

# Department of Mechanical Engineering University of Glasgow

## Synrad Series 48 CO<sub>2</sub> LASER, SCHEME OF WORK

### START-UP/SHUT-DOWN PROCEDURE

Laser : Class 4, 50W,  $\lambda = 10.6\mu\text{m}$ , CO<sub>2</sub> Laser (Quasi-CW)  
Responsible Person : Dr. James Sharp  
Authorised Operators : Dr. James Sharp, Dr. Ian Watson

**“WARNING”** ALL SAFETY PRECAUTIONS AND THE FUNCTION OF ALL CONTROLS AND INDICATORS MUST BE UNDERSTOOD BEFORE OPERATING THE EQUIPMENT.

### GENERAL PRECAUTIONS

1. You have to be a registered laser user to use this equipment and be trained to use this laser. Only registered laser users are permitted to use this laser. A laser request form needs to be completed prior to using the laser.
2. Laser users must be familiar with the manufacturer's and the Institution's safety information. General guidelines on using lasers can be found at <http://www.gla.ac.uk/schools/engineering/studentstaff/safety/>
3. When not in use the key to the laser (or other means of controlling access) should be kept separately from the laser, to prevent unauthorised use.
4. All beam paths shall be kept as short as possible and enclosed whenever reasonably practicable.
5. The area in which this laser is used should be a designated laser area, and have the appropriate warning notice on the door.

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### SPECIFIC CONSIDERATIONS RELATING TO THIS EXPERIMENT

#### START-UP PROCEDURE

1. Laser safety goggles are to be stored beside at the entrance to the lab.
2. Switch on the laser warning sign on the outside of the lab door.
3. Switch on the small He-Ne beam indicator laser in the laser enclosure.
4. Obtain interlock system key from Dr. Sharp, place key in the “Laser Interlock Control” unit key-switch and switch on.
5. Obtain laser key from Dr. Sharp, place key in the key-switch at the rear of the laser. DO NOT SWITCH ON.
6. Press the “Reset” button on the interlock unit.
7. Visually check that there are no unexpected objects in the beam path as indicated by the He-Ne laser. If you are at all uncertain, contact Dr. Sharp.

8. Open the lab door to check interlock trips out and block's the He-Ne beam (then reset the interlock)
9. Switch on the "Crystal Fibre Interface" unit.
10. Switch on the mains power to the laser power supply and control systems. (2x green LED's + 1x blue LED will illuminate at the rear of the laser housing. If not, switch off mains power and contact Dr. Sharp.)
11. Check that nothing is blocking the circulation to the cooling fans.
12. Check the "UC-2000 Laser Controller" unit has power and indicates the laser is off.
13. The "UC-2000 Laser Controller" unit has the following settings :
  - CLL – closed loop control, low power
  - CLH – closed loop control, high power
  - ANC – analogue current control (input at rear)
  - ANV – analogue voltage control (input at rear)
  - MAN – manual control
14. Set unit to MAN and the power setting to its minimum position (fully anti-clockwise) and indicates a power level of 00.0%.
15. Put on laser safety goggles and warn others in the lab to put on safety goggles.
16. Enable the laser using the key at the rear of the laser housing.
17. To switch on the laser output, press the "LASE ON/OFF" button on the UC-2000 controller. Red LED illuminated indicates laser is ON.
18. Adjust power level as required. The laser will take approximately 20 minutes to warm-up and stabilise its output.

## **OPERATING PROCEDURE**

**DO NOT override the interlocks when entering or leaving the laboratory.**

### ***Should you require access to the fibre growth chamber :***

19. Set unit to MAN and the power setting to its minimum position (fully anti-clockwise).
20. Switch off the laser: press the "LASE ON/OFF" button on the UC-2000 controller. Red LED off indicates laser is OFF.
21. Switch off the small He-Ne beam indicator laser in the laser enclosure.

### ***Should there be a request for entry via the intercom :***

22. If it is safe to do so, reply to the intercom request
23. Give warning that the laser is in operation and that safety goggles are required.
24. Use the "Door Entry Timer" to provide access.

### ***Should you wish to use computer control of the laser power :***

25. Make sure the "Crystal Fibre Interface" unit is properly connected to the rear of the UC-2000 control unit. If you are not sure do not attempt to use computer control.
26. Start the computer control program setting the output voltage to 0 Volts.
27. Set unit to MAN and the power setting to its minimum position (fully anti-clockwise) and indicates a power level of 00.0%.
28. Set the UC-2000 control unit to ANV.
29. Adjust laser power using voltage control from the computer.
30. Return to manual control by setting the laser power to its minimum position (fully anti-clockwise and switch the unit to MAN.

## **SHUT DOWN PROCEDURE**

To switch off the laser:

31. Set unit to MAN and the power setting to its minimum position (fully anti-clockwise).
32. Switch off the laser: press the "LASE ON/OFF" button on the UC-2000 controller. Red LED off indicates laser is OFF.

33. Switch off the "Laser Power Supply" unit.
34. Switch off the small He-Ne beam indicator laser in the laser enclosure.
35. Reverse steps 6 to 3 above.
36. Remove the key from the "Laser Interlock Control" unit and return to Dr. Sharp
37. Remove the key from the rear of the laser and return to Dr. Sharp
38. Return laser safety goggles to their place of storage.
39. Leave main power to laser on for 30 minutes while laser cools.(Keep the fans running.)

Full laser safety procedures should be observed during start up, operation and/or shut down of the laser. Interlocks must not be overridden. Panel covers, safety enclosures to be removed by trained personnel only. Maintenance to be carried out by trained personnel only.

### **IN THE EVENT OF AN EMERGENCY**

Turn off the "Laser Interlock Control" unit. Make yourself familiar with the position of this switch prior to using the laser. Do not touch any of the equipment. Seek assistance and/or first aid immediately and notify Dr. Sharp and/or Dr. Watson.