Series 200
Series 280
DC CO_2 Laser
Users Manual

Part No.: 1EAA98E02

INTRODUCTION

GSI Group, Laser Division is a worldwide technology company specialising in the development, production and support of Lasers and Laser-based systems. The Company organisation includes manufacturing operations located in North America and Europe along with a network of support centres.

GSI Group, Laser Division offers a complete range of lasers that cover applications in sectors including electronics, aerospace, automotive, advanced manufacturing, packaging and advanced research. In the field of research, our products are employed for spectroscopy, holography, photochemistry, and many other specialised applications. In the manufacturing sector, they are used to cut, drill, engrave, etch, mark and weld a large variety of materials and items.

GSI Group collaborates with customers to develop laser systems that increase productivity, solve manufacturing problems and meet the requirements of leading-edge research.

Thank you for purchasing this product. You can now benefit from the superior and reliable performance of an advanced laser system.

Should you have any queries about this system, or experience any difficulties in its use, do not hesitate to contact us. Our engineers and technical staff are always on hand to provide professional advice. It is recommended that you contact:

GSI Group,China - Service and Technical Support Hotline

Telephone : +86 (0) 512 - 62837080
Fax: +86 (0) 512 - 62837087
Email : cn.sales.laserdivision@gsig.com

When contacting a Customer Centre, please have the following information at hand:

- The Laser model (SLC2x0x Laser).
- The Laser serial number.
- Any relevant information that would assist in fault diagnosis.

Please find the necessary time to read this manual thoroughly. It begins with safety measures that must be observed by all personnel authorised to use this system, and includes relevant installation details.

The manual clarifies both the purpose of the components on the laser head, and the function of every control. It describes the essential maintenance routines that must be undertaken in order to keep the product in peak condition, and explores the subject of troubleshooting.

Finally, the manual concludes with the laser's technical specification, and supporting documentation. In a few instances, an additional section covering the special features of customised systems is included.

It is vital that we draw your attention to the following:

WARNING: Certain precautions essential for the safe operation and maintenance of this high power laser are included within the manual and must be fully understood prior to the application of any electrical power to the system!

WARNING: No modifications or adjustments to components and controls should be undertaken other than those specified herein. Failure to observe this condition may result in hazardous laser radiation exposure!

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1. Safety

1.1 General

Only authorised personnel who have been instructed in and fully understand the necessary safety procedures must use this laser.

Access to the laser should be restricted to authorised personnel. Suitable warnings signs should be placed around the area where it is operating.

Any local safety requirements for the operation of this equipment must be complied with.

1.2 Optical Safety

This is a high power Class 4 (IEC 825-1:2001) / IV (CDRH) CO2 laser system.

WARNING: Laser radiation can cause serious eye damage - including blindness. Never look directly into either the CO_2 or HeNe laser beam. Injury to the eyes and skin can result from direct exposure to CO_2 laser radiation.

When the system is operational, all personnel must at all times wear approved laser goggles or glasses. It is vital that these are effective at the wavelength(s) emitted by this laser! The wavelength of the main infrared beam is 10.6µm.

Information to assist with the selection of suitable eye protection is provided on the Laser Radiation Warning and Classification Label.

Never look directly into the main beam or any reflected laser beams - even when wearing eye protection - or blindness may occur.

Ensure that the beam is never reflected - even partially - back along its path into the laser head, as this will result in optical damage to its components.

Ensure that the beam is not directed towards reflective objects. (Note that personal jewellery is a potential hazard.)

It is strongly recommended that the laser is positioned so that beams are not at eye level, and the beam is not pointed at a room entrance. Take care that laser light cannot escape through windows.

Interaction of the beam with certain materials can cause potentially harmful levels of visible radiation to be emitted. Appropriate protective measures must be taken in this case. For further information on this subject see subsection 1.6.

1.3 Electrical Safety

WARNING: This equipment contains lethal AC and DC voltages. These may still be present even when the power is disconnected.

Never attempt to remove the covers from the power supply unit or the chiller. Only qualified technical personnel who are familiar with the equipment must access these items.

No electrical hazard exists if the system is operated normally. This requires a) the protective cover to be in position on the head, b) the PSUs to be enclosed within the case provided by GSI Group or in an equivalent container, and c) both items to be properly grounded.

Always use extreme caution when operating the system with the head cover removed or either PSU unshielded, as there is then a risk of exposure to HV electricity. Personnel in the vicinity should wear rubber-soled shoes and remove conductive clothing and jewellery (including metal watches). In the unlikely event that it is necessary to make HV measurements, two people should be present.

WARNING: Stimulating the CO2 in the tube requires voltages as high as 40kV, which are present in the laser head, the PSU, and the HV connection between them.

WARNING: If the LV return from a laser tube is disconnected, or has become disconnected, from the power supply, then potentially lethal voltages may appear at the LV (output) end of the laser tube. Do not touch the laser tube ends when the PSU has mains power to it.

A safety interlock is provided in the wiring harness of the head and may be connected if desired (see subsection 4.5).

WARNING: Although this interlock can prevent the activation of the PSU when the head cover is removed, 220-240V (or 110V) AC current is still present at various locations throughout the assembly (depending on how the interlock switch has been connected).

WARNING: The CO_2 tube and PSU all hold charge for some time after the system is shut down. Before working on or near these items, either a) this capacitance must be discharged to ground (if the ground connection needs to be held, make sure it is by an insulated part), or b) they must be left for five minutes after turning power off.

1.4 Laser Apertures

Safety beam stops are not normally supplied on OEM lasers. These are understood to be a component part of equipment being manufactured for an end-user, which should contain suitable precautions to avoid unnecessary beam exposure.

1.5 Equipment Safety Standards

This laser component is designed to comply with the following:

- BS EN 60825 - Radiation Safety of Laser Products - Equipment Classification, Requirements and User's Guide
- BS EN 60204 - Safety of Machinery - Electrical Equipment Machines
- BS EN55011 – Emitted RF radiation.
- BS EN61000 – EMC Requirements
- CDRH US Safety Requirements: Compliance with 21 CFR 1040.10 and 1040.11; except for deviations pursuant to Laser Notice No. 50, dated 26 July 2001.

1.5.1 Declaration of Incorporation

Use of the GSI Group Ltd, Laser Division product(s) referred to in this Manual, as part of a whole Machine may not ensure conformity of the whole Machine with the Machinery Directive. Machinery may not be put in to service until it has been declared in conformity with the relevant provisions of the Directive.

1.6 References

For further guidance on the safe use of laser equipment, the following is a list of suggested reading:

1) Laser Safety Guide
Laser Institute of America, 12424 Research Parkway, Orlando Florida 32826-3249, USA

2) American National Standard for the Safe Use of Lasers (ANSIZ136.1-1986)
Laser Institute of America, 12424 Research Parkway, Orlando Florida 32826-3249, USA

3) Radiation Safety of Laser Products - Equipment Classification, Requirements and User's Guide (BS EN 60825)
BSI, Linford Wood, Milton Keynes MK14 6LE, UK

2. Safety Labels

The labels illustrated in this section are essential for the safe operation of the laser. They must not be removed under any circumstances, and any missing or defaced labels must be immediately replaced. Spares can be obtained from GSI Group.

2.1 Laser Radiation Warning and Classification Labels

The values are not an output specification, and are provided to assist with the selection of suitable eye protection.

2.2 Laser Aperture Labels

Labels are provide to clearly show where the laser beam will exit from the laser casing.

3. Prerequisites and Installation

3.1 Introduction

The Series 200 CW DC CO_2 system is normally provided as four distinct items: the laser head, (described in section 4), plus the power supply unit (PSU), which have their own Operator Manuals. All equipment manufactured by GSI Group, however, shares certain features in common. For reliability and durability, it is precision engineered from the best materials available, while for flexibility and cost-effectiveness, it is designed and constructed on a modular basis.

Please note that this system is supplied on the understanding that it will form a component part of equipment being manufactured for an end-user. It is the purchaser's responsibility to employ the various interlocks to ensure legislative compliance. Relevant pins on the user interfaces on the laser head (see subsection 4.5), Chiller, CIU and PSU should be connected to suitable monitoring or control devices prior to operation.

Series 200 and series 280 Industrial CO_2 Lasers are offered in a choice of optical configurations allowing the end user to choose the option providing best performance for each application. The various models offered include:

200S	200W specified output power, beam waist located at 1.1m from output coupler
200N	200W specified output power, beam waist located at output coupler
280S	280W specified output power, beam waist located at 1.1m from output coupler
280N	280W specified output power, beam waist located at output coupler

Please see chapter 8.1 for details.

To allow for even greater flexibility, high voltage power supplies (two required) are not packaged with the laser head to allow the end user the freedom to choose any suitable mechanical configuration when integrating the laser into his system. GSI Group provides the only suitable high voltage power supply for this system. Other supplies will void the warranty.

3.2 Electrical Requirements

Conforming to BS EN 610101-1, and designed for 220-240V / 50Hz operation. GSI provides two kinds of PSU:, CWC100A and CWC140A. The 200x system needs two off CWC100A PSU and the 280x system needs two off CWC140A PSU. Each of CWC100A needs a 5A power supply and CWC140A needs a 6A power supply at 230V nominal voltage.

Please see CWC100 Series manuals (P/N 1EAB00E02) for details.

3.3 Coolant Requirements

The systems require a chiller with a water-to-refrigerant heat exchanger. This must be filled with distilled or, preferably, deionised water to provide the coolant.

Cooling of the tube is vital to maintain both good performance and lifetime. As such, proper connection of the laser tube to an adequate cooling system is essential. The tube has two hose connections for the cooling system.

The recommended cooling liquid is 100 % de-ionised water at the appropriate flow rate (see table 1) with the tube connected.

Do not use tap water as this may result in damage to the cooling jacket over time. The cooling water should be temperature regulated between 15 - 25°C to maintain good laser performance. The laser output power can not be expected to be stable if the coolant water supply temperature is fluctuating. Additionally, an in line particle filter and de-ionisation cartridge should be in the cooling circuit. These items should be arranged and chosen such that the required flow rate is not compromised. After attachment to cooling system, ensure there are **no bubbles** in the laser cooling jackets. **If the tube mounting is vertical, make sure there is no air bubble at the top of the tube**. Operation with bubbles present could lead to thermal shock, possibly causing damage to the laser tube.

Table 1: Coolant requirement of laser systems

Model	SLC280x	SLC200x
Water specification	Chilled deionized water with in circuit filter	
Temperature ()	15 - 25	
Flow rate (l/min)	>8	>7.2
Pressure (bar)	2 - 4	
Heat load (kW)	>1.5	>1.3

Certain high speed, short duration, pulse formats may require a different cooling fluid. Call GSI Group if pulses of less than 1ms duration are required

WARNING : If the laser is operated by mistake for any length of time without cooling, let the laser cool completely before starting the cooling and laser again.

Operation of the laser without cooling may boil water in the cooling jacket, but if the laser is allowed to cool at least one hour before the cooling is turned on, the laser may survive.

To provide further protection it is required that an Interlock is fitted to into the Laser system to stop the laser operating when there is not an adequate flow of coolant at the correct temperature. GSI Group supply a Coolant Interlock Unit as standard with the SLC range laser tubes. This comes in two formats: one to be fitted in-line to the coolant circuit, and one designed for use with a GSI Group Chiller or Cooler. Details of this Unit are given in a separate Manual.

WARNING: If a suitable Coolant Interlock, approved by GSI Laser Division, is not used then damage to the laser will not be covered by GSI Group Warranty.

3.4 Environmental Requirements

The laser should be operated in a room with a temperature range of 15-30ºC and a humidity level of 30-60%. It should be used in a dust-free environment (of Classification Pollution Degree 2 or less as defined by BS EN 1010-1 and BS EN 60950:1992).

There must be adequate ventilation to the PSU.

The room must satisfy any local safety standards for the operation of this equipment.

3.5 Packaging

If the system arrives with damaged packaging, before it is accepted the extent of the damage must be noted on the freight bill or bill of lading. In addition, this event must be reported to GSI Group within 72 hours - but preferably immediately.

The packaging should be retained for any future storage or shipment of the laser.

3.6 Return of the Laser Head

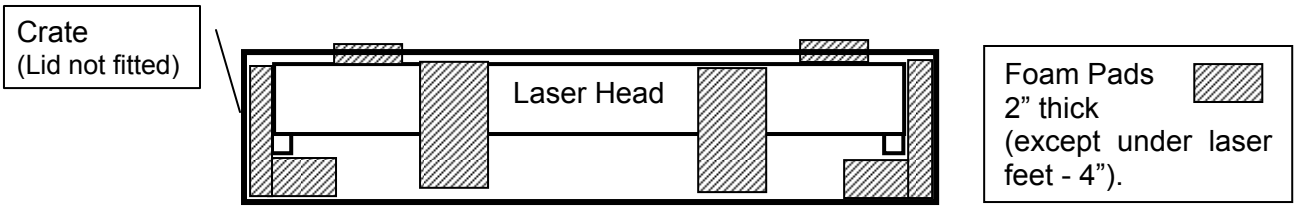
If the head needs to be returned, this must be done using the original packaging - a wooden crate with foam liners, which must be fully intact and in good condition. GSI Group must be contacted in advance for authorisation and an RMA number.

WARNING: Before shipping all coolant must be removed, by draining the head and then gently blowing compressed gas into the outlet. As the quick-fit connectors for the water pipes are self-sealing, these operations must be done with the coolant pipes fitted to the laser. Failure to do this can lead to damage to the laser head during shipping.

Both the coolant inlet and outlet ports should be sealed using the plugs supplied.

Electrical tape should be applied to the end plate to cover the beam output, before the head is repacked in its plastic wrap and placed into its crate, top upwards. The laser must be packed with sponge foam inserts to provide protection and cushioning. The lid of the crate must be secured with screws. Ideally the original foam inserts used when the laser was delivered should be re-used as

shown below. The foam on top of the laser should be compressed to about half its thickness when the lid is fixed down.



Note: The crate used by GSI Group is specifically designed for the industrial laser head only. Never under any circumstance compromise the integrity of the crate and never ship more than one laser head in a single crate.

Ensure the following labels are applied to the crate.

- "FRAGILE" on all sides.
- "TOP LOAD ONLY" on the top side.
- "CAUTION, HANDLE WITH CARE" on all sides.
- Two destination labels including the RMA number on the top side addressed to:

  GSI Group China,

  Building 8 Gangtian Industrial Square,

  Gangtian Road, Suzhou Industrial Park,

  Jiangsu, PRC 215024

3.7 Installation Procedure

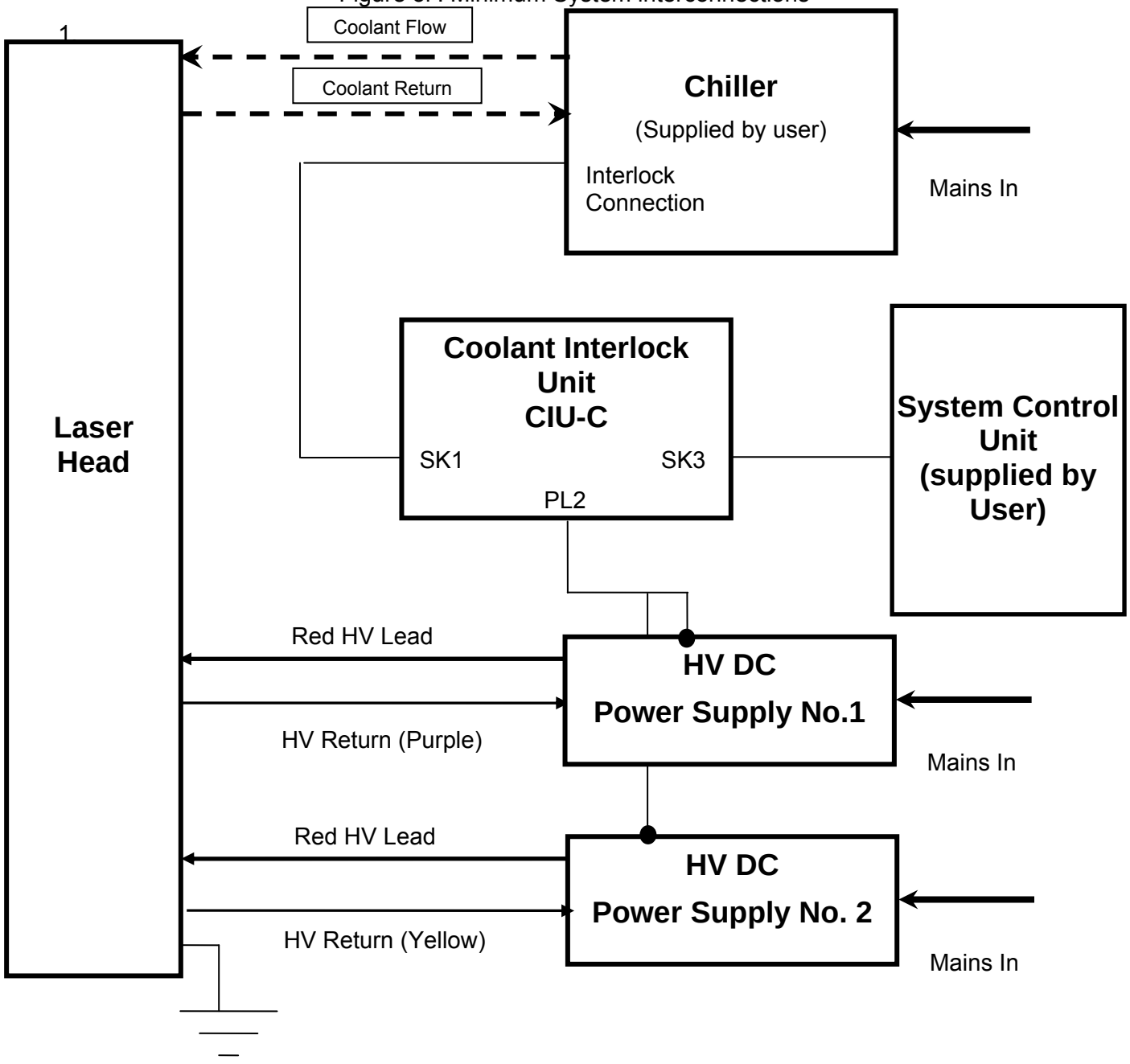
GSI Group personnel will not install OEM systems unless specifically arranged.

WARNING: During the installation procedure wear appropriate safety glasses whenever the laser is in operation.

WARNING: Ensure that all beams are always directed into a suitable beam dump, capable of absorbing the laser power without overheating, and giving only minimal back reflections and scatter.

Fig. 3i illustrates the operational circuit recommended as a minimum requirement.

Figure 3i : Minimum System interconnections



Verify that the necessary water, electrical and environmental requirements are met before removing the protective plastic wrapper.

2. Position the laser head on a flat surface higher than the chiller, and secure it using the screw holes (¼ – 20 UNC) in the feet projecting from its underside. To avoid the possibility of twisting torque insert only two screws at the output end and one at the far end. (If desired, the feet can be repositioned on the other side of their supporting brackets - see fig. 3ii)
3. Position the PSU in close proximity to the head. The OEM version (two required) can be secured using the four screw holes on one side of the unit.

Fig. 3ii: Mounting of head

WARNING: Ensure that the screws inserted are the correct length: i.e. that they do not make contact with any internal components. Maximum insertion depth is 6.5mm

4. Make sure that there is adequate workspace, and good ventilation to the chiller and PSU.
5. Attach the two red HV lines from the two PSUs to the head (see fig. 3i). These have a standard length of 1.8m.
6. Connect the PSUs to the Coolant Interlock Unit (CIU).
7. Insert the 16-way head connector. Attach the separate wires (leading from pins 1 & 2 of the socket) to the HV returns on the PSUs.

WARNING: These wires are critical for the safe operation of the laser. They must never be routed along, nor wrapped around, the red HV lines. In addition, they must never be grounded!

WARNING: It is very important that the current return lines are not confused between the power supplies. The high voltage tube connection from a particular supply must have the return line from that tube returning to the same supply. Failure to observe this will result in a dangerous condition.

8. Connect a power lead routed through an appropriate circuit breaker to the Neutral and Live connections on the input filter at the rear of the PSU and to the Earth connection stud on the PSU case (see HV PSU Manual). Do not provide power to the system at this stage!
9. Ensure that the system is properly grounded - i.e. head connector pin 7 secured to earth.
10. Attach the water connections between the head and chiller. The head has quick-fit water pipe connections. The mating parts, to take a 3/8” i.d. plastic hose, are supplied with the laser. Double check that the hoses are not reversed, or damage will occur!
11. Connect the Chiller to the Coolant Interlock Unit. Connect to the chiller a power lead from a switchable supply and routed through an appropriate circuit breaker.
12. Fill the chiller with coolant, and then turn it on and check for water flow, leaks, air locks and crimped pipes. Remove the head cover to verify that there are no bubbles in the tube, and then replace it.
13. Equip the laser head with suitable controls via the head connector (see subsection 4.5). Do the same for the PSU, via the Coolant Interlock Unit (CIU)
14. Apply power to the system and undertake test firing of the laser (see subsection 5.1) at low power (around 5mA current demand). It is recommended that each tube be tested individually at first. Disconnect the 25-way connector from PSU2, and test fire the Primary Tube. Swap the 25-way connector from PSU1 to PSU2 and test fire the secondary tube. If everything is satisfactory, reconnect the control cable leads from the CIU back to their correct PSU.

WARNING: Do not attempt to adjust the alignment of the laser under any circumstances!

WARNING: Activating the laser without coolant flow will seriously damage it in a short time. If this is done in error, immediately switch off the laser but DO NOT turn on the coolant flow. Wait until the inner bore of the CO_2 tube is at room temperature before attempting a restart (see subsection 5.1).

WARNING: Failure to observe the above procedure invalidates the warranty.

4. Laser Description

4.1 Overview

Figure 4i shows schematically the internal layout of the head on a Series 200 CW DC excited CO_2 laser. At either end of the tubes - hand made from borosilicate glass - are ultra high vacuum flange seals. Each incorporates an electrode (with a protective cap shielding the HV cathode) and a mirror. The highly reflective surface of the rear mirror faces into the tube, as does the partially reflective coating of the output mirror.

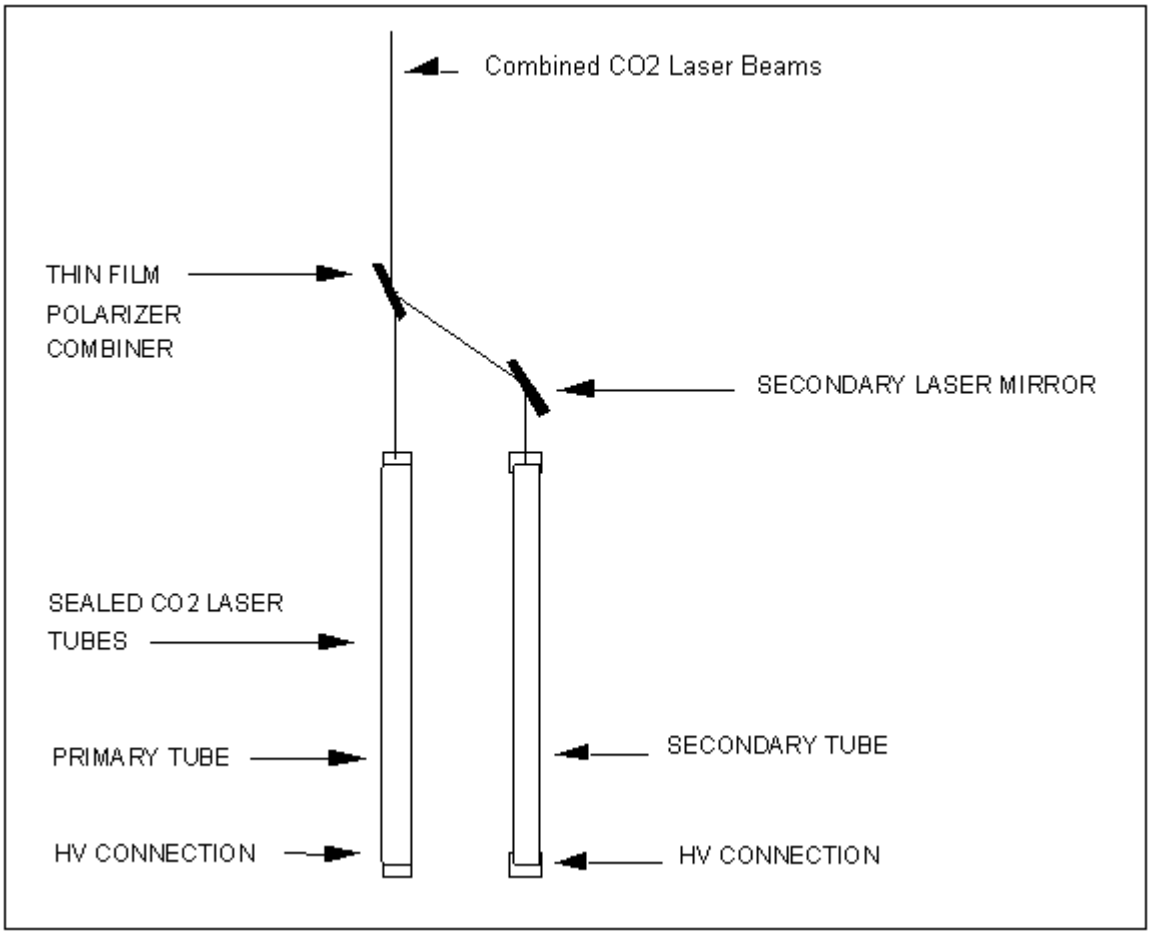


Figure 4i :Series 200 Laser Head Layout

Within the tube is a gas mixture specially formulated with the aim of ensuring that the operation of the laser is constant over an extended period. When a voltage (around 40kV) is applied to the electrodes by the PSU, the resulting electrical discharge stimulates the CO_2 molecules present in the gas to a vibrationally excited level. This (asymmetric) state is unstable, however, so they then emit energy to drop to a lower (symmetric) mode - only to be stimulated once again. This continuous process generates invisible laser radiation at the infrared wavelength of 10.6µm.

The Series 200 Laser Head incorporates two laser tubes. Each produces a linearly polarised beam, but with the planes of polarisation orthogonal. A patented beam combining technique is then used to provide a single output beam incorporating both polarisations.

The Optic Box is located inside the head assembly, adjacent to the output couplers of the two tubes. The box contains the necessary optics to combine the two separate CO_2 beams into one single output.

The Thin Film Polariser is used to combine the two CO_2 laser beams. The output beams of the two CO_2 laser tubes are polarized in orthogonal directions and orientated such that they will combine through the Brewster plate. The optic is mounted to a mount that is used to steer the Secondary

Tube's beam in one axis of the far field. The optic is very fragile and although there is a plate mounted on top of it for protection, special caution should be used when using tools near the mount.

The Secondary Tube Mirror, located at the rear right of the optic box, is coated to reflect 10.6µm radiation and it is used to steer's beam onto the Brewster Plate to combine it with the Primary Tube's beam. The mirror is mounted to a mount that is used to steer the Secondary Tube's output in one axis of the far field and two axes of the near field.

The head is protected by a cover equipped with the HV and water connections, a 16-pin user interface (see fig. 4ii).

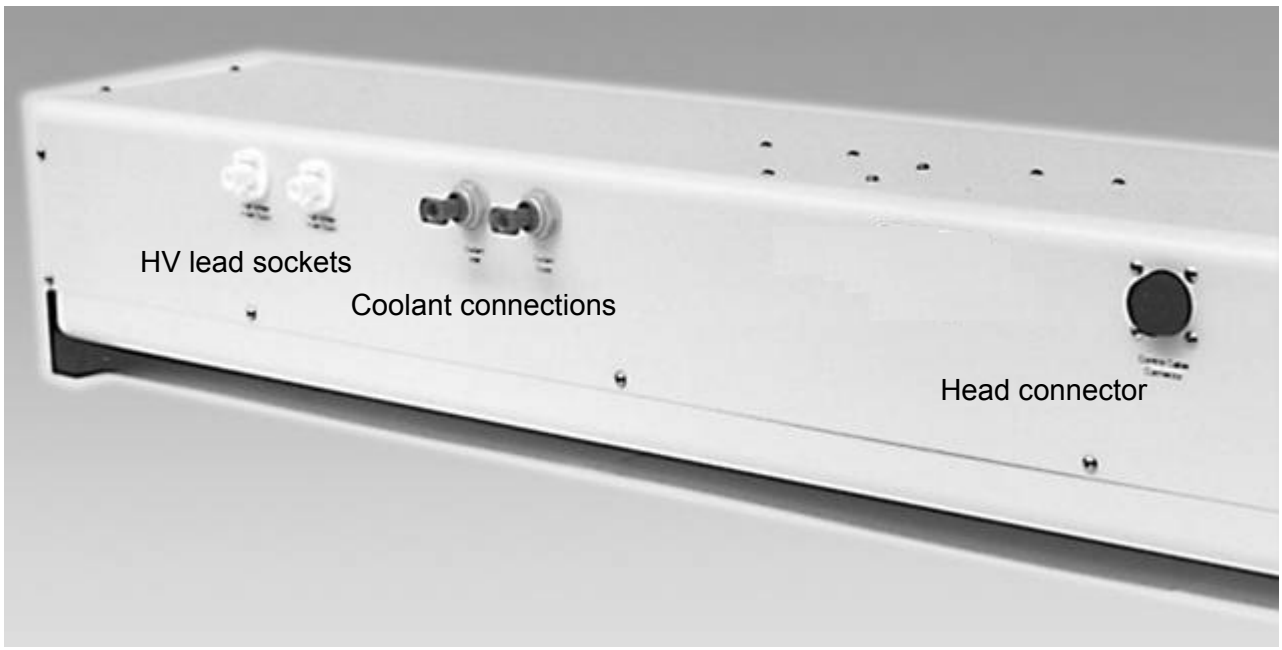


Fig. 4ii: Connections on laser head

4.2 Head Connector

This 16-way user interface (see fig.4 iii) is detailed below. The system uses Pins 1, 2, 3, 7, 15 and 16.

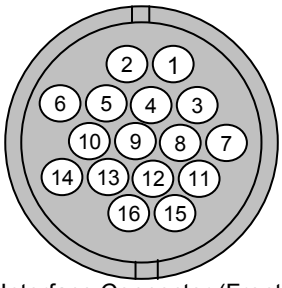


Fig. 4iii: Head Interface Connector (Front view of cable plug)

Pin 1: Current return to HV Power Supply No. 1 (purple wire separate from main cable).

Pin 2: Current return to HV Power Supply No. 2 (yellow wire separate from main cable).

WARNING: These must be attached to the HV returns on the correct PSUs (see subsection 3.7.6)!

Pin 3: The Primary tube current can be monitored as the voltage between Pin 3 (-ve) and Pin 1 (+ve). Scaling is 1V = 10mA. Use high impedance meter, and if using an electronic digital meter, do not turn it on until the discharge in the laser tube has started.

Pin 4: Not used.

Pin 5: Not used.

Pin 6: Not used.

Pin 7: Main ground.

Pin 8: Not used.

Pin 9: Not used..

Pin 10: Not used..

Pin 11: Not used.

Pin 12: Not used.

Pin 13: Not used.

Pin 14: Not used.

Pin 15: Head cover interlock - This digital input is connected to ground when the head cover is in position. The connection is broken when the cover is removed. For the interlock to function, the resulting signal needs to open a switch linked to the 'laser enable' input on the PSU.

Pin 16: The Secondary tube current can be monitored as the voltage between Pin 16 (-ve) and Pin 2 (+ve). Scaling is 1V = 10mA. Use a high impedance meter, and if using an electronic digital meter, do not turn it on until the discharge in the laser tube has started.

5. Operating Procedure

5.1 Start-up Sequence

1) Switch on the power to the chiller.
2) Switch on the power to the PSU.
3) Set the power control on the PSU to produce the required tube energy.
4) Activate the 'laser enable' input on the PSU to fire the tube.

5.2 Shutdown Sequence

1) Switch off the PSU.
2) Switch off the chiller.

5.3 Operating Current Limits

MINIMUM CURRENT:

The discharge within the tube may become unstable if the current is set to below 2mA. If the discharge is unstable the output will be erratic and the mode will be poor.

Ensure that the minimum current conditions are observed in operation.

MAXIMUM CURRENT:

SLC200x: Specified maximum current is 32mA, absolute maximum current is 35mA.

SLC280x: Specified maximum current is 35mA, absolute maximum current is 40mA.

Running under specified maximum current will produce the specified laser output to the end of the tube life. Operating the laser above this current will reduce the laser tube lifetime. In no circumstances should the current to the laser tube be above the absolute maximum current. Operation at the minimum current to perform the required processing will increase the life of the tubes.

NOTE: ***The running current of each tube may be determined***

1) ***by monitoring Pin 3 of the Head Connector (1V=10mA) (P & I version lasers only)***
2) ***by monitoring Pin 17 of the 25-way PSU interface connector (1V=5mA)***
3) ***by attaching a Digital Voltmeter (20 Volts DC scale) across the current sense resistor (100ohm) which is attached to the output end of either tube and reading the voltage (1 Volt DC =10 mA). Connect across Pins 1 and 3 for the Primary Tube, and Pins 2 and 16 for the Secondary tube (see section 4.5).***

6. Maintenance

6.1 General Information

The procedures described below must be followed to keep the system in good working order. GSI Group will not be responsible for any degradation in laser performance caused by the failure to comply with the maintenance schedule. Replacement deioniser cartridges should be obtained directly from the company or its agents.

6.2 Schedule

Every month:	Check the coolant level in the Chiller reservoir.
Every 3 months:	Change the coolant.
	Check the condition of the condenser block in the Chiller.
Every 6 months:	Fit a new deioniser cartridge and coolant filter
	Remove excess dust and debris from HV PSU, laser head and chiller.

No attempt should be made to adjust the CO_2 tube, which has no user serviceable parts. Please contact GSI Group to arrange its refurbishment at the end of its life (at which time reduced laser output will be observed).

6.3 System Servicing

In order to safeguard the long-term integrity of this laser system, it is important that customers as well as GSI Group engineers keep an accurate record of servicing and general component replacement. The following sheet is for your convenience and should be completed every time a maintenance task is performed.

Installation Address:

System Serial No.	
System Order No.	
Installation Date	
Length of Warranty	
Service Contact Name	
Telephone No.	

Date	Service Description	Repair No.	GSI Group Order No.

7. Troubleshooting

Some basic steps to take are given below. If these do not resolve the situation, or in the event of a recurring problem, please contact GSI Group:

Problem: The tube comes on at full power, irrespective of the Current Demand setting.

Possible Causes:

1) The LV return from the laser tube is not connected correctly. Turn off the PSUs and make sure that LV return is not connected to wrong PSU, or is touching a ground point. (See Section 3.7.8)

Warning: Do not attempt to check the LV connection to the anode end of the Laser Tube whilst either of the PSUs has mains power applied to them. There is a risk of an electric shock.

Problem: The tube stops firing or fails to fire.

Possible Causes:

1) The head cover interlock - if connected - has activated. Check that the cover is properly secured and that the interlock system is working correctly.

2) The flow fail interlock - if connected - has activated. Verify that the water connections linking the laser head and chiller are correctly attached, that coolant is not leaking from the inlet and outlet ports, and that it is circulating through the tube envelope.

3) The circuit breaker on the power supply to the PSU has activated. Reset it if necessary.

Problem: The compressor is operating but the coolant temperature continues to rise.

Possible Causes:

1) Operating conditions are exceeding the chiller specification. Confirm that the ambient air temperature is below 35ºC, and if necessary reduce it further (to a minimum of 15ºC) - thus improving the cooling power of the fan.

2) There is insufficient airflow to the chiller. Check that there is sufficient space around the unit, and that ejected air is not entering the air intake.

3) The condenser block is contaminated. Inspect it and clean it if necessary.

4) There is insufficient water in the reservoir. Check if the level switch is open. If this is the case, top up the reservoir.

5) The coolant is contaminated or has not been changed frequently enough. Drain and flush out the system with deionised water. Do not add any cleaning agents or algal inhibitors to the water!

Problem: The chiller stops operating.

Possible Causes:

1) The internal over temperature interlock has triggered. (This can be confirmed by the diagnostic switch in the interface if connected.) Leave the unit to cool to room temperature, and investigate the five possibilities above.

2) The circuit breaker on the power supply to the PSU has activated. Reset it if necessary.

8. Technical Specification

8.1 Laser Head

		Laser Type:	SLC200	SLC280
Output power	Specified		220 Watts	280 watts
	Maximum		240 Watts	300 watts

	Version	**S**	**N**
Beam quality (M^2)		≤1.1	≤1.1
Beam waist (2 w_o)		4.8mm	5.8mm
Beam divergence		3.1mrad	2.6mrad
Waist location (from output coupler)		1.1m	0.0m
Pointing stability (ref. to tube)		<0.1mrad	<0.1mrad

Typical power stability	±5% (at full power during warm-up)
Dynamic range	8:1 (SLC200x), 6:1 (SLC280x)
Length	1702mm (SLC200x) 1817mm (SLC280x)
Width	203mm
Height	167mm
Weight	35-38kg

8.2 PSU

	PSU Type:	CWC100A	CWC140A
Maximum Current (Specified Output Power)		32mA	35mA
Absolute Maximum Current		35mA	40mA
Strike voltage		<50kV	<50kV
Max pulse frequency		1000Hz	
OEM version (2 OFF required)			
Length		350mm	
Width		133mm	
Height		173mm	
Weight		5kg	
Environment		**Operating**	**Storage**
Temperature		15-30ºC	-10*-35ºC
Humidity		30-60% RH	20-80% RH

WARNING: For Storage at or below 0°C care must be taken to ensure that all coolant is removed from the laser tubes.

9. Drawings and Schematics

Figure 1 : Envelope and Mounting Dimensions (SLC200x)

Figure 2 : Envelope and Mounting Dimensions (SLC280x)

Figure 3 : Simplified Wiring Diagram

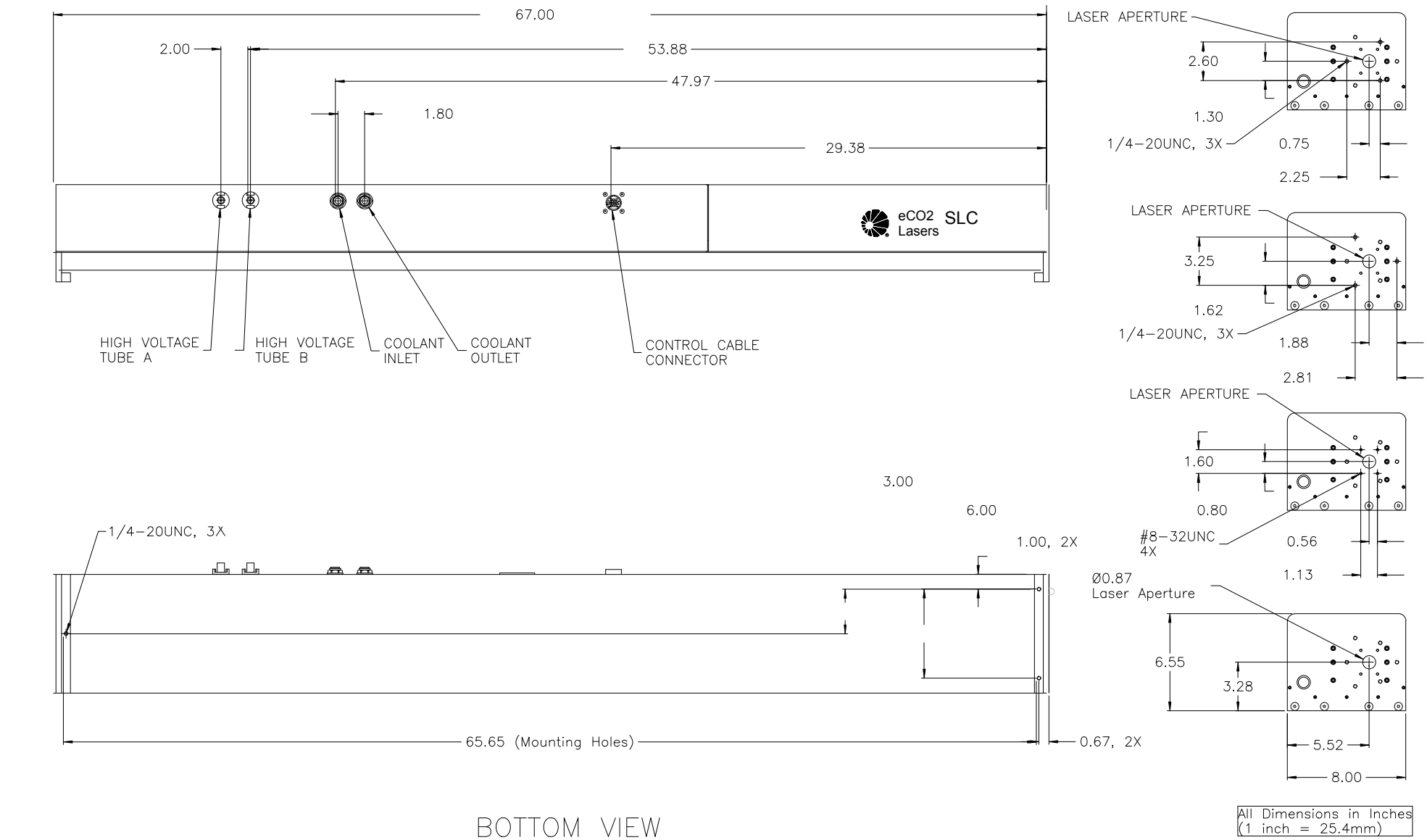


Figure 1 : Envelope and Mounting Dimensions (SLC200x)

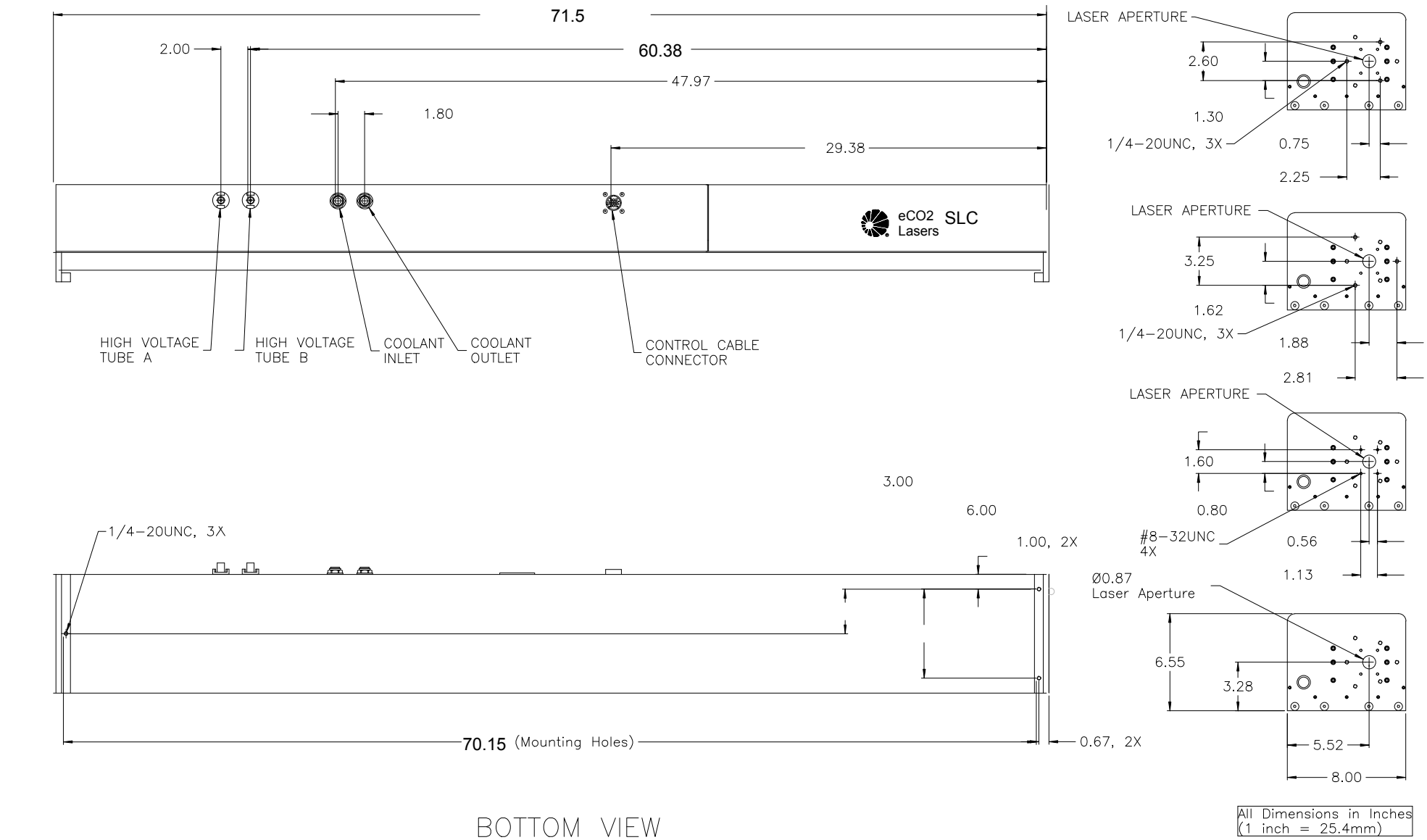


Figure 2: Envelop and Mounting Dimensions (SLC280x)

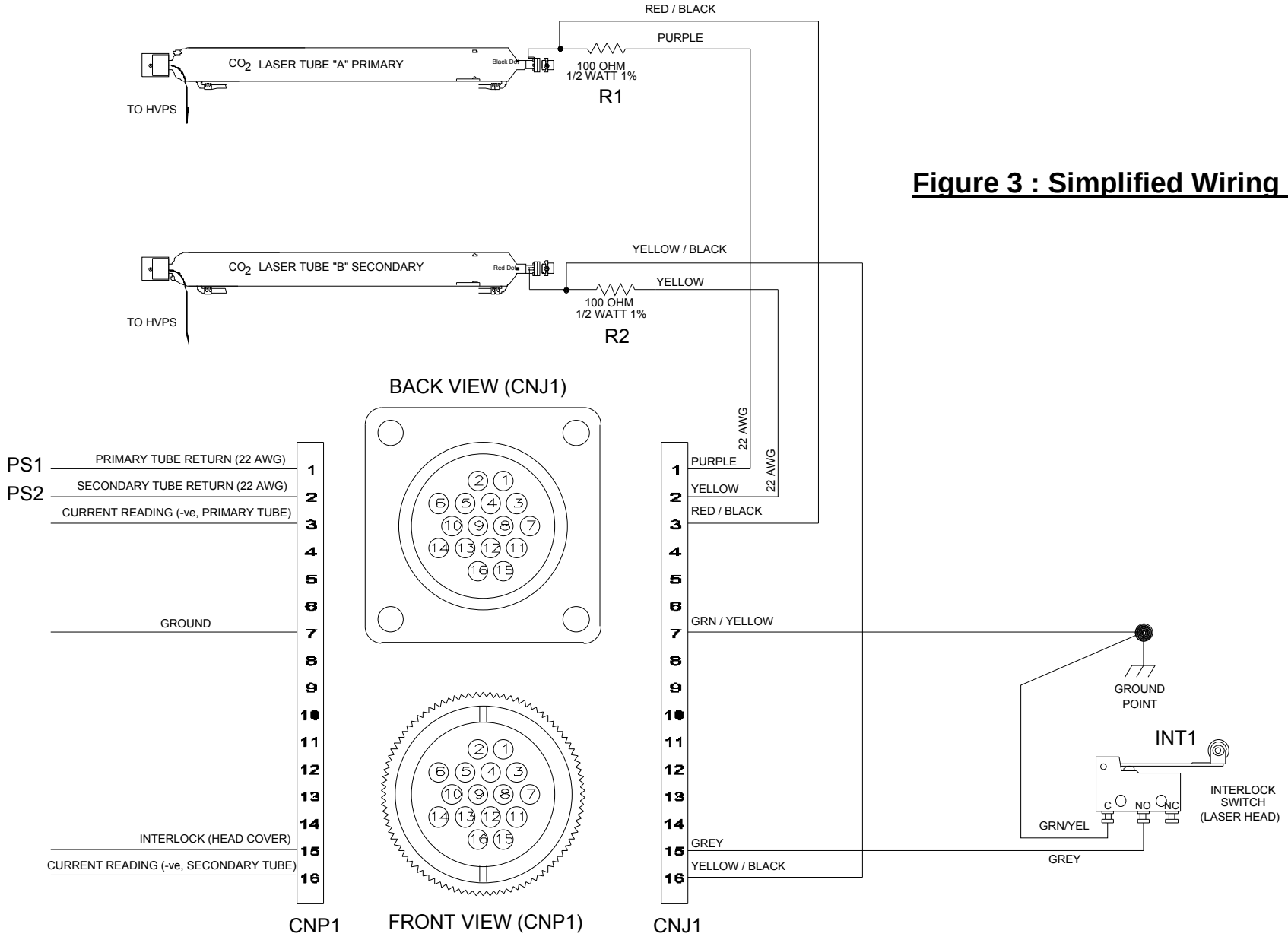


Figure 3 : Simplified Wiring Diagram

Declaration *of* Conformity

We GSI Group Ltd, Laser Division, under our sole responsibility declare that the product(s) listed here conform to the following EC Directives and European Standards.

Product Description	Conforms to EC Directives:	Conforms to EU Standards:
DC CO2 Lasers SLC100 Series SLC200 Series	***Machinery Directive*** 89/392/EEC. ~ As a component part (See separate Declaration of Incorporation) ***EMC Directive*** 89/336/EEC ***Low Voltage Directive*** 73/23/EEC	***Safety*** BS EN 60204 BS EN 60825 ***EMC**** EN 61000-6-4 : (Emissions) EN 61000-6-2 : (Immunity) EN 55011 Class A

System Serial Number : Month/Year of Manufacture :

Laser Type :

Signed for GSI Group Ltd

Dr Mark Greenwood

Technical Director

Declaration *of* Incorporation

Community Directives applicable: 98/37/EEC and amendments

Use of the GSI Group Ltd, Laser Division product(s) shown here, as part of a whole machine may not ensure conformity of the whole machine with the Machinery Directive. Machinery may not be put in to service until it has been declared in conformity with the relevant provisions of the Directive.

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