1 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.

1.1 General Laser Information

• GEP.-no. of the laser (CIR 261)	GEP
• COMPexPro model type	<select type> <select gas type>
• Line voltage	<select voltage>
• Line frequency	<select frequency>
• Resonator setup	<select setup>
• Rear mirror type	<select type>
• Wavelength / Gas mix	<select wavelength>
• Gas mode	<select gas mode>

1.2 Takeover / Inspection

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	☐

1.3 Installation

For details, see Service Manual.

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	☐

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)	☐

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	-	☐	-	-

1.4 Functional Test

1.4.1 Power ON Circuit

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	☐

1.4.2 Software Boot-Up

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	<select gas mix>

1.4.3 Thyratron Voltages

Task	OK
• Frequency setting	<select frequency>
• Cathode heater voltage U_C	VAC
• Reservoir heater voltage U_R	VAC
• Bias Voltage	VDC

1.4.4 Interlock Sensors Test

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)	☐

1.4.5 Software Parameters and Actuators Test

Task	OK
Hook up service PC with LCS_MON to COM1	
• Serial #1 Mode (Service)	<select mode>
• Serial #2 Mode (Terminal)	<select mode>
• 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	☐

1.4.6 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	☐

1.4.7 New Fill and Alignment

Task	OK
• Perform NEW FILL	☐
• Evacuation time	min
• Set up calibrated external power meter (use N_2 @ 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)	☐

1.4.8 Energy Monitor Test / Performance Check

Task	OK
Adapt energy reading @ HV_{max} @ 10Hz:	
• Adaption of energy reading required?	<select>
• Only, if “yes, mesh” was selected before: Mesh filter replacements	x <%> <action> x <%> <action> x <%> <action>
• Binary energy ADC reading @ HV_{max} @ 10Hz (12 bit: 3500 – 3800; 16 bit: 55000 – 60000)	counts
• Binary energy ADC reading @ $EGY_{nominal}$	counts
Verify energy calibration @ $EGY_{nominal}$ @ 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	☐

1.5 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	☐

Location, Date	Signature Customer	Signature FSE

2 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.

2.1 General Laser Information

• GEP.-no. of the laser (CIR 261)	GEP
• COMPexPro model type	<select type> <select gas type>
• Line Voltage	<select voltage>
• Line Frequency	<select frequency>
• Resonator setup	<select setup>
• Rear mirror type	<select type>
• Wavelength / Gas mix	<select wavelength>
• Gas mode	<select gas mode>

2.2 New Fill and Alignment

Task	OK
• Close all covers and perform NEW FILL	☐
• Set up calibrated external power meter (use N_2 @ 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)	☐

2.3 Energy Monitor Test / Performance Check

Task	OK
• Binary energy ADC reading @ HV_{max} @ 10Hz (12 bit: 3500 – 3800; 16 bit: 55000 – 60000)	counts
• Binary energy ADC reading @ $EGY_{nominal}$	counts
Verify energy calibration @ $EGY_{nominal}$ @ 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

2.4 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	☐

2.5 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	☐

Location, Date	Signature Customer	Signature FSE