

1. Do not connect the device to power supply during the installation. Only connect the device to power after the installation and mounting have been completed.
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 tightened down, and that it cannot get loose and move as a result of sound vibrations, cables pulled on, or similar external disturbances.
4. Always attach a safety chain or cable between the projector and its structure (such as truss).
5. Ensure that all the cables have enough length just incase 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.

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.

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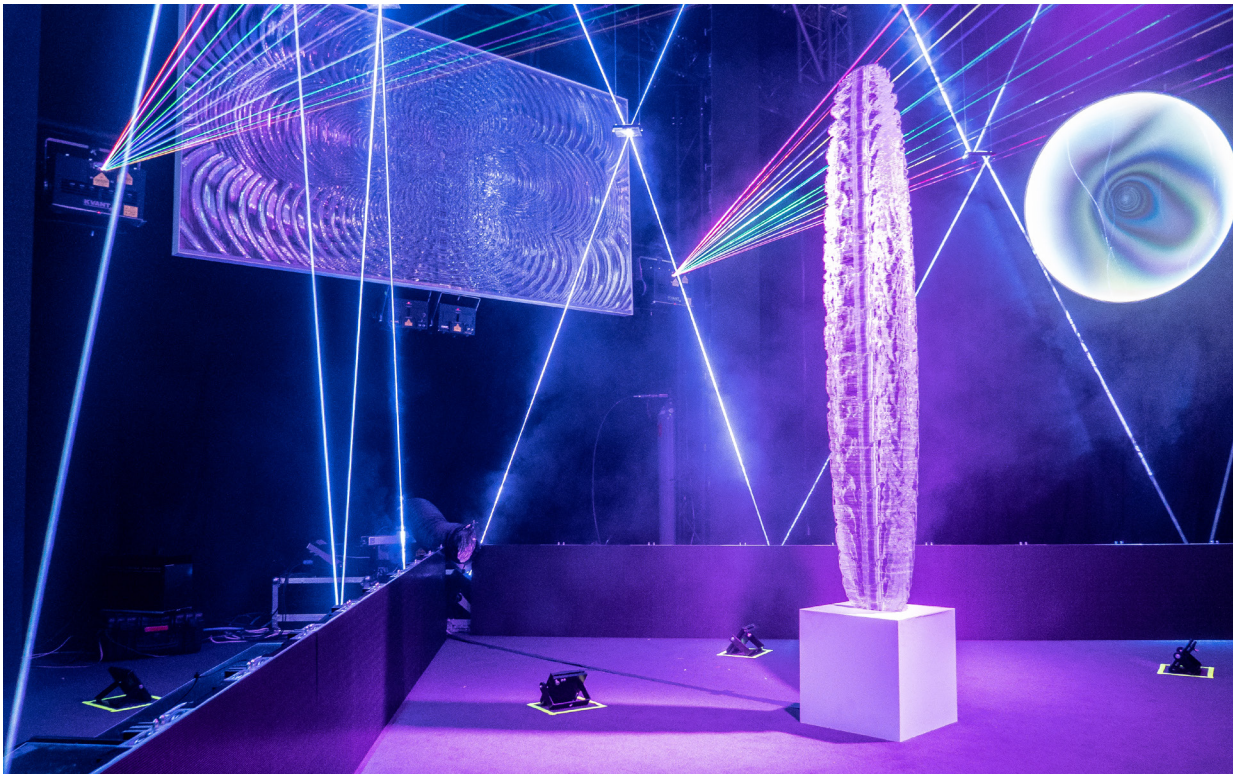
2.4 CONTROL SYSTEM

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.



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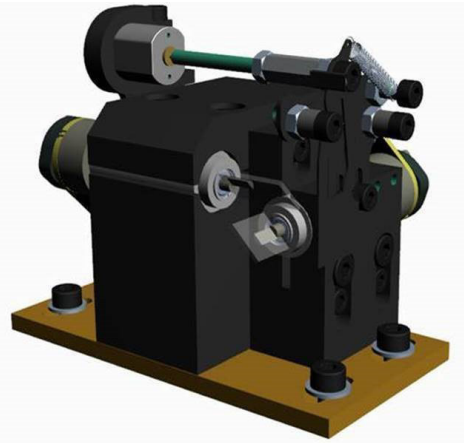
2.5 SCANNING SYSTEM

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 "35K". (The term "35K" refers to a metric that is achieved when the original ILDA test pattern is projected at 8 degrees, and all of its visual qualities are maintained. Note that all other patterns may be scanned much wider, and in some cases even faster, but the term "35K" only refers to a single test pattern, and single test condition). 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 × 10.500 = 31.500pps). Given that the scanners noted above are "35K" scanners, this seems easily achievable. However, the projection of 3 separate stars necessitates a wider scan angle, and – in general, the scan speed must be reduced as the projection angle is increased. Thus, it may be 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.

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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.

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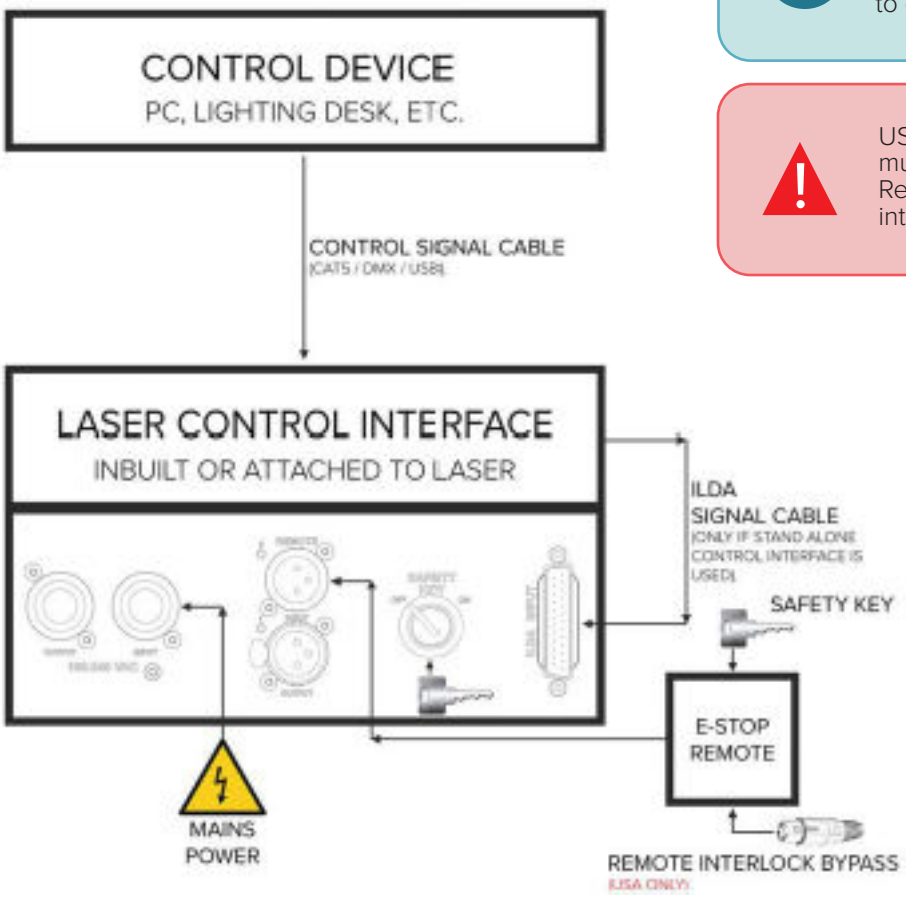
2.6 CONNECTION DIAGRAM

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.



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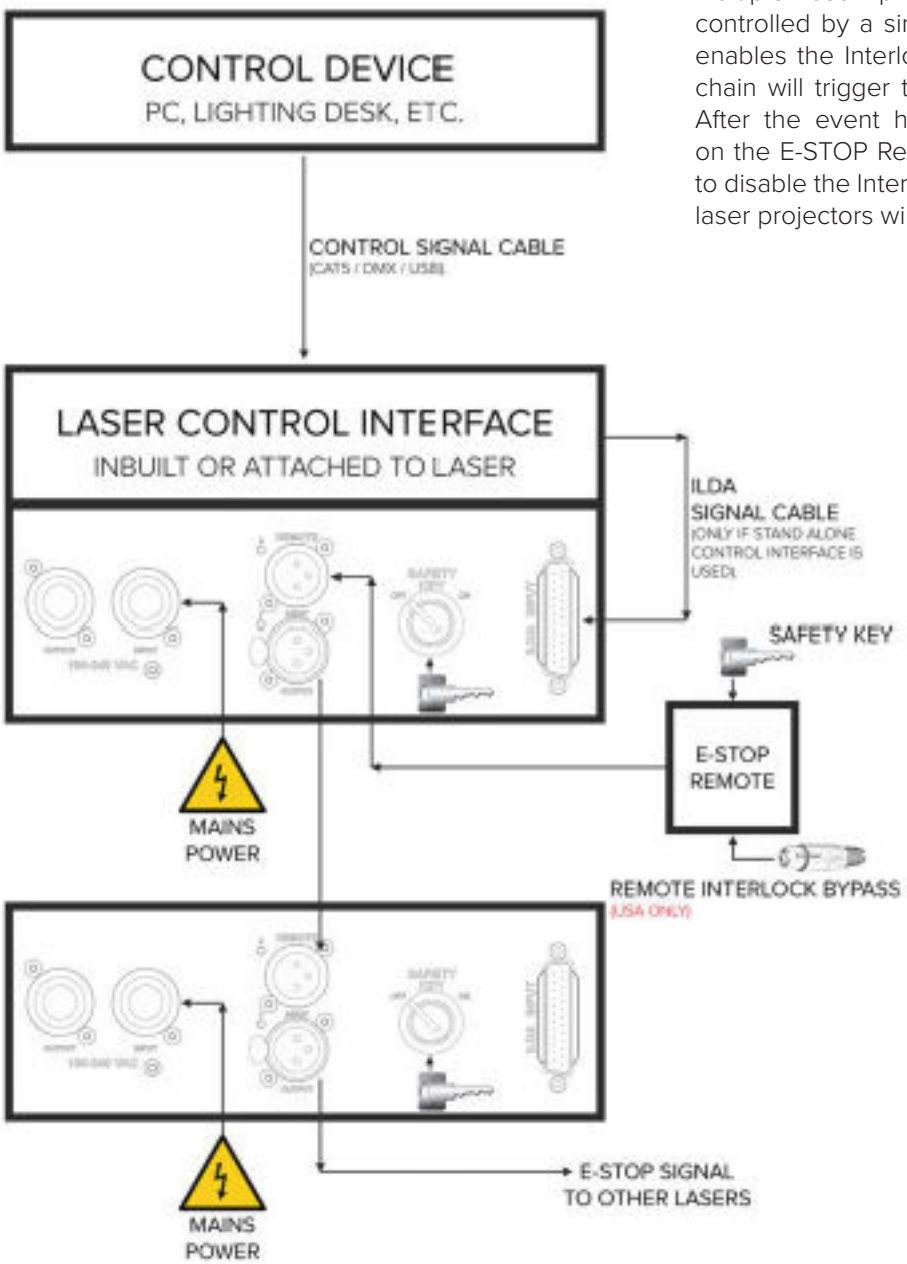
2.7 MULTIPLE SYSTEM INTERLOCK



Multiple laser projectors may be daisy chained and controlled by a single E-STOP Remote. Any event which enables the Interlock on any laser projector in the daisy chain will trigger the safety Interlock for all the systems. After the event has been corrected the START button on the E-STOP Remote must be pressed by the operator to disable the Interlock. After an Emission Delay period the laser projectors will be ready for use.

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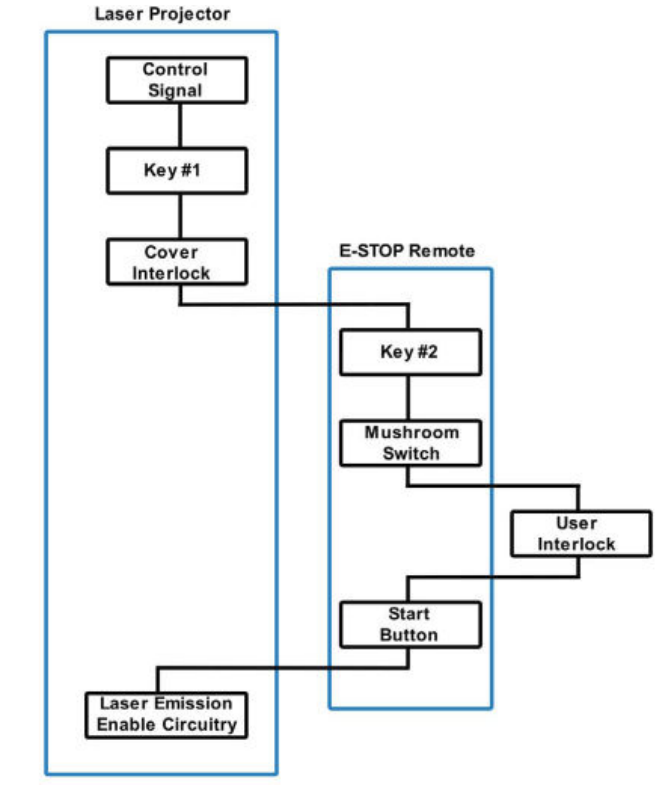
2.8 SWITCHING ON SEQUENCE AND USER INTERLOCK

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 both E-STOP Remote and laser system safety keys to ON position.
3. Release the E-STOP button by pulling it upwards.
4. Open the aperture window by loosening the bolt at the bottom of the aperture, adjust the masking plate to desired position and tighten the bolt 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 Connection Diagram



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. #2 Key Switch on E-STOP Remote turned to OFF position.
4. #1 Key Switch on laser projector turned to OFF position.
5. 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.

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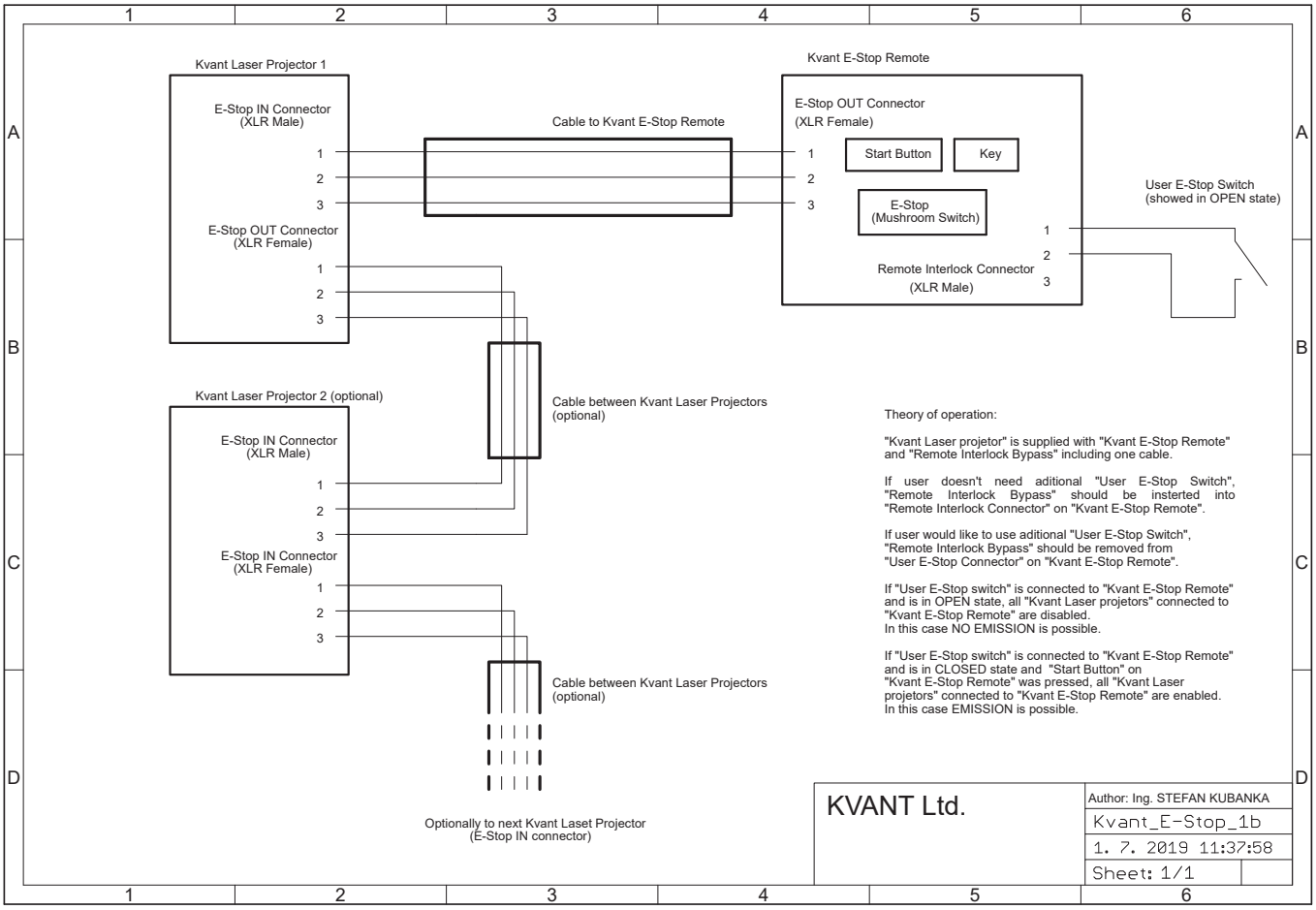
E-STOP Connection Drawing including User Interlock option



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.

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2.9 MAINTENANCE

Maintenance: no user serviceable parts inside.

Please note that a laser light entering the aperture of your laser projector (reflected or from another laser) or wrongly reflected beams inside the projector can permanently damage the laser sources.
The manufacturer's warranty does not cover such damage.

Aperture Window

To clean the aperture output window use a soft cloth and medical grade isopropyl alcohol. If necessary, you can remove the aperture output window by loosing the 4 socket bolts and clean the inside of the window as well.

Cooling Fans

Use compressed air for cleaning the bottom part of the laser system. There are cooling fans located at the bottom of the heat sink and they are vital for correct operation of the laser system. Please always ensure that they are spinning freely.
You should perform this service every 2 months if the laser is used regularly or even more often if it is used in dusty conditions.

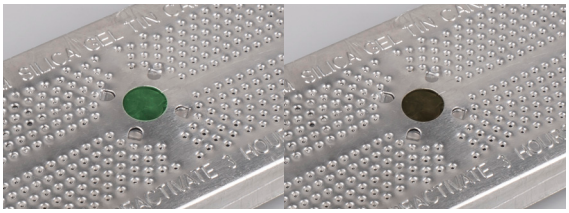
Internal Optics

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.

Drying agent cartridge

Drying agent cartridge (silica gel desiccant) helps to prevent water condensation inside the optical compartment of the laser system, which is much needed in high temperatures and high humidity environments. The desiccant cartridge is installed on the inside of the optical compartment cover.

It is essential to regularly inspect the condition of the silica gel granules inside the cartridges. That can be done through the opening in the middle of the cartridge. If the colour of the granules inside the cartridge is green, instead of brown (brown is when they are dry), it means they are soaked, and they must be dried out. Inspect the cartridge every time you open the optical compartment, or at least once a month.



wet silica gel dry silica gel

The drying out process is pretty simple:

1. Detach the cartridge from the cover and place it into the conventional oven - do not use microwave!!!
2. Heat the oven to 120°C (250°F) and leave the cartridge inside for about 3-4 hours, until all the moisture is released.
3. Insert the cartridge back into its place and close the optical compartment cover as soon as the cartridge cools down. That way, it will absorb the maximum amount of moisture from the inside of the optical section.

If the granules don't turn brown during this process, they must be replaced with new ones.

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2.10 DISPOSAL OF THE EQUPIMENT

The equipment is made of components and materials such as metal, plastic, aluminium, which can be dismantled, sorted and recycled in accordance with the Waste Act at the end of the life of the equipment or when it is no longer functional.

The equipment can also be handed over as a whole in a collection yard.

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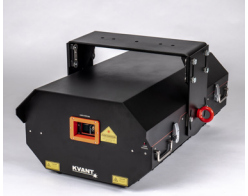
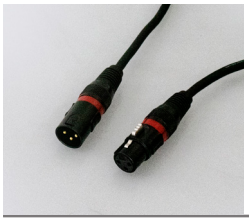
3 ITEM CHECKLIST

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	Descriptions
	1x	KVANT Epic Laser Display System
	1x	Emergency STOP remote US version / EU version **BUS ID: 1647 / BUS ID: 1648**
	1x	3-pin XLR Emergency Stop Remote Cable 10m version / 25m version **BUS ID: 588 / BUS ID: 1618**
	1x	Remote Interlock Bypass (for USA only) **BUS ID: 651**
	1x	AC Power cable with powerCon TRUE1 connector EU version **BUS ID: 605** UK version **BUS ID: 606** US version **BUS ID: 607**

Item	Number of units	Descriptions
	2x	Set of Safety Keys
	1x	Network Signal Cable (cat5) 10m version / 25m version **BUS ID: 1041 / BUS ID: 1611**
	1x	User manual USB drive **BUS ID: 1054**
	1x	QC Certificate
	1x	Chiller unit (optional for Epic 100)

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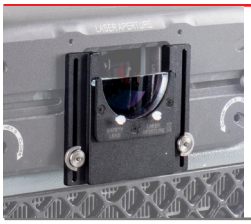
4 OPTIONAL ACCESSORIES

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

Item	Descriptions
	SafetyScan lens attachment bracket (lens is not included). This item is compatible only with this model version.
	DiscoScan lens attachment bracket (lens is not included). This item is compatible only with this model version.
	4-way masking plate
	Optical Bench (available in the 4th Quarter)

Item	Descriptions
	Motorised Dichroic Filters for Easy Colour Alignment
	Pass (Professional Audience Safety System) Card Integration
	Beyond upgrade
	Rain cover

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5 SYSTEM OVERVIEW

KVANT Epic is a full colour, semiconductor diode laser system designed for professional laser displays.

When operated correctly and in the right conditions the Epic laser system is able to deliver a strong performance in large indoor and outdoor venues. The Epic can display virtually any colour within the basic RGB palette and its secondary mixed colours including white.

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 venues where lots of smoke or haze is used on a daily basis.

The laser projector is neither waterproof, nor completely dustproof. Please use it indoors and avoid places with excessive amounts of dust.

5.1 FRONT VIEW

1. Laser aperture.
To clean the laser aperture window from inside or to swap the aperture plate for different type of aperture (i.e. DiscoScan lens attachment bracket), remove the six bolts that hold the laser aperture in place and remove it.

2. Laser emission indicator.
When this indicator is lit up, the laser system is ready to emit the laser radiation as soon as it recieves instructions from control software.

3. Attachment bracket.
The attachment bracket spins around the laser body whilst it can be locked in desired position by two screws on sides. Due to the sophisticated locking mechanism there's no need to use excessive force when locking the system in position.

4. Safety eyelet.
Use this together with appropriate safety wire to secure the system against unexpected fall.

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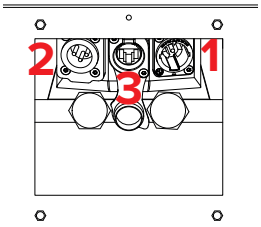
5.2 REAR VIEW



* under rain cover

1. Mains power INPUT/OUTPUT. Use supplied Neutrik powerCON TRUE1 power cable to connect the laser system to mains power supply using the INPUT connector. The OUTPUT connector is used to daisy chain power between multiple laser systems for quick and easy installation. **The powerCON TRUE1** is a connector with breaking capacity (CBC), i.e. it can be connected or disconnected under load or live.

3. Ethernet.
Use these ports to connect PC control signal or to daisy chain the control signal between multiple laser display systems.

4. Quick release connectors INLET/OUTLET.
Use for quick and easy connection to water cooling system.

5. Rain cover.
Quick to install protection for laser projector from rain and snow.

2. E-STOP Remote connector, Interlock status indicator and User Interlock. In order to use the laser system, the Interlock must be closed circuit. This is done by connecting the Emergency STOP Remote to the XLR REMOTE INPUT socket on the projector using the supplied cable. The US version of the Emergency STOP must also have the Remote Interlock Bypass inserted into it.

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. In most countries it is required by law to have a fully working Emergency STOP in place for every laser system used. Modifying or using anything other than the E-STOP Remote provided, in the manner it was intended, may invalidate your laser projector's variance.

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The Remote Interlock Bypass may be replaced by the user's own interlock system using a switch or dry relay closure to connect pins 1 and 2. With pins 1 and 2 shorted, Laser Emission is possible, provided all other interlocks are closed circuit. With pins 1 and 2 open, NO Laser Emission is possible.

The Interlock status indicator START (2) goes off and status indicator READY (2) lights up when the Interlock is closed circuit and the Interlock key is in the ON position. All above must be done correctly to allow laser emission from the system.

The projector's REMOTE Output is used to daisy-chain the Remote signal when you want to use a single Emergency STOP Remote to control multiple systems.

After a power failure or interlock failure (open circuit) has occurred and been corrected you need to manually reset laser emission by pressing the START button on the E-STOP Remote. Laser emission will then be available after a 60 second delay.

The intent of laser manufactures is to produce a laser diode driver with as linear response behaviour as possible, so when the diode current increases, the optical power and light intensity grow linearly. However, the human eye senses brightness of light logarithmically over a moderate range (Weber–Fechner law). So when light intensity grows linearly, human eye and brain doesn't perceive it as a linear increase, and our visual perception of colours changes.

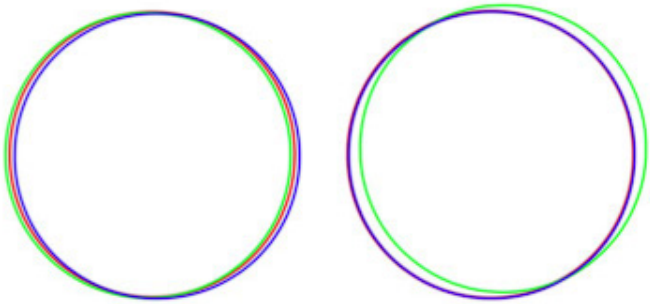
In the world of laser display systems this generates challenges when we work with mixed colours (i.e. yellow, magenta etc.). Normally the mixed colours coming out of laser systems do not directly correspond with those we see on computer screens – because of the difference in visual perception. In order to synchronise all the colours we see on our screen and those coming out of the laser device we do, so called, palette calibration procedure in the laser control software. This can be of course rather lengthy process and even if it's done properly, the calibrated palette will always be tied to particular control system or profile that was used during the colour calibration and not to the laser projector itself. So we came with the idea to hard-code the "calibrated palette" into every Spectrum laser system in our factory during the manufacture. No matter what control interface you use or what control signal is used (Ethernet, DMX, ILDA), the calibrated palette is always there, ready for you to be switched on by Colour Balance button.

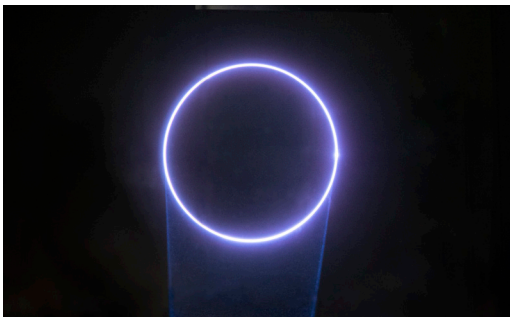
EN

6 BEAM ALIGNMENT PRINCIPLE

Please read the following information carefully and take your time to process them! If you are not 100% certain that you understand the beam alignment principle, DO NOT ATTEMPT to proceed with the beam alignment by yourself. Instead, contact our servicing department for help.

The beam alignment is a process of pointing the beams coming out of laser modules inside your laser projector to the exact spot outside of the projector. If the colours are separated, the alignment must be made to ensure that all the mixed-colour projections are sharp and unified.





The final result is heavily dependent on each beam's parametres, such as its shape (circular, square, rectangular), initial size and divergence. If one is different in shape, size or divergence from another, the result won't be perfect even if the alignment was done correctly.

When aligning laser modules with various beam profiles, sizes and divergences, it is always good to cross-check different colours during the alignment. This is because better matching beams are always aligned easily and more precisely.

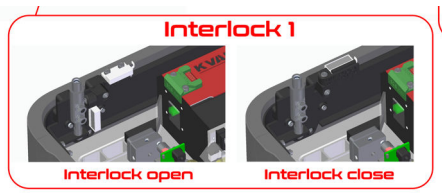
Various beam profiles.

There are, for sure, many ways how to accomplish good alignment results. However, the following general instructions are based on our own experience.

Follow all the laser safety regulations and guidelines for servicing Class 4 laser devices. Wear eye protection and be aware of residual beams and reflections when working with the optical compartment opened.

Before starting beam alignment:

- Remove the top (black) cover by releasing the 4 metal clasps. Then unscrew 12 orange handles and remove second (silver) cover.
- Slowly remove the cover – **detach the GND wire** that is attached to the top cover from the inside of the system! To detach the wire gently pull it out from the connector.
- 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".
- Power up system as normal.



In the defeated position the label "INTERLOCK DEFEATED" becomes visible as shown in the image. Placing the magnetic interlock in the defeated position raises the interlock higher than the edge of the housing which will not allow the cover to be installed.

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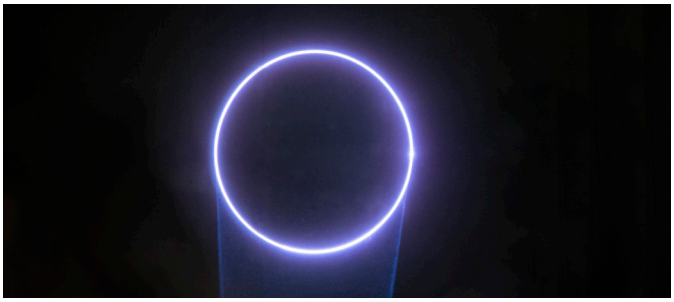
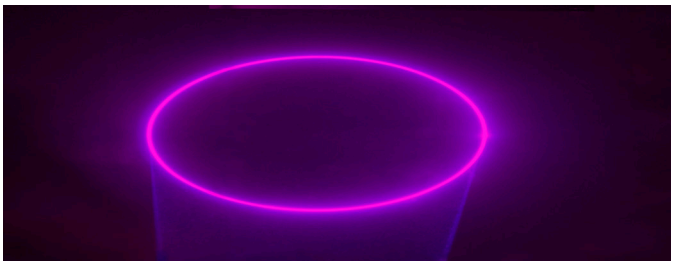
It is important to note that the principle described in the following points is generic and applicable to any laser type from manufacturer, so the diagram shown in the example may not be the same as your laser projector.

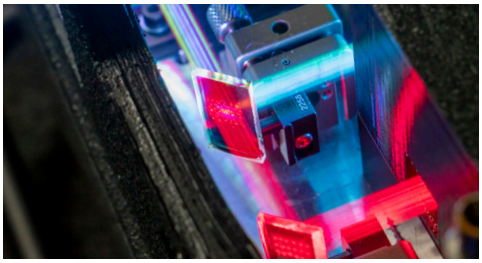
1. Align the beams at the greatest projection distance and angle possible - use binoculars if necessary. The greater the distance, the more precise the alignment will be. The minimum distance should be 6 metres and over.



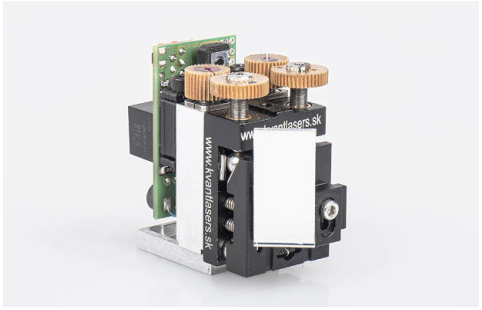
2. If the lasers are too bright (when aligning in the dark, for example) or with some colours, it can be difficult to recognise whether the beams are correctly aligned or not. Lower the power output to ease your eyes and see the beams better.
3. An ideal effect for beam alignment is, in our opinion, a circle projected at the widest angle possible whilst the whole shape is visible.
4. Aligned beams determine the colour of the projected effect. For example, the projected effect must be set to magenta to align the blue laser beam to the red laser beam.



5. A laser beam exiting the laser module inside a laser projector is pointed in the desired direction with a specially coated glass called a dichroic filter. Depending on the coating, the dichroic filter either reflects or passes through specific wavelegths (laser beams/colours). This means that using various dichroic filters inside the laser projector allows us to change the direction of laser beams or join one beam with another - that's if 1st laser beam is passing through a dichroic filter while 2nd one is being reflected off it in the same direction.



6. A dichroic filter is usually fitted to some type of X-Y axes mounts. These mounts would typically have a mechanism allowing us to tilt the dichroic filter to alter the direction of a reflected beam.



7. There are many possible internal layouts and constructions of laser projectors. For example, some will have one laser module pre colour; others may have two or more colours encapsulated in a single enclosure where the beams are aligned inside. The beam alignment principle will always be the same but maybe done differently, depending on the alignment mechanism.

8. In every laser projector, one of the beams (colours) is always the carrying one. It's the one that all the other beams are aligned to. For this purpose, we typically choose the one with the most direct and shortest path between the laser module output and the X scanning mirror (the bottom mirror of the two scanning mirrors). Important here is to make sure that this carrying beam is pointing to the exact centre of the X scanning mirror. This is crucial as it ensures that the projected effect will be complete and without unwanted reflections, such as those from the scanner shaft.
9. Once the carrying beam is set correctly, we can progress to the next laser beam in the line. The order of the aligning beams should be from the most direct one to the one with the most complex path between its origin and the X scanner mirror. By working this way, you adjust dichroic filters that are used by multiple beams only once.

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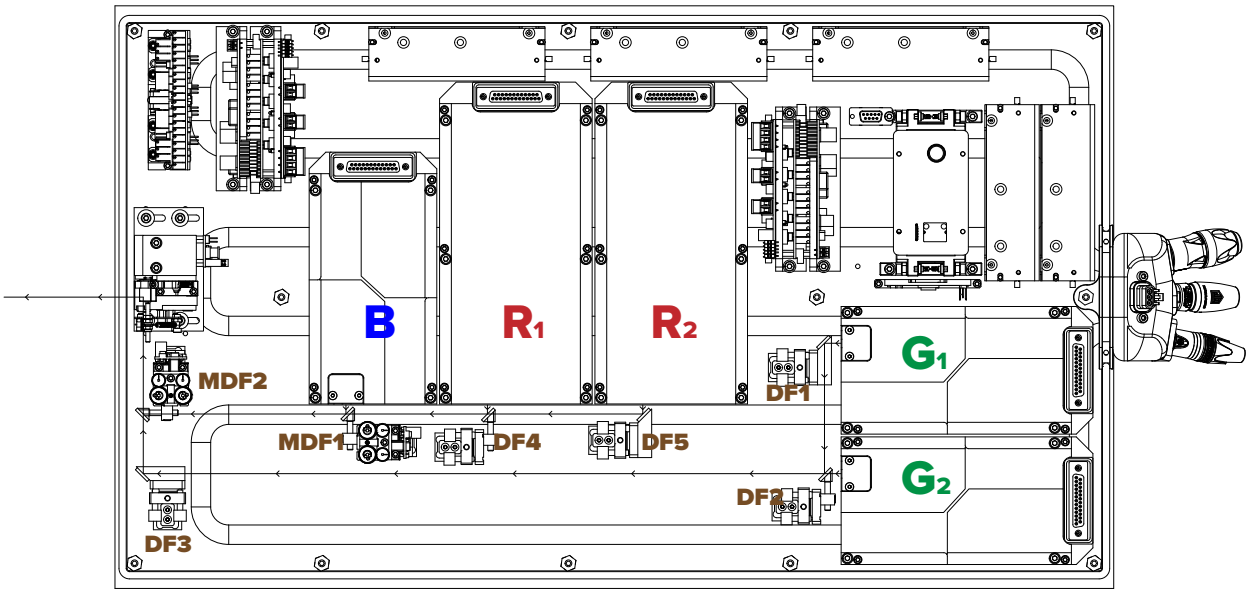
Example:

- Inside the laser projector there are five modules, in red, green and blue. The red and green modules are in pairs of two.
- Due to the internal layout of the components inside the laser projector, we start to adjust the green color first, which is the furthest away from the scanners but has the simplest path to the scanners.
- Turn on the Green circle effect using your software.
- Use the dichroic filter DF1 to adjust the beam exiting the G1 module to match the beam exiting the G2 module.
- Align the Green beam using the DF3 to the mirrors of the scanner.
- From this point on, do not touch DF1 and DF2, as it will not be necessary to adjust the green beams separately.
- Change the effect colour to Red.
- Using dichroic filters DF4 and DF5, adjust the red beams coming from modules R1 and R2 together (exactly as for green).
- Change the effect colour to Magenta.
- Using the Motorized Dichroic Filter (MDF1), adjust the beam coming from the Blue module so that the blue effect colour overlaps the red effect colour.
- Change the effect colour to White and use MDF2 to adjust the Magenta (R+B) and Green colours to create a uniform white effect colour.



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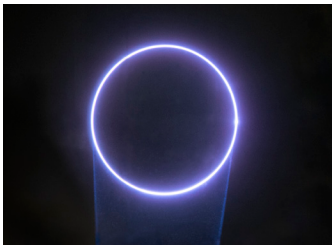
6.4 BEAM ALIGNMENT WITH MOTORISED DICHROIC FILTERS

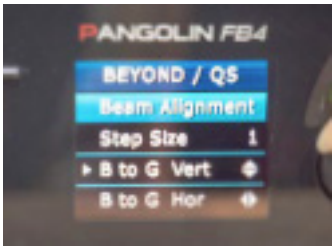
1. Adjusting colours directly from Epic interface

A: Power up the system as standard.



B: Create a full-size white circle (static tunnel effect).

C: Find Beam Alignment option in the menu and enter it by pressing the rotary knob.

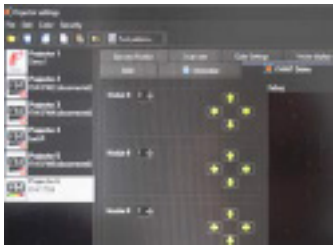


D: Here you can set the STEP SIZE *(amount of movement in a single step),* and VERTICAL / HORIZONTAL movement for every colour in your projector *(R=RED, G=GREEN, B=BLUE, Y=YELLOW).*

2. Adjusting colours from Beyond software

Beyond automatically identifies Motorised Dichroic Filters when the laser projector is connected (and powered up) to the PC via Ethernet.

A: Power up the system as standard and create a full-size white circle (static tunnel effect).



B: Go to : PROJECTOR SETTINGS -> KVANT DICHRO tab. There you will find all the information and control options for the dichroic filters.

C: To start the beam alignment, press the READ STATUS button.

D: Start with the first dichroic filter (laser module1) and/ or any other as necessary. Use the arrows associated with each module to move the beam to the desired position.

When the alignment procedure is successful, you will see all the colours nicely overlaying each other, resulting in an even, bright and sharp white circle.

EN

7 HOW TO CONTROL YELLOW COLOUR

To control Yellow colour on RGBY Projector there are two ways. Below is described which should be used.

- FB4 is built into every RGBY Projector, FB4 has 6 color outputs. Red, Green, Blue, Magenta, Yellow, Cyan. Normally these 6 color outputs can be controlled only when FB4 is in „Beyond/QS mode" and when Beyond software is used to operate laser projector (Advanced Mode).
- If FB4 is in „Beyond/QS mode" and QuickShow software is used to operate laser projector, only R, G and B colors (signals) are used. (Use Colour Balance display mode).
- ILDA Input of FB4 is using only 3 input colors. Red, Green and Blue. Normally when FB4 is in „ILDA Input" mode, it is not possible to control all 6 color outputs. (Use Colour Balance display mode).
- DMX, Art-Net or Autoplay. For standard frames on SD card also only R, G and B colors can be controlled. (Use Colour Balance display mode)

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7.1 ADVANCED MODE

To control Yellow colour in Beyond/QS mode, it is necessary to activate „Advanced Mode" in Color Settings tab for selected projector. See „yellow arrow" on figure 1.

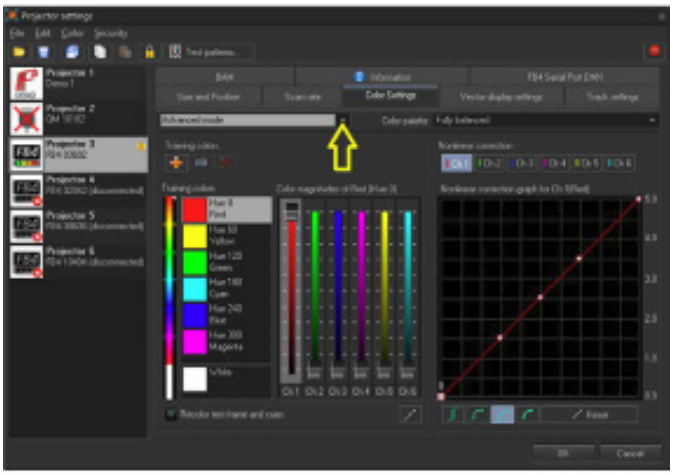

Figure 1: Activate Advanced mode in Color Settings tab.

As we are interested in Yellow colour now, please click on yellow rectangle as indicated by „yellow arrow" on figure 2.

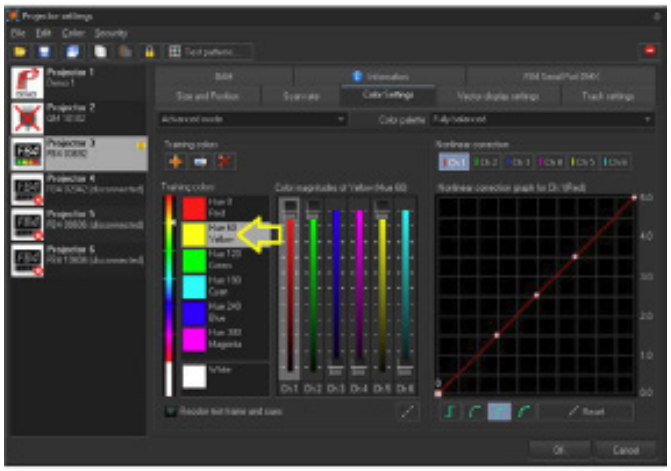

Figure 2: Select Yellow color

This is default setting for Yellow colour. If any yellow image is projected by RGBY laser projector using this setting, RGBY projector will turn ON Red, Green and Yellow Laser Module.

If it is required to project any yellow image ONLY with Yellow Laser Module, it is necessary to disable Red and Green module using Red and Green faders. See figure 3.

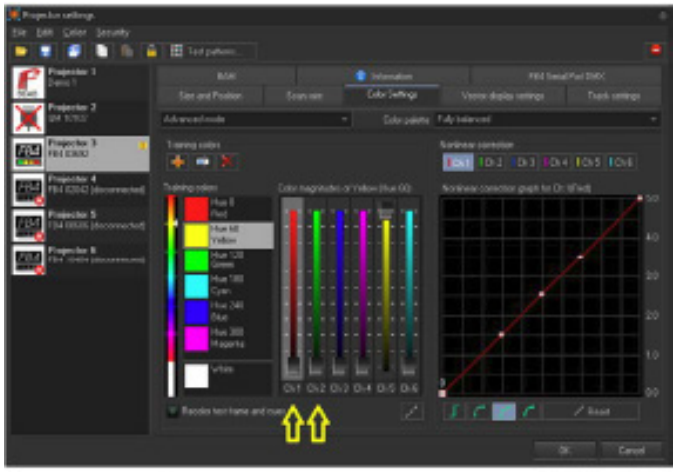

Figure 3: Only Yellow Laser Module active

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7.2 COLOUR BALANCE DISPLAY MODE

Primary function of Colour Balance Button is same as on Beambrush projectors. It is to see same colors on projected image compared to computer screen.

On RGBY Projector additional functionality of “Colour Balance Button” is to enable control of Yellow color (Yellow Laser Module) EVEN ONLY R, G and B color signals are available. Use Colour Balance display mode when:

- FB4 is in „ILDA Input” mode
- FB4 is in „Beyond/QS mode” and Beyond software is used, BUT „Advanced Mode” is not active
- FB4 is in „Beyond/QS mode” and QuickShow software is used (no „Advanced Mode” available)
- standard frames from SD card are used in DMX, Art-Net and Autoplay mode

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8 TECHNICAL SPECIFICATIONS

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

LD

Low Divergence upgrade affects the laser beam, so it is a bit thicker at the source, but much more coherent further away. And that makes it more than twice as bright and visible at a distance when compared to standard laser display systems.

HPS

High performace system. Upgrade for ultimate laser graphic and animation systems featuring 60kpps X-Y galvo Saturn1 scanning system.

RGBY

RGBY labelled systems come with an extra OPSL module inside - the one that outputs 577nm yellow laser. In simple terms, adding yellow to the mix broadens your lighting design colour palette with more vivid colours and increases LUX level, which means brightness!

BB

BeamBrush gives you instant zoom, wash, waving and positioning; combined with the razor sharp coherent profile of laser. So you can move from a classical moving head appearance, to a razor sharp laser look, instantaneously.

8.1 TECHNICAL SPECIFICATIONS [EPIC 100]

KVANT Epic 100 – full colour, semiconductor diode laser system

Total Optical Power (installed): 107W

Total Optical Power (guaranteed): 100W*

**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	Module Type	Wavelenght	Power installed
Red	2x RLM-9kF	638nm	23 000mW
Green	2xGLM-13kF6	525nm	34 000mW
Blue	BLM-50kF	455nm	50 000mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 3349 m

Beam diameter at laser aperture: 7x12 mm
Beam divergence: 1.1mrad (full angle)
Red: 0.5/0.5 mrad
Green: 0.5/0.5mrad
Blue: 0.6/0.6 mrad
Modulation: 100 kHz | analog – 100 kHz
Module cooling: TEC

Scanning System:
Juno 5 | 22 Kpps @ 8°, max. scanning angle 40° on both axes

Control signal: Ethernet, DMX/ArtNet, SD card (via inbuilt FB4-SK control interface)
Power requirements: 100-240V/50-60Hz (±5%)
Consumption (MAX): 1800VA
Operation temperature: 10-35, or -20 to 40 when installed in the Monsoon enclosure
Ingress protection rating: IP20, or IP54 with an optional rain cover installed [certification in progress]
Dimensions (WxDxH): 500 x 315 x 876mm
Weight: 89kg
Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety, V-RAD 506 mechanical shutter | reaction time <20ms, adjustable aperture masking plate.
This laser system fully complies with the latest EN 60825-1, FDA regulations and TUV Laser Safety.

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8.2 TECHNICAL SPECIFICATIONS [EPIC 170]

KVANT Epic 170 – full colour, semiconductor diode laser system

Total Optical Power (installed): 170W

Total Optical Power (guaranteed): 150W*

**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	Module Type	Wavelenght	Power installed
Red	RLM-30kF	638nm	30 000mW
Green	GLM-60kF	525nm	60 000mW
Blue	BLM-80kF	465nm	80 000mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 4220 m

Beam diameter at laser aperture: 10x12 mm
Beam divergence: 1.1mrad (full angle)
Red: 0.5/0.5 mrad
Green: 0.5/0.5mrad
Blue: 0.6/0.6 mrad
Modulation: 100 kHz | analog – 100 kHz
Module cooling: TEC

Scanning System:
17 Kpps @ 8°, max. scanning angle 40° on both axes

Control signal: Ethernet, DMX/ArtNet, SD card (via inbuilt FB4-SK control interface)
Power requirements: 100-240V/50-60Hz (±5%)
Consumption (MAX): 1800VA
Operation temperature: 10-35
Chiller Coolant: Water + 15% glycol, 6-10 l/min, 20°C
Chiller consumption: <1600W
Chiller weight: 46kg
Ingress protection rating: IP20, or IP54 with an optional rain cover installed [certification in progress]
Dimensions (WxDxH): 500 x 315 x 876mm
Weight: 89kg
Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety, V-RAD 506 mechanical shutter | reaction time <20ms, adjustable aperture masking plate.
This laser system fully complies with the latest EN 60825-1, FDA regulations and TUV Laser Safety.

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8.3 TECHNICAL SPECIFICATIONS [EPIC 270]

KVANT Epic 270 – full colour, semiconductor diode laser system

Total Optical Power (installed): 270W

Total Optical Power (guaranteed): 240W*

**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	Module Type	Wavelenght	Power installed
Red	RLM-30kF	638nm	30 000mW
Green	GLM-60kF	525nm	60 000mW
Blue	BLM-180kF	455+465nm	180 000mW

NOHD (Nominal Ocular Hazard Distance for guaranteed power output): 5321 m

Beam diameter at laser aperture: 10x12 mm
Beam divergence: 1.1mrad (full angle)
Red: 0.5/0.5 mrad
Green: 0.5/0.5mrad
Blue: 0.6/0.6 mrad
Modulation: 100 kHz | analog – 100 kHz
Module cooling: TEC

Scanning System:
17 Kpps @ 8°, max. scanning angle 40° on both axes

Control signal: Ethernet, DMX/ArtNet, SD card (via inbuilt FB4 control interface)
Power requirements: 100-240V/50-60Hz (±5%)
Consumption (MAX): 1800VA
Operation temperature: 10-35
Chiller Coolant: Water + 15% glycol, 6-10 l/min, 20°C
Cooling fluid: g12 ultra mixed with distilled water, ratio of 1:2
Chiller consumption: <1600W
Chiller weight: 46kg
Ingress protection rating: IP20, or IP54 with an optional rain cover installed [certification in progress]
Dimensions (WxDxH): 500 x 315 x 876mm
Weight: 89kg
Laser safety features: Keyed interlock, emission delay, magnetic interlock, scan-fail safety, V-RAD 506 mechanical shutter | reaction time <20ms, adjustable aperture masking plate.
This laser system fully complies with the latest EN 60825-1, FDA regulations and TUV Laser Safety.

EN

9 TROUBLESHOOTING

Q: My projector's aperture glass is cracked, broken or missing. Can I continue using my projector?

A: Laser beams hitting glass splits will be scattered into unwanted directions, creating a risk of damage to eyesight, health or property. Broken or missing aperture glass enables humidity, water, and dust inside the laser projector's optical compartment, which can cause permanent damage to the system.

It is essential to replace the damaged or missing aperture glass before using the laser projector.

Q: The housing of the projector is damaged. Can I continue using my projector?

A: The projector must not be operated if the housing is damaged to the level that it causes visible gaps between the projector's adjacent faces. The gaps enable humidity, water, and dust inside the laser projector's optical compartment, which can cause permanent damage to the system. There is also a risk of laser emission leaks from other parts of the system, which contradicts the IEC 60825-1 safety standard. Damaged housing parts must be repaired or replaced before operating the projector again.

Q: Projector's eyebolt is bent, fractured or unscrewed. Can I continue using my projector if it is installed using the eyebolt as a safety mechanism? Or continue with the installation?

A: No! The projector must not be used, lifted or hanged. Never attempt to repair bent or fractured eyebolt. Replace it with a new one with the same or higher load capacity.

Q: Is it OK that the cooling fans are not running during operation?

A: Yes, it's OK. Kvant projectors have built-in automatic regulation of the fan speed. After powering up the projector, all cooling fans will run at 100% speed for about 2 seconds. Then their speed is adjusted according to the heatsink's temperature.

Clubmax (without FB4):
if heatsink's temperature is below 25°C (77°F), the fans are turned off. Within the range of 25°C (77°K) to 55°C (131°F), the fan speed increases with increasing temperature of the heatsink, and over 55°C (131°F) they run at full speed.

BeamBrush, Clubmax FB4, Atom and Spectrum series:
if heatsink's temperature is below 15°C (59°F), the fans are turned off or run at low speed. Within the range of 15°C (59°K) to 33°C (91°F), the fan speed increases with increasing temperature of the heatsink, and over 33°C (91°F) they run at full speed.

Q: Is it OK if some fans are running at full speed and some at low speed during the operation?

A: Yes, it is OK . Kvant Atom and Spectrum projectors use multi-zone regulation of the fan speeds. Fans that cool down warmer sections of the heatsink work at higher speeds. The correct functionality of all fans can be checked anytime by power cycling the projector. After powering up the projector, all cooling fans will run at 100% speed for about 2 seconds. Then their speed is adjusted according to the heatsink's temperature.

Q: Cooling fans generate a strange noise. Is that a problem?

A: Strange noise is usually caused by an object stacked in the fan's propeller area. It can be a piece of confetti or plastic or even a hardened mixture of smoke residue and dust. Check the fans and if such an obstruction is found, turn the projector off and remove it. Another reason for the noisy fans could be its damaged propeller or bearings. If that's the case, then the fan needs to be replaced with a new one of the same type.

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Q: Shutter doesn't open, and its plate blocks the output (in ILDA operation mode).

A: In the ILDA operation mode, the shutter is also controlled with the "shutter" signal from an external controller. Check the ILDA cable, mainly if pin #13 is connecting properly. We recommend using only original ILDA cables.

Q: Shutter doesn't open, and its plate blocks the output.

A: If the shutter doesn't open in any operation mode, please contact your distributor or technical assistance of Kvant Lasers, s.r.o.

Q: The projector is powered ON , ready for emission, but the FB4 display is inactive. And it doesn't turn on after pushing or turning the encoder knob next to the FB4 display.

A: Perform a power cycle procedure with the mains power switch or unplugging the mains power cable for 5 seconds. After the power cycle, the display should start working correctly.

Q: One of the RGB colours doesn't work.

A: Check colour settings in the FB4 menu and make sure that all R, G and B colours are set at 100%. If the projector doesn't have a built-in FB4 controller, check the brightness potentiometers at the rear panel - all three should be set to the maximum level.

If all the above is as described and the problem persists, turn off the mains power switch (or disconnect the mains power cord) for 10 minutes.
All PSUs should fully discharge and cool down.
After 10 minutes, power up the projector. If overloaded PSUs caused the malfunction, it should now work correctly again.

Q: One of the RGB colours doesn't work (ILDA operation mode only).

A: Check connection on both ends of the ILDA cable and inspect the ILDA male connector's pins.

Q: Scanning is unstable or distorted on both the X and Y axes (ILDA operation mode only).

A: Distortion of the scanned effects can occur when the projector and the PC (controller) are not connected to the same mains power phase due to different PE wire potentials (Earth).
Always connect the PC/controller and the laser projector to the same mains power socket when operating in ILDA mode.

Q: The projection size is reduced to about 50% on one or both of the X and Y axes.

A: Check Master Settings in the FB4 menu and ensure both axes size are set to 100% size. If the projector doesn't have FB4 controller build-in, ensure both X and Y potentiometers located on the rear panel are set to the maximum level.
If all the above is as described and the problem persists, check ILDA cable connectors on both sides and the ILDA input connector on the projector. One or more of #1, #2, #14, #15 pins may be bent or damaged.

Q: One colour of the projected effect is shifted out from others - misaligned.

A: It is necessary to reset the output directions (alignment) of individual colours (laser beams) inside the projector. There are several ways how to join them together, but only one is correct. The correct one ensures perfectly joined beams at both short and long-distance projections. Please check the User manual (chapter Beam alignment) for beam alignment instructions.

Q: Projector #2 doesn't work when connected to the ILDA output of projector #1.

A: Try to replace the ILDA cable with a new one between projectors and check the ILDA input connector on projector #2 for any damage. If this does not solve the issue, exchange the projectors one for another and see if that works. If both work fine, then projector #1 has faulty ILDA output. If none of them is working, then projector #2 has faulty ILDA input. Please contact your distributor or technical assistance of Kvant Lasers, s.r.o. for further help.

Q: Projection is blurred or foggy. Static beams (points) have a halo around them. How to fix this?

A: This is usually an optical problem such as scratches, dust and dirt on the components on the beams' path from their source to the output aperture; or on the aperture glass itself. Use a clean fine-cotton cloth soaked with isopropyl alcohol to clean the surface of the output window. Clean it carefully so you won't scratch the surface with dirt particles already stacked to the cloth.

Remember that the output window's anti-reflex surface can be easily scratched and permanently damaged by an incorrect cleaning process.

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Q: Projection is blurred or foggy; static beams (points) have a halo around them, but the output window is clean. How to fix this?

A: This is usually an optical problem such as scratches, dust and dirt on the components on the beams' path from their source to the output aperture (scanner mirror, dichroic filter, bounce mirror). To inspect and clean the optical components, the projector must be turned off and disconnected from the mains power supply.

Use a clean cotton bud (swab) soaked with isopropyl alcohol to clean the optical component's surface. The bud must be "rotated" against movement direction during cleaning to avoid the surface get scratched by dust and dirt already taken from the surface. After one whole spin (360 deg), dispose of the cotton bud and take a new cotton bud to continue the cleaning process. Remember that the optical parts' surface can be easily scratched and permanently damaged by an incorrect cleaning process.

Q: One of the colours fades out and then goes back to its full power. This repeats. Why is this happening?

A: The laser projector has automatic over-temperature protection, decreasing the individual laser module's power output to 50% if its temperature goes above the preset level. After stabilization of temperature, the output power goes back to 100%. If the temperature at 50% power output still rises, the power output is cut to zero until the temperature returns to safe values.

If the projector reduces the power output of one or more colours, the reason for it could be insufficient cooling caused by lack of airflow, too warm cooling air, or faulty fans on the main heatsink.

Q: The projection suddenly lost a significant amount of blue colour. The colour tone of all RGB effects changed, and the total power output decreased too. Why?

A: The most likely reason is the activated Colour Balance function, which balances all the primary colours in the correct ration for all the mixed colours to be precisely right. For example, projected white is nice and crisp, without discolouration towards blue. To enable or disable this function, press the little button next to the FB4 display on the rear panel. This feature is switched ON when the yellow LED indicator next to this button is on. When the Colour Balance function is disabled, all the colours go back to 100% power output.

Q: How many projectors can I daisy-chain with E-STOP Remote?

A: The number of projectors running on a single E-STOP Remote is unlimited. Each projector amplifies the E-STOP signal for the next projector in line.

Q: What is the maximum distance of the E-STOP connection between two projectors?

A: The maximum length between two projectors is defined by the internal resistance of used cable connection wires. The total resistance of one wire within connection must be below 400 Ohm. Standard microphone XLR cables have resistance typically below 0,1 Ohm/meter. So the maximum distance between two projectors with such cable is approximately 4km.

Q: How many projectors can I daisy-chain with a single Ethernet line (PC OUT–> IN1, OUT1-> IN2, OUT2-> IN3...)?

A: We recommended daisy-chaining a maximum of 6 units on a single Ethernet line. If you connect more than six projectors, the data packet losses will most likely be noticeable, resulting in a disruptive movement of projected graphics and animations.

For the best possible quality of multi-laser data connection, it is recommended to use a high-speed 1Gbit data connection between PC and data switch. Also, it is recommended to separate 100Mbit data connections between the data switch and each projector.

Q: Is it possible to connect a door switch as a safety measure to interrupt the laser emission?

A: Yes. Laser projectors supplied to the US market come with an E-STOP Remote with Auxiliary Input for Normally Closed (NC) door switch.

Into this input, the client can connect either an interlock jumper, a door switch or any additional safety item, e.g. output of PIR sensor for observing the area around the laser projector.

Q: Is this projector compatible with other Kvant projectors?

A: All Kvant projectors manufactured from 06/2014 and later are fully compatible with each other. To check and ensure compatibility with older Kvant projectors made prior 05/2014, please contact the technical support representative of Kvant Lasers, s.r.o.

Suppose Spectrum LD projector with Saturn9 scanning set is used with non-LD projectors. In that case, it is recommended to decrease the maximum size and scan rate of the non-LD system(s) to meet the LD system limits and full compatibility. If more systems from various manufacturers are used together, it is recommended to use a separate ILDA signal source for each manufacturer's group.

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Q: The projector has been exposed to rain during an outdoor show without the Rain Cover installed. What shall I do next?

A: It is necessary to remove the laser projector from its flight case as soon as possible - within 24 hours at the latest after the show, and let both projector and flight case fully dry out.

NEVER turn ON the projector before it is 100% dry inside out.

When ready, please check the status of the anti-humidity cassette containing silica gel. For more information about this topic, go to the User manual (chapter Maintenance). Insufficient drying of the projector and its flight-case can cause permanent damage to the projector (mould, corrosion) and voids the warranty. Powering up wet or dump projector can cause electrical shock, injury, or fire risk. It can also cause permanent damage to the projector, in which case the warranty is voided.

Q: Is the Rain cover accessory suitable for long term protection against outdoor weather conditions?

A: No. The Rain cover was designed as emergency protection against rain or snow for short term outdoor use. During intense precipitation and winds, it can get soaked with water. Therefore, removing the rain cover from the projector after every use and letting it dry together with the projector is necessary. Insufficient drying of the projector and its flight-case can cause permanent damage to the projector (mould, corrosion) and voids the warranty. Powering up wet or dump projector can cause electrical shock, injury, or fire risk. It can also cause permanent damage to the projector, in which case the warranty is voided.

Q: Is it possible to use the Rain cover for a projector that is set other than horizontally (i.e. when projecting upwards)?

A: No. Our Rain cover works efficiently ONLY for projectors set in a horizontal position - that's with rubber feet towards the ground.

If the Rain cover is used any other way, it won't protect your equipment.

Q: At low temperatures, the laser projector won't start.

A: The operating temperature range for Kvant laser projectors is +10°C (50°F) to +35°C (95°F).

If used outside of this range, we recommend using the Kvant Monsoon. This robust and durable enclosure will protect your delicate equipment, such as laser projectors, against harsh weather conditions, extreme temperatures and high humidity. As a temporary solution, you can use an electric heater to pre-heat the air entering the laser projector. Place the heater at the correct distance from the projector, so when the air enters the laser projector, it is within the range +10°C (50°F) to +25°C (77°F). The projector may get damaged if the heater is placed too close to the projector's airflow inlets or rear control panel.

Q: Laser projector stops working or even won't start at high ambient temperatures.

A: The operating temperature range for Kvant laser projectors is +10°C (50°F) to +35°C (95°F). Using projectors in an environment with air temperatures within 35°C (95°F) to 45°C (113°F) is not harmful to the projector, but limits its ability to disperse the heat efficiently, resulting in lowered nominal power output or complete cutoff.

There is a risk of permanent damage to the laser projector if used in temperatures exceeding 45°C (113°F), in which case the warranty is voided.

Never place and use projectors near objects that generate excessive heat, such as radiators, powerful discharge lighting, or warm air outlets.

For the use in temperatures exceeding 35°C (95°F), installing the projector into the Monsoon box with a built-in AC unit is highly recommended.
As a temporary solution, you can use a small AC unit and direct it 's output towards the projector's intake fans.

Q: Is it possible to do modifications to the electronic circuitry of the laser projectors?

A: It is not allowed to modify the electronic circuitry of laser projectors without prior authorization and approval of Kvant's technical support representative.
Any unauthorized modifications will result in immediate warranty termination.
There is a risk of electric shock and the risk of injury or property damage by laser radiation. Unauthorized modifications of the circuitry may cause a change in the projector's functionality and specifications, making it incompliant with regulations and standards of Class 4 laser devices.

Q: What if I feel a small electric shock when touching the metal parts of the projector's housing?

A: Turn off the projector immediately. Disconnect the projector from the AC mains power supply. A qualified electrician must check the mains power cable and the socket.
The two common reasons are:

1. Too long AC mains power cable with joined cables N (blue) and PE (yellow-green). The 3-wire connection is essential.
2. Disconnected, not connected, or interrupted PE wire in AC mains power cable or AC wall plug.

Q: What if I feel a pretty strong electric shock when touching the metal parts of the projector's housing?

A: There is a danger of fatal electric shock! Turn off the projector immediately. Disconnect the projector from the AC mains power supply. A qualified electrician must check the mains power cable and the socket.

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Q: Can anybody operate the laser projector?

A: No. The laser projector should be operated by an adult person who passed their training as a Laser Display Operator of Class 4 laser devices. The operator should be aware of and follow all the regulations, requirements, and laws regarding a country where operating the Class 4 laser system.

The manufacturer holds no responsibility for injuries or damages caused by the use of this laser display equipment.

Q: Where can I find the Conformity Declaration (CE) for this laser projector?

A: Conformity Declaration is part of the user manual. Because the corresponding standards are updated from time to time, please contact a distributor or one of our sales representatives to obtain the latest Conformity Declaration for your laser projector.

Q: How can I ecologically discard an old laser projector?

A: Laser projector doesn't contain any poisonous materials or dangerous components. Therefore, you can ecologically discard it the same way you would do any old electronic equipment. For more details, please contact your local waste authority.

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10 CONTACT INFORMATION

Software:

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831 02 Bratislava
Slovakia, Europe

e-mail: info@kvant.sk
Telephone: 00421-2-654 113 55

Technical support contact:
e-mail: micek@kvant.sk
Telephone: +421 918 339 980

Address:
Pangolin Laser Systems, Inc.
1265 Upsala Road, suite 1165
Sanford, FL 32771

Technical support contact:
e-mail: support@pangolin.com
Telephone: +(407) 299-2088

Made in EU.

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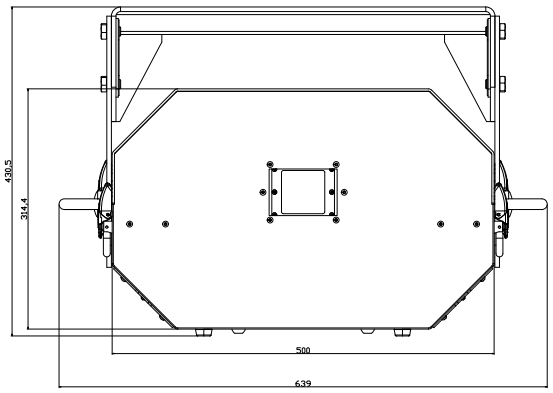
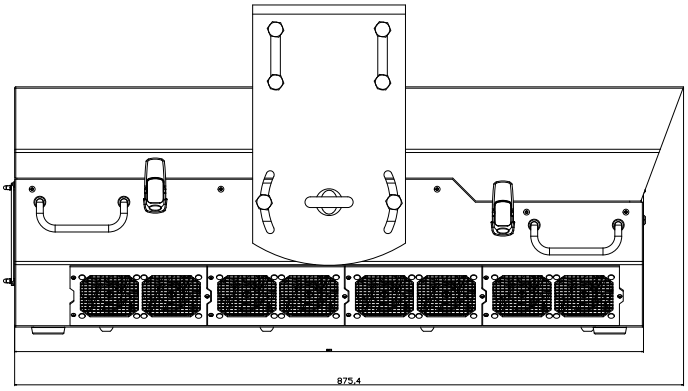
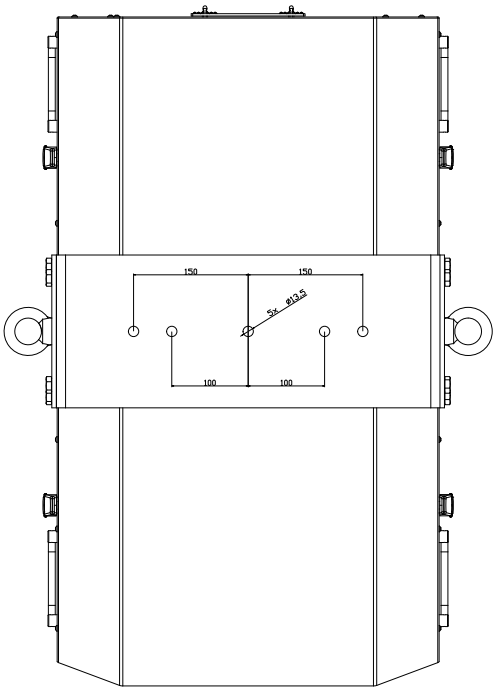
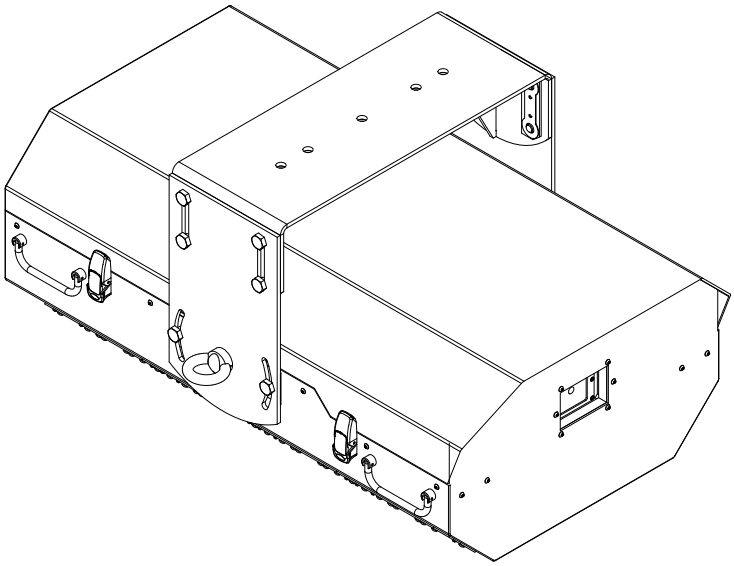
4 DIMENSION DETAILS









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