# Installation of Laser Device

For further details about routines mentioned below please review our SITE PREPARATION, USER, or SERVICE Manual. NOTE : Please write a corresponding note into the FSR or if legitimate an corresponding Non Conformance Report (NCR) for any miscellaneous against this list.

## General Laser Information

|  |  |
| --- | --- |
|  |  |
| * GEP.-no. of the laser (CIR 261) | GEP |
| * COMPexPro model type |  |
| * Line voltage |  |
| * Line frequency |  |
| * Resonator setup |  |
| * Rear mirror type |  |
| * Wavelength / Gas mix |  |
| * Gas mode |  |

## Takeover / Inspection

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| **Task** | **OK** |
| * Check laser device for any mechanical damage. No visible housing damages. Open side service panel and check also inside of laser head |  |
| * Front beam shutter closed and secured (transportation lock screw inserted) |  |
| * Vacuum pump secured (transportation lock screw inserted) |  |
| * Check the contents of shipment against the packing list provided |  |
| * Gas inlet connectors/connection points are all capped |  |
| * Purge gas connector is capped |  |
| * Water inlet/outlet connectors are capped |  |
| * Both Coherent seals at the laser tube front and rear side are neither removed nor damaged |  |
| * All safety labels attached according to label plan (see User Manual) |  |
| **Availability Check of Parts:**   * Mains cable with plug (shipped without plug, plug needs to be provided by customer) |  |
| * Service tool case (complete) |  |
| * Documentation and test protocols supplied |  |
| * Pre-installation checklist (Site Preparation) completed |  |

## Installation

For details, see Service Manual.

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| **Task** | **OK** |
| **Positioning and Levelling:**   * Laser settled down at the correct position |  |
| * Level the laser using a spirit level and tape measure as a reference until required beam exit height is reached. Stands can be adjusted by hand if laser head is lifted by fork lift. |  |
| * Remove locking screw from mechanical beam shutter |  |
| * Remove locking screw from vacuum pump |  |
| **Air Cooling / Exhaust Line:** |  |
| * Connect the exhaust flange to the exhaust fan outlet, attach the exhaust hose and connect it to a suitable ventilation output |  |
| * Air intakes at laser head beam exit side are not blocked |  |
| **Laser Gas Lines:**   * Inspect Gas bottle purity, composition, bottle age, remaining pressure in comparison with site preparation document |  |
| * Gas lines connected (normally performed by customer) |  |
| * Halogen protection cover prepared at halogen / premix line NOTE: do not fix cover before leak test is done |  |
| Set gas inlet pressure (abs.) at primary gas supply: |  |
| * Halogen /Premix | bar abs |
| * Rare (Ar, Kr, Xe) | bar abs |
| * Buffer (Ne) | bar abs |
| * Inert (He) | bar abs |
| * Blanking plugs installed at not used gas connections |  |
| **Purge Gas Line:**   * Connect purge gas line (if required) |  |
| Set purge gas inlet flow rate at external flow regulator (has to be provided by customer): |  |
| * Purge (N2) (req. for 193nm and 157nm operation) | l / min |
| * Purge gas distribution checked for leaks |  |

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| **Task** | **OK** |
| **Water Lines:**   * Connect water lines (if not already performed by customer) |  |
| * Verify the water facility or water chiller in comparison with site preparation document (do not use distilled or deionised water) |  |
| * Turn on water supply |  |
| * No water leaks or blockages (check at max. flow) |  |
| **Mains Power Supply Line:** |  |
| * Facility power supply corresponds with electrical requirements of laser device model |  |
| Measure line voltages/frequency at the facility side power outlet: |  |
| Line frequency | Hz |
| L – N | VAC |
| N – PE | VAC |
| * Plug installed on mains power supply cable |  |
| **Control Devices / Remote Connector:** |  |
| * Connect HHT with laser head using 25 pin plug at COM2 |  |
| * Terminate the customer interface with the remote connector dummy plug (delivered with laser device) |  |

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| **Task** | **OK** |
| **Internal Connections:** |  |
| Open side service panel and make sure that all FOLs, cables and N2-, water-hoses at the following modules are properly connected and not damaged, loose or blocked: | FOL  Cable    Hoses/Pipes  Optics |
| **Laser Head Compartment - Front Side** |  |
| * Laser Control Board | - - |
| * Energy Monitor |  |
| * 24VDC Distribution | -  - - |
| * Thyratron Supply Module | - - |
| * High Voltage Power Supply | - - |
| * Safety Module | -  - - |
| * Electrostatic Filter | -  - - |
| * Gas Circulation Fan Motor | -  - - |
| * Front tube window / OC | - - - |
| * Pressure and Temperature Sensor (if available) | -  - - |
| **Laser Head Compartment - Rear Side** |  |
| * Laser Tube Rear Side incl. Temperature Interlock Switch | -   - |
| * Rear tube window / HR (beam dump attached) | - - - |
| * Vacuum Pump | -   - |
| * Halogen Filter | - -  - |
| * Water Regulation (if installed) | -   - |
| * Valve Block | -   - |
| * Mains supply module | -  - - |
| * PE connections | -  - - |

## Functional Test

### Power ON Circuit

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| **Task** | **OK** |
| * Connect mains power supply cable to the facility |  |
| Turn MAINS SWITCH ON and KEY SWITCH ON: |  |
| * HVPS: air cooling fan runs (air sucked in at air intake HVPS, NOTE: only working if safety module active) |  |
| * Laser Head: air cooling fans run |  |

### Software Boot-Up

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| **Task** | **OK** |
| Watch the software start up / self test on HHT: |  |
| * HHT software version – CTERM | V |
| * Laser control software version – LCS | V |
| HHT display information after boot-up: |  |
| * Opmode / warnings / interlocks |  |
| * Tube temperature (> 20°C, if reading available) | °C |
| * Tube pressure (> 1250mbar) | mbar |
| HHT display information after thyratron warm-up: |  |
| * Laser total counter | mio |
| * System date | .  . |
| * System time (set to local if necessary) | : |
| * Selected gas mix |  |

### Thyratron Voltages

|  |  |
| --- | --- |
| **Task** | **OK** |
| * Frequency setting |  |
| * Cathode heater voltage UC | VAC |
| * Reservoir heater voltage UR | VAC |
| * Bias Voltage | VDC |

### Interlock Sensors Test

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| **Task** | **OK** |
| Force the following interlocks / warnings (by disconnecting sensor, opening covers, removing plugs) and observe the corresponding opmode message on the HHT display: |  |
| * Reservoir Temp. Interlock (10, 31, 122 → reboot) |  |
| * Remote Interlock Customer Interface / External Gas Failure (16, 122, 221) |  |
| * Cover Interlock Side Access Panel (42, 122) |  |
| * Cover Interlock Front Access Panel (120, 122) |  |
| * Cover Interlock Rear Access Panel (121, 122) |  |
| * Tube Pressure Sensor Failed / Too High (128, 224) |  |
| * Tube Temperature Sensor Failed (130) |  |

### Software Parameters and Actuators Test

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| --- | --- |
| **Task** | **OK** |
| Hook up service PC with LCS\_MON to COM1 |  |
| * Serial #1 Mode (Service) |  |
| * Serial #2 Mode (Terminal) |  |
| * Read settings successful |  |
| * Laser parameters set according to D128179 |  |
| Switch Fan ON and OFF from Laser Control menue |  |
| * Circulation fan rotates clockwise while switched ON |  |
| Open and close vacuum valve (Laser Control menue, Gas Control, Direct Control activated) |  |
| * Vacuum pump runs for 2 min |  |

### Gas System Test

|  |  |
| --- | --- |
| **Task** | **OK** |
| Note: in PREMIX configuration RARE and BUFFER are not used   * External gas valves are still closed |  |
| * *Flush* all filling lines (evacuate) / external valves still closed |  |
| * Open external inert gas supply and leak check line |  |
| * *Purge* rare, buffer, and halogen line (fill with He)   Note: to increase He pressure inside gas filling lines activate Direct Control using LCS\_Mon software (Laser Control / Gas Control Menue) and alternately open the INERT and RARE / BUFFER / HALOGEN valve 10 – 20 x (depends on length of gas filling lines, if available refer to facility’s pressure gauge) |  |
| * Leak check rare, buffer, and halogen line |  |
| * Halogen line protection cover installed |  |
| * *Flush* rare, buffer, and halogen line (evacuate) |  |
| * Open external rare, buffer, and halogen gas supply |  |
| * *Flush* rare, buffer, and halogen line (fill fresh gas into lines) |  |
| * If necessary: do static passivation of halogen / premix line |  |
| * Open manual shut-off valve at reservoir |  |
| * Close all service panels |  |
| Perform LEAK CHECK of WINDOW EXCHANGE procedure without actually replacing the windows: |  |
| * Leak check successful |  |
| * All solenoid gas valves are working properly |  |

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### New Fill and Alignment

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| **Task** | **OK** |
| * Perform NEW FILL |  |
| * Evacuation time | min |
| * Set up calibrated external power meter (use N2 @ 193nm) |  |
| * Warm up the laser in HV CONST mode. Increase reprate and HV gradually until performance is stable and max. reprate has been reached. |  |
| * Laser radiation light is working |  |
| * Check Warning: Internal Gas Purifier (51) Note: wait > 5 min in OPMODE=ON with disconnected –X29) |  |
| * Tube temperature (stab. value if regulation valve installed) | °C |
| * Optimize resonator alignment / best power and beam symmetry |  |
| * Documentation of beam profile (fax burn, ccd image etc) |  |

### Energy Monitor Test / Performance Check

|  |  |
| --- | --- |
| **Task** | **OK** |
| Adapt energy reading @ HVmax @ 10Hz: |  |
| * Adaption of energy reading required? |  |
| * Only, if “yes, mesh” was selected before: Mesh filter replacements | x     x     x |
| * Binary energy ADC reading @ HVmax @ 10Hz (12 bit: 3500 – 3800; 16 bit: 55000 – 60000) | counts |
| * Binary energy ADC reading @ EGYnominal | counts |
| Verify energy calibration @ EGYnominal @ max. reprate: | Hz |
| * Energy reading on HHT | mJ |
| * Power reading on external power meter | W |
| * Laser performance meets specifications |  |
| * Laser performance documented in eFSR | .FSR |
| * eFSR signed by customer and FSE |  |

## Hand **Over**

|  |  |
| --- | --- |
| **Task** | **OK** |
| * Remove DCP dummy plug and connect customer signal lines to the interface (only if required) |  |
| * Laser total counter after installation | mio |
| * Halogen filter contamination after installation | % |
| * Reset User and Maintenance counter |  |
| * Handing over interlock defeat keys according to SIR0282 |  |
| * Make a copy of the installation/de-installation check list and ensure that one copy is provided to the Customer |  |
| * Submit the eFSR created in step 1.4.8 to the nearest local Coherent Service organization |  |

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| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| Location, Date |  | Signature Customer |  | Signature FSE |

# De-installation of Laser Device

For further details about routines mentioned below please review our SITE PREPARATION, USER, or SERVICE Manual. NOTE : Please write a corresponding note into the FSR or if legitimate an corresponding Non Conformance Report (NCR) for any miscellaneous against this list.

## General Laser Information

|  |  |
| --- | --- |
|  |  |
| * GEP.-no. of the laser (CIR 261) | GEP |
| * COMPexPro model type |  |
| * Line Voltage |  |
| * Line Frequency |  |
| * Resonator setup |  |
| * Rear mirror type |  |
| * Wavelength / Gas mix |  |
| * Gas mode |  |

## New Fill and Alignment

|  |  |
| --- | --- |
| **Task** | **OK** |
| * Close all covers and perform NEW FILL |  |
| * Set up calibrated external power meter (use N2 @ 193nm) |  |
| * Warm up the laser in HV CONST mode. Increase reprate and HV gradually until performance is stable and max. reprate has been reached. |  |
| * Tube temperature (stab. value if regulation valve installed) | °C |
| * Optimize resonator alignment / best power and beam symmetry if necessary |  |
| * Documentation of beam profile (fax burn, ccd image etc) |  |

## Energy Monitor Test / Performance Check

|  |  |
| --- | --- |
| **Task** | **OK** |
| * Binary energy ADC reading @ HVmax @ 10Hz (12 bit: 3500 – 3800; 16 bit: 55000 – 60000) | counts |
| * Binary energy ADC reading @ EGYnominal | counts |
| Verify energy calibration @ EGYnominal @ max. reprate: | Hz |
| * Energy reading on HHT | mJ |
| * Power reading on external power meter | W |
| * Laser performance documented in eFSR | .FSR |
| * eFSR signed by customer and FSE |  |
| * Laser total counter before de-installation | mio |

## De-Installation

For details, see Service Manual.

|  |  |
| --- | --- |
| **Task** | **OK** |
| Preparing the laser tube for transportation: |  |
| * Perform “Windows Exchange” procedure”. Abort at the end of the flushing routine (on ‘’Replace Windows’’ screen) |  |
| * Perform “Transport Fill” |  |
| * Tube pressure reading | mbar |
| * Tube temperature reading (if TEMP REG. available) | °C |
| * Close manual shut-off valve at reservoir |  |
| Preparing the gas and water lines for de-installation: Note: in PREMIX configuration RARE and BUFFER are not used |  |
| * Close Halogen / Premix pressure gauge at primary gas supply |  |
| * Purge the Halogen / Premix line with He   Note: to increase He pressure inside gas filling lines activate Direct Control using LCS\_Mon software (Laser Control / Gas Control Menue) and alternately open the INERT and HALOGEN / PREMIX valve 10 – 20 x (depends on length of gas filling lines, if available refer to facility’s pressure gauge) |  |
| * Close now all other gas cylinder / facility stop valves |  |
| * Close external water valves |  |
| * Drain water out of the laser’s cooling lines  (only possible if the facility is set up to do so, use N2, if installed fully open water regulation valve) |  |
| * Switch off laser device |  |
| * Disconnect and cap the water inlet and outlet lines |  |
| * Disconnect and cap all gas lines and inlets |  |
| * Disconnect and cap purge gas line and inlet |  |
| * Disconnect the exhaust line |  |
| * Remove exhaust flange and halogen protection cover (to be shipped with the laser device) |  |
| * Remove all cable connections from the customer interface |  |
| * Disconnect HHT |  |
| * Remove key from key switch and store in service case |  |
| * Unplug the mains power supply cable (plug itself usually is customer’s property) |  |
| * Secure the vacuum pump by inserting locking screw |  |
| * Close and secure the external beam shutter with its transportation lock screw |  |

## Prepare for Shipment – Safety Double Check

|  |  |
| --- | --- |
| **Task** | **OK** |
| * Check that the manual beam shutter is closed and secured |  |
| * Check that the inlet gas line connections are covered with dummy gaskets heads |  |
| * Check that the purge gas line connection is covered with a gasket head |  |
| * Check that the water connectors are capped |  |
| * Both Coherent seals at the laser tube front and rear side are neither removed nor damaged |  |
| * Check that all safety labels are attached according to the labelling plan in the safety Manual and that no safety labels are damaged |  |
| * Check the laser device housing for visible signs of damage, impurities and contaminations |  |
| * Check that all accessories listed on the packing list are in the shipping area or service case, respectively (including formerly handed-over defeat keys): |  |
| * Verify that all laser housing covers a refitted including their PE connections and closed properly |  |
| * Make a copy of the installation/de-installation check list and ensure that the copy is provided to the receiver of the shipment |  |
| * Submit the eFSR created in step 2.3 to the nearest local Coherent Service organization |  |

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| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| Location, Date |  | Signature Customer |  | Signature FSE |