



Laser
QUANTUM

INNOVATIVE RELIABLE INTELLIGENT

ventus IR

with mpc6000

R-0159 v1.1



OPERATING MANUAL



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Declaration of Conformity



Laser Quantum declares that the product:

Name	Description
ventus IR	1047, 1053, 1064nm DPSS laser

has been manufactured in conformity with the following standards:

- **IEC/BS EN60825-1:2014** Safety of laser products - Part 1: Equipment classification and requirements
- **BS EN 61010-1:2010** Safety requirements for electrical equipment for measurement and laboratory use. General requirements
- **BS EN 61326-1:20013** Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
- **RoHS: 2011/65/EU** Restriction on the use of certain hazardous substances in electrical and electronic equipment



Caution

Failure to read this manual carefully before operating the laser may result in catastrophic damage to the system which may void the warranty



Section 1: Introduction

The ventus IR is a Diode-Pumped Solid-State (DPSS) laser system emitting light in the infrared region of the spectrum at 1047, 1053, 1064 nm, depending on the variant ordered. It is a Class 3b or Class 4 laser product. This manual describes the set up requirements and operational procedures to ensure the systems safe operation.



Warning: Use of controls or procedures or performance of procedures other than those specified herein may result in hazardous radiation exposure

Section 1.1: Operational Requirement – Electrical Specification

The mpc6000 Power Supply Unit (PSU) requires

Input Voltage 12V DC Acceptable range 11V to 14V

Input Current 8A Minimum of 8A must be available from the external source

Note the centre pin of the input connector is positive and the external DC source must not have a Ground connection

Section 1.2: Operational Requirement – Environment

Optimal Operating Temperature Range – Laser Head 22C to 37C

Maximum Operating Temperature – Laser Head 40C

Maximum Operating Temperature – PSU 40C

For optimal performance, the laser head should be mounted onto an appropriate heatsink in a stable environmental temperature. The heatsink requirements will depend on the ambient temperature of the operating environment and the operating power of the laser (section 6).

In the event of the laser head or PSU over-heating a controlled shut down of the system will occur (Section 6.1). The system can only be restarted once it has been cooled to a safe temperature.

Section 1.3: Storage Requirement – Environment

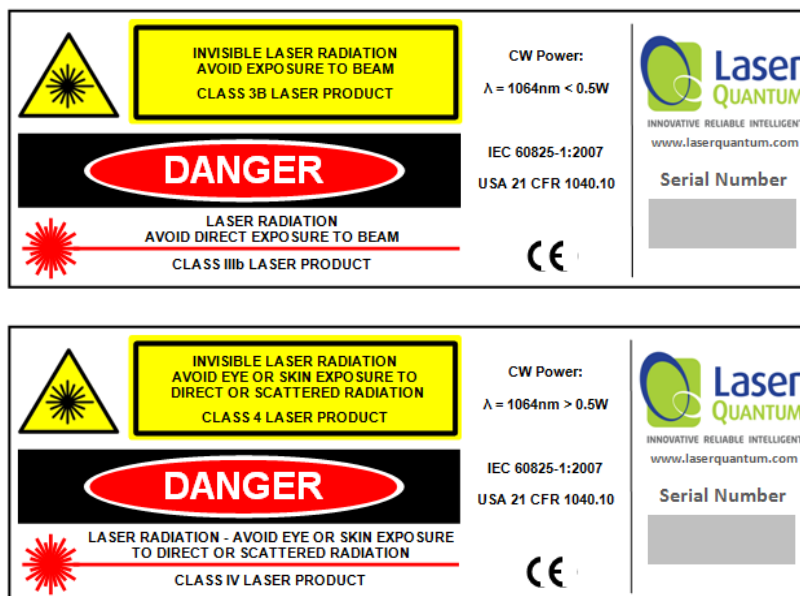
Temperature Range 5C to 45C

Humidity Non-Condensing

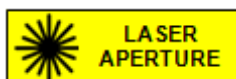


Section 2: Laser Safety

The ventus IR is a Class 3b or Class 4 laser product. A warning label appears on the laser head and an example of both of these is reproduced here:



A further label also appears adjacent to the laser aperture:



When operating the laser, those in the environment must adhere to the following instructions to avoid eye damage and prevent the risk of fire

- Laser safety goggles must be worn at all times when the laser is in operation
- Always ensure the beam is safely collected in a suitable beam stop or that the laser is disabled when not in use

For a full description of laser safety procedures, the user is referred to Declaration of Conformity standards plus:

- FDA Code of Federal Regulations (CFR) Title 21 Subchapter J section 1040.10 Laser products
- American National Standards for Safe Use of Lasers – ANSI Z136



Section 3: System Specifications

A full list of parts supplied with the laser systems appears in Section 3.1.

The dimensions (mm) and weights (kg) are shown in Section 3.2. These measurements should be referred to whilst integrating the system.

Section 3.1: Parts List

The **ventus IR** laser system comes complete with:

- **ventus IR** laser head
- **mpc6000** Microprocessor Controlled Power Supply Unit (PSU)
- Umbilical Cable – to connect the laser head and PSU

Depending on the purchase specification, some or all of the following items may also be included:

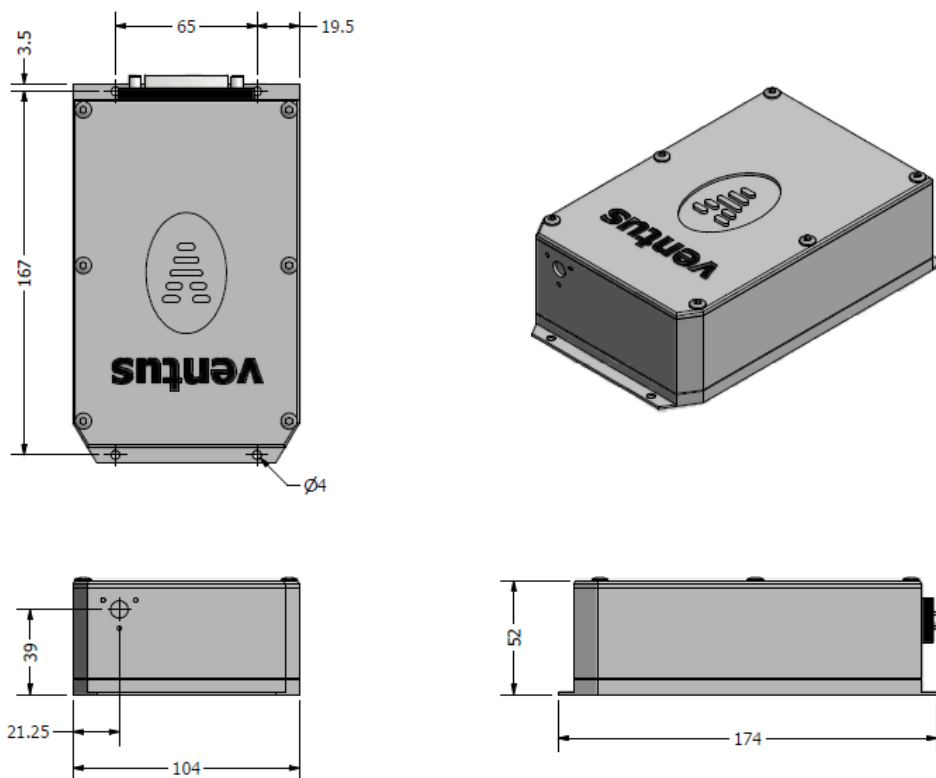
- External Power Supply Source (AC to 12V DC Switchmode)
- IEC Mains Lead
- PSU Key Set – to operate the interlock key on the PSU control panel
- Interlock Dongle – to enable the laser system (Green spot on casing and Green LED)**
- Operating Manual – delivered on a USB flash drive

**** Note:** If a Red spot Interlock Dongle has been supplied, Section 5.1 is amended to include an additional safety warning which must be taken into consideration before operating the laser.

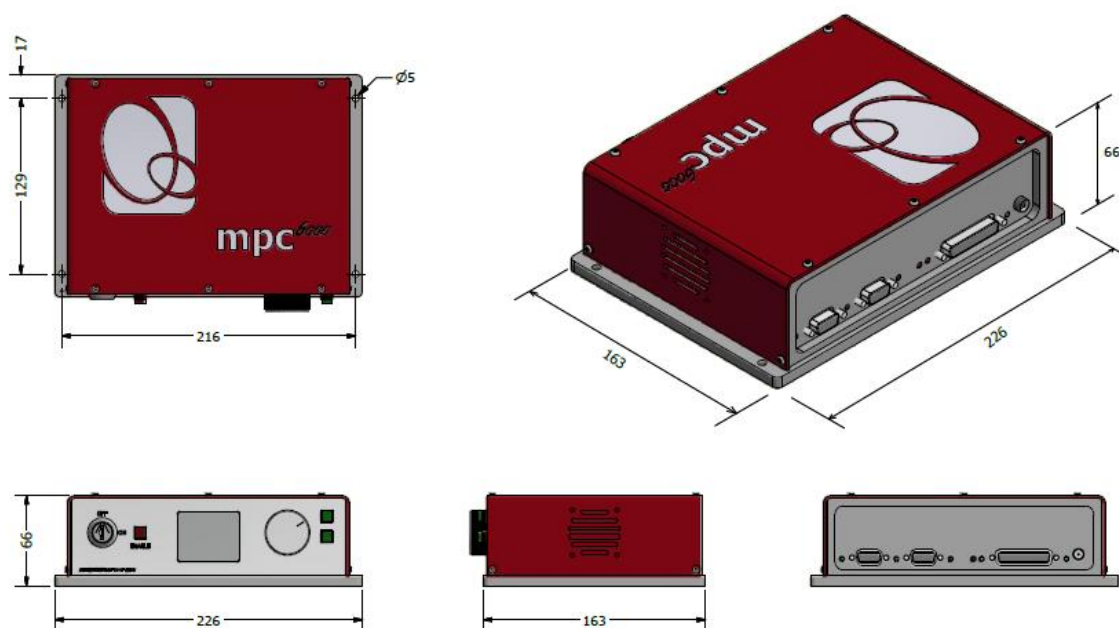


Section 3.2: Weights and Dimensions

ventus IR laser head Weight: 1.2kg



mpc6000 PSU Weight: 1.7kg





Section 4: PSU Configuration Drawings

Figure 4.1

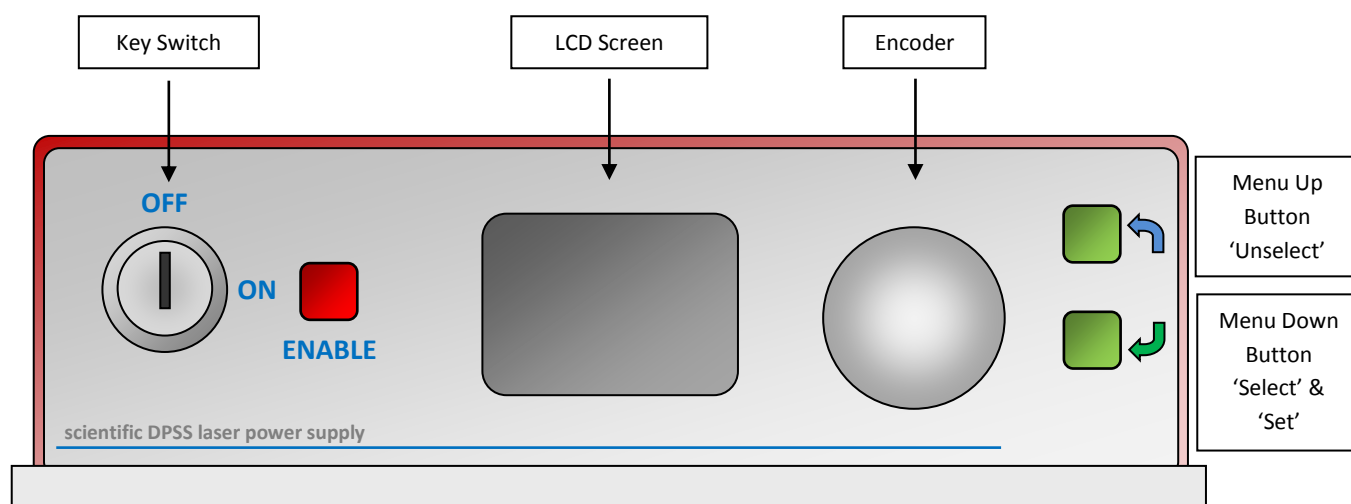
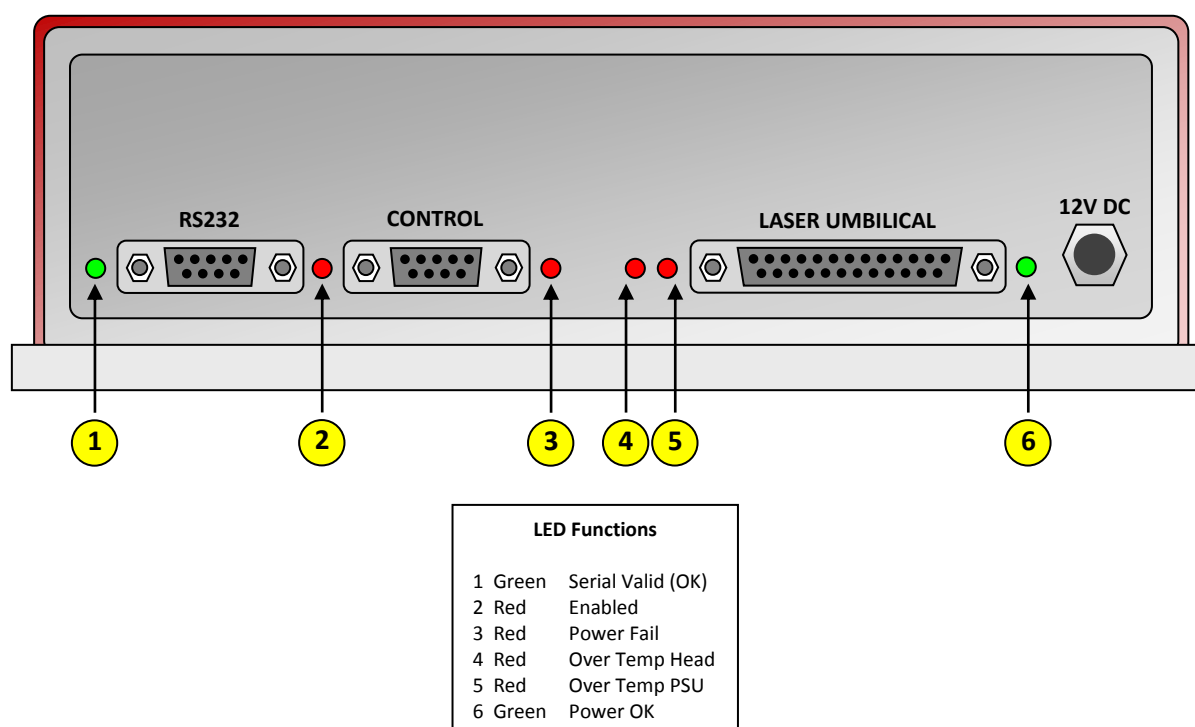


Figure 4.2



Attention: The laser contains components which can be damaged if exposed to an electro-static discharge. Ensure the connector pins on the back of the laser head are never exposed to an electro-static discharge.



Caution

Care must be taken to prevent direct exposure to the laser beam before the system is enabled

Section 5: Laser Operation

Section 5.1: Switching the laser 'on'

1. Ensure the **mpc6000** is not powered (i.e. 12V DC source is switched off).
2. Connect the Umbilical Cable to the port marked 'Laser Umbilical' on the **mpc6000** before connecting the other end to the laser head. Tighten the locking posts on the screws at both ends so they are finger tight.
3. Switch on the 12V DC source, this should illuminate the **mpc6000** green power LED. At this stage the thermal control circuitry is activated but no laser emission should occur
4. The analogue Control port (see Figure 4.2) is multi-functional as it has connections for Interlock, Enable Switch and Laser Power Control/Modulation. The Interlock must be closed to allow the laser to operate and this can be achieved using the supplied Green spot Interlock Dongle.
5. With the Key Switch turned to the 'on' position, a momentary press of the Enable button will start the laser.



Warning: If a red spot Interlock Dongle has been supplied with the laser system this will over-ride the need to press the Enable button. Turning the Key Switch to the 'on' position will start the laser



6. Using the Encoder and Menu Up/Down buttons (see Figure 4.1) the operation current or power can be adjusted (see Section 5.3: Front Panel Controls).

Section 5.2: Switching the laser 'off'

The laser is switched off by turning the Key Switch to the 'off' position or disabling the interlock connection.



Section 5.3: Front Panel Controls

On the front panel of the PSU: 'Up' button is marked  'Down' button is marked 

In order to adjust the laser output, the user must first select the parameter mode displayed on the LCD screen by pressing the menu down button. This action changes the text with the navigation marker (). Depressing the menu down again will change the text with the selection marker ><. The rotary encoder allows the selection of the required parameter: 'CURRENT' and 'SERIAL'. Once selected, depressing the menu up button once will return the parameter back to the navigation marker (). The laser is now operating in the selected mode.

Using the rotary encoder select the parameter to be changed. Depressing the menu down button again will change the selection marker to ><. The value can then be changed using the rotary encoder. The value will change faster if the rotary encoder is depressed whilst rotated.

Once the desired value is reached, depressing the menu up button twice will store the parameter in long-term memory.

The current is represented on the top horizontal bar as a percentage of the maximum available.

Enabling/Disabling the RS232 serial link turns it on/off.

Both the laser head [LASER] and power supply [PSU] temperatures are displayed on the screen, as well as the Status display. The Status messages are tabulated below:

Status message	Description
KEYSWITCH : OFF	Keyswitch / Interlock disabled
ENABLE TO START	Laser read, awaiting Enable button
LASER DISABLED	Laser disabled via RS232 command
LASER EMISSION	Danger! Laser emission

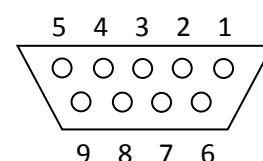


Section 5.4: Control Port - Functionality

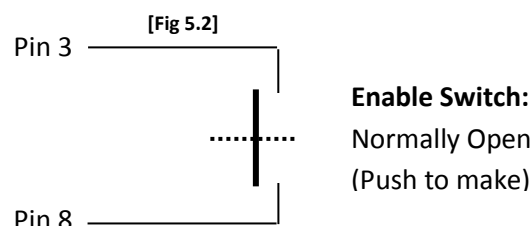
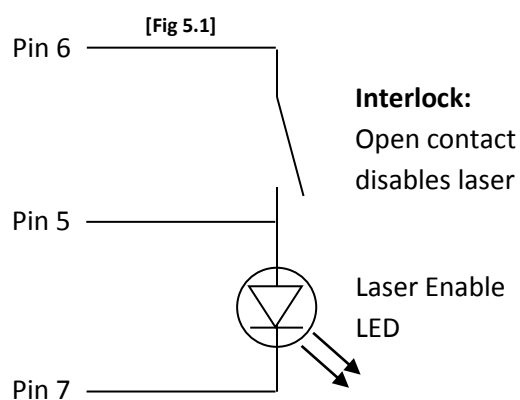
The **mpc6000** can be operated directly via the Control port (see Section 4.2) by applying 0 to 5V in accordance with the diagrams in this section.

Pin	Function
1	+5V rail (source)
2	Ground (GND)
3	Enable switch (connection 1)
4	+5V (input)
5	Interlock (connection 2), Enable LED anode & Ground (GND)
6	Interlock (connection 1)
7	Enable LED cathode
8	Enable switch (connection 2)
9	Ground (GND)

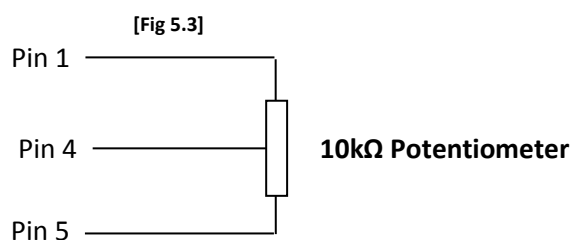
**9-way Function Table
and Pin-Out Diagram**



The remote Interlock, Enable and Enable LED can be wired in accordance with the diagrams below [Fig 5.1 & Fig 5.2], to be used as part of a laboratory interlock safety circuit. If either Interlock is broken the system will shut down, the Enable button must be pressed to restart the system.



The PSU has its own 5V source (pin 1) which when shorted to pin 4 drives full current to the laser diode. By wiring a variable potentiometer in accordance with the diagram [Fig 5.3] the laser current can be varied smoothly.





Section 5.5: RS232 Port - Functionality

Control of the laser can be achieved via the RS232 port using a terminal emulator such as HyperTerminal or PuTTY. This allows the operator to:

- turn the laser on/off
- control the laser power
- prompt the processor for information such as laser head/PSU temperature
- check the laser status

It is necessary to have the Interlock and Enable switches closed via the Control port in order to enable the laser, prior to controlling the laser through the RS232 port. Pins 1 and 4 of the Control port must be shorted together to allow maximum current to be set by the RS232 commands.

The RS232 port uses the standard 9-way connector pin configuration

Pin	Function
2	TXD: RS232 - Transmit
3	RXD: RS232 - Receive
5	GND - Ground

Port settings are:

Baud Rate: 19,200

Parity: None

Stop Bit: 1

Hand Shaking: None

The operator must wait for a response from the PSU before sending the next command. A response is any text string (including null) followed by a carriage return.



Section 5.6: RS232 Port - Serial Commands

Serial Command	Function
OFF	Disables the laser, regardless of the interlock status
ON	Enables the laser subject to Interlock and Enable Switch status
CURRENT=###	This sets the current to the diodes as a % of the maximum e.g. to set a current of 85% of maximum send CURRENT=85, followed by striking the RETURN key.*
STEN=YES / NO	Enable (YES) or disables (NO) laser as default at start-up. This serial command must be followed by WRITE
WRITE	Stores STEN in memory
LASTEMP?	Returns the temperature of the laser head in degrees centigrade
PSUTEMP?	Returns the temperature of the PSU in degrees centigrade
STATUS?	Returns the status of the Interlock
TIMERS?	Returns the timers of the laser and PSU: <div>Time=#####.# Total time the system has been powered Laser Time=#####.# Total time the diodes have been powered Laser > 1A Time=#####.# Total time the diodes have been powered >1A</div>

**A minimum % current threshold level is required to achieve laser emission. This threshold varies from laser to laser and is also dependent on the laser power.*



Section 6: Cooling Requirements and Power Consumption

Section 6.1: Cooling Requirements

The laser has a characteristic warm-up period before it reaches specification; this time depends partly on the heat sink to which it is attached. However, the typical warm-up time is 10 minutes from switch on.

In order for the laser to perform to specification, it must be adequately heat-sinked. Operating the laser on an inadequate heat-sink will adversely affect its stability and may result in a thermal runaway of the laser head. Operating the laser on an optical bench will produce optimum performance. In normal laboratory conditions, a heat-sink with dimensions 400 x 400 x 10 mm should be suitable for the laser to operate in accordance with its specifications. Depending upon environmental conditions and power of the laser, additional cooling aid might be required (e.g. TEC, forced air cooling, water cooling). For further information on heat-sinking your laser system, please consult your sales representative who may be able to provide a heat-sink solution.

ventus IR laser head

Once the maximum operational temperature for the laser head (see Section 1.2) has been reached one of two things will occur:

- 1) The current to the diode will immediately be switched off and the laser system will need to be restarted once the temperature has been restored to normal
- 2) If de-rating is enabled the current will gradually be reduced to zero in order to try to allow the laser head temperature to stabilise. If the current does reach zero the system will need to be restarted. The effects of de-rating are shown in the table below

Current to Laser	Head OVERTEMP LED	Colour of Laser and PSU text on LCD
As set by user	Off	Orange
Begins to de-rate	Flashes	Flash Red and White
Reduced to zero	On	Flash Red and White

mpc6000 PSU

A similar arrangement occurs for the PSU once the maximum operating temperature (see Section 1.2) has been reached. Note: The indicator LED in this instance is marked 'PSU OVERTEMP LED'.



Section 6.2: Power Consumption

The power consumption shown is that which is drawn at the plug from the mains supply in both the Maximum and Typical states. The Maximum current will usually be drawn at start up and the Typical current is when all temperatures are stabilised and the system is operating at the specified power. Peak values are shown in all cases.

Maximum at 240V supply – using the supplied External Power Supply Source:

360W (@1.5A)

At the 12V input the PSU must be able to draw a maximum of 8.5A

Laser System: Maximum (laser system power shown in blue)

1500mW	80W	3000mW	85W	5000mW	95W
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Laser System: Typical (laser system power shown in blue)

1500mW	70W	3000mW	75W	5000mW	85W
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The ratio of the laser head to system power consumption is 1:2.5. The values shown are system power consumption.



Section 7: Laser Maintenance

If the **ventus IR** is operated in a smoky or dirty environment, occasional cleaning of the laser window may be necessary. To perform this procedure, the laser must be turned off and, using optical cloth dampened with research grade methanol, the laser window must be gently wiped.

- Always follow the instructions given in this Operating Manual
- Never touch the connector on the laser head with anything other than the Umbilical cable provided and always follow the connection instructions in this Operating Manual
- Do not open the laser head or PSU; this will immediately invalidate the warranty
- Do not subject the laser head to mechanical shock; if severe this can cause mis-alignment of the laser cavity
- Do not allow the output window of the laser to be touched as this may damage the precision optical coatings used. Avoid very dirty atmospheres where dirt may settle on the window.
- Do not operate or store this laser system in very humid or damp environments

Section 8: Liability

Laser Quantum accepts no liability for damage to persons or property caused by incorrect or unsafe use of any of its products; this is the sole responsibility of the user. Proper safety regulations for the use of these products must be observed at all times.



Section 9: Warranty

Laser Quantum provides a return to base warranty across all our product ranges (see Support Section 10). The warranty period for your laser can be found on the invoice provided with the system.

Warranty cover for the laser is subject to proper use, care and protection from mistreatment. Examples of mistreatment include but are not limited to any of the following:

- Any deviation from the instructions laid out in the Operating Manual
- Opening the product or breaking the warranty seals
- Operation in any hostile environment as outlined in the Operating Manual
- Any damage due to operation in unclean environments
- Any substantial mechanical shock
- Any damage through static discharge (this will not occur under normal operation)

The definition of mistreatment and its applicability to the warranty is at the reasonable discretion of LQ.

LQ's obligation under this warranty is limited to the replacement or repair of the product which having been returned to the factory is found to be defective, and where the defect was not caused by factors external to the product. Any replacement part/product is under warranty for the remainder of the initial product warranty period.

Section 10: Support

Should the laser fall below acceptable specification performance, please contact our service and support team on +44 161 975 5306 or email: support@laserquantum.com. They will provide initial assistance to rectify the problem remotely. If this is not possible, they will provide you with a Return Material Authorisation (RMA) Form and instruction on how to package and return the laser safely to us for assessment.

**PLEASE DO NOT RETURN THE LASER
WITHOUT PRIOR CONTACT WITH AND AGREEMENT FROM OUR SUPPORT TEAM**

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