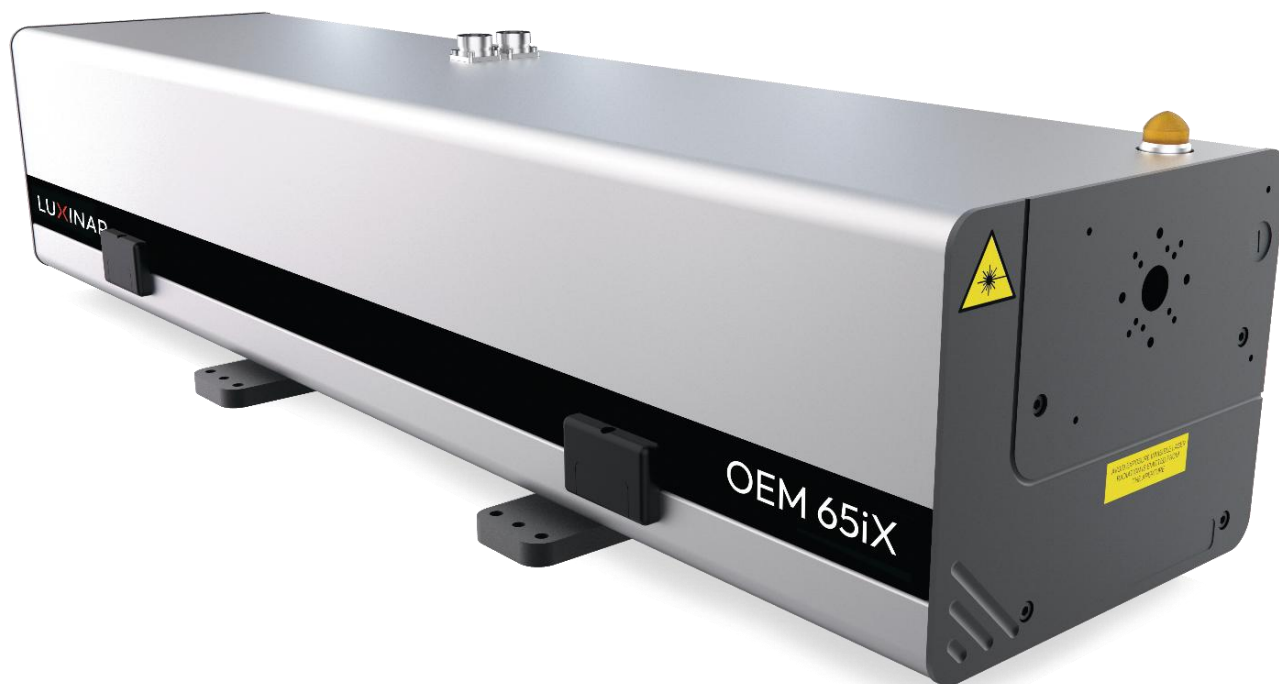




OEM 65iX

Sealed CO₂ laser source

User manual

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Please note that while every effort has been made to ensure that the data given in this document is accurate, the information, figures, illustrations, tables, specifications and schematics contained herein are subject to change without notice. The most recent additions and supplementary information are given in the Additional Information Section in this manual.

OEM 65iX

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Warranty shipments, returns and adjustments

Warranty claims must be made promptly and must be received by Luxinar Ltd during the applicable warranty period.

Always identify the product, by both model number and serial number, when contacting Luxinar Aftersales.

If it becomes necessary to return a product for repair and/or adjustment, the instructions as to how and where these products should be shipped must be obtained from Luxinar Aftersales.

Service and repair

Servicing or calibration of the system can only be carried out by trained Luxinar service engineers or customers who have undertaken and passed a Luxinar approved service training course. Details of training courses and servicing can be obtained from the local Luxinar Aftersales address.

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Preface

Audience

This manual should be read by all personnel who install or operate OEM 65iX lasers.

Important!

Read this manual carefully before operating the laser for the first time. Pay special attention to the Safety chapter.

The OEM 65iX is designed and sold for use in Original Equipment Manufacturer (OEM) systems and is not to be used as a stand-alone laser. The OEM is responsible for compliance with all applicable safety regulations.

Other publications

- Luxinar part number 906-0251-xx; Safety manual
- Luxinar part number 906-0109-00; Serial interface specification
- Luxinar part number 906-0104-xx; Optical isolation (ATFR)
- Luxinar part number 906-0202-99; Chiller coolant temperature tables

How to use this manual

The following conventions are used in this manual.

Admonitions

The use of controls, replacement parts, adjustments, or procedures other than those specified within this manual may result in exposure to any of these hazards.

- Laser hazards
- Electrical hazards
- Environmental hazards
- Mechanical hazards

The degree of seriousness of the hazard is indicated by the use of the following signal words:

DANGER

Indicates an imminent hazard which, if not avoided, is extremely likely to result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also used to alert the user against unsafe working practices and potential damage to the equipment.

Connector labels and signal name

Connector labels and signal names are shown in bold serif font to aid identification. For example;

RF Enable, external interlock

Section 1

Safety

General safety information

It is strongly recommended that any personnel who are involved with the installation, operation or maintenance of this laser equipment should first read and fully understand the contents of this manual and Safety manual 906-0251-xx.

If there are any questions or doubts on any of the safety aspects of the equipment, then do not hesitate to contact your nearest Luxinar Aftersales office or distributor for advice before proceeding.

The installation, operation, maintenance and repair of this laser equipment must only be carried out by Luxinar service personnel or trained staff who have received correct instruction concerning the hazards associated with this particular equipment.

Important!

All safety critical instructions contained within this document are framed with a border and identified by CAUTION, WARNING or DANGER depending on the severity of the risk involved. In addition, the safety symbol  indicates that care should be taken when working with or on the laser equipment.

Luxinar does not accept liability for any damage or injury howsoever caused or arising.

The symbol given below is also used on the equipment and indicates that the user should refer to the OEM equipment operator's manual for more information on the safe operation or installation of the equipment.



Label locations

Version with covers

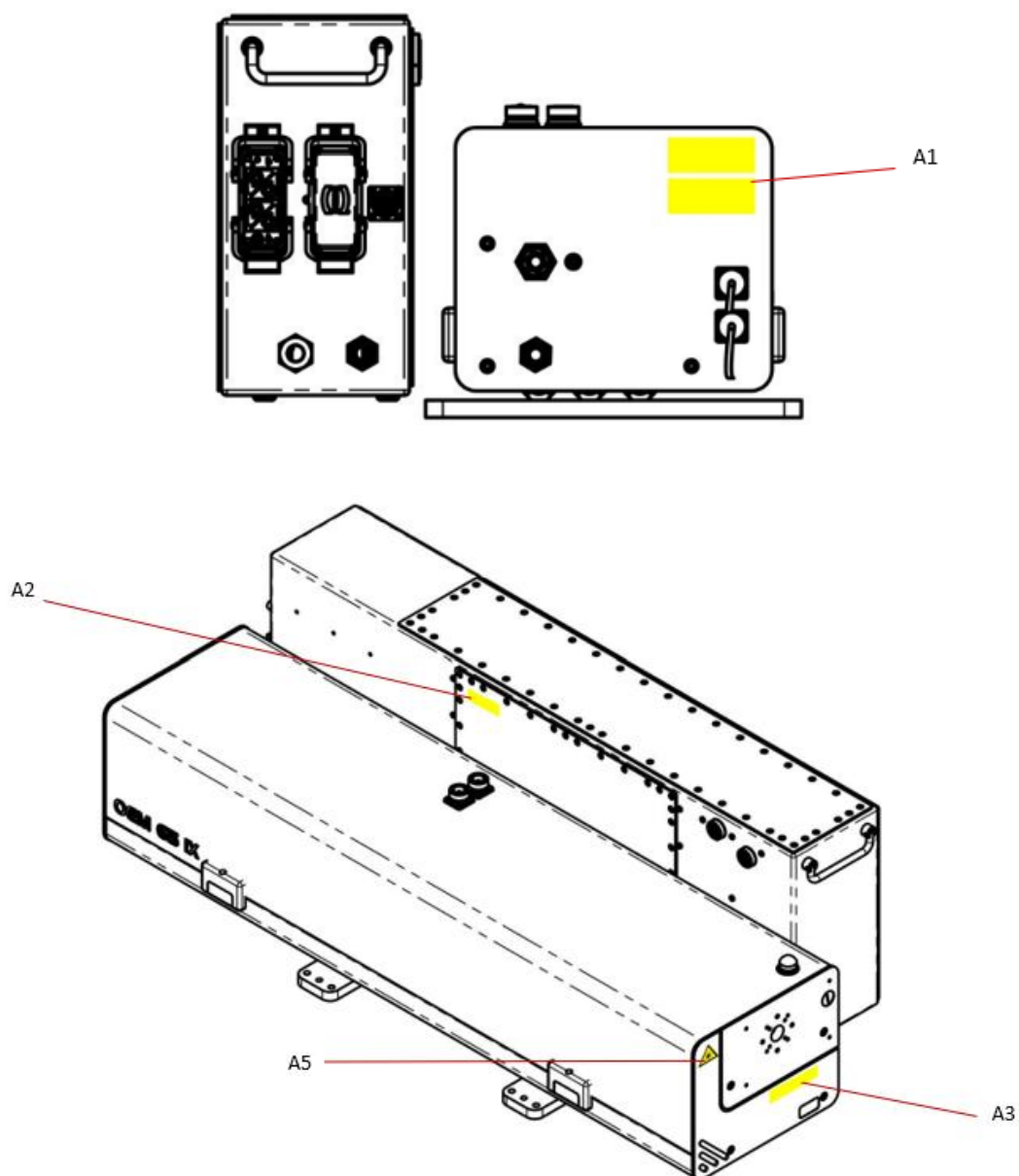


Figure 1 - Location of safety labels - Version with covers

Version without covers

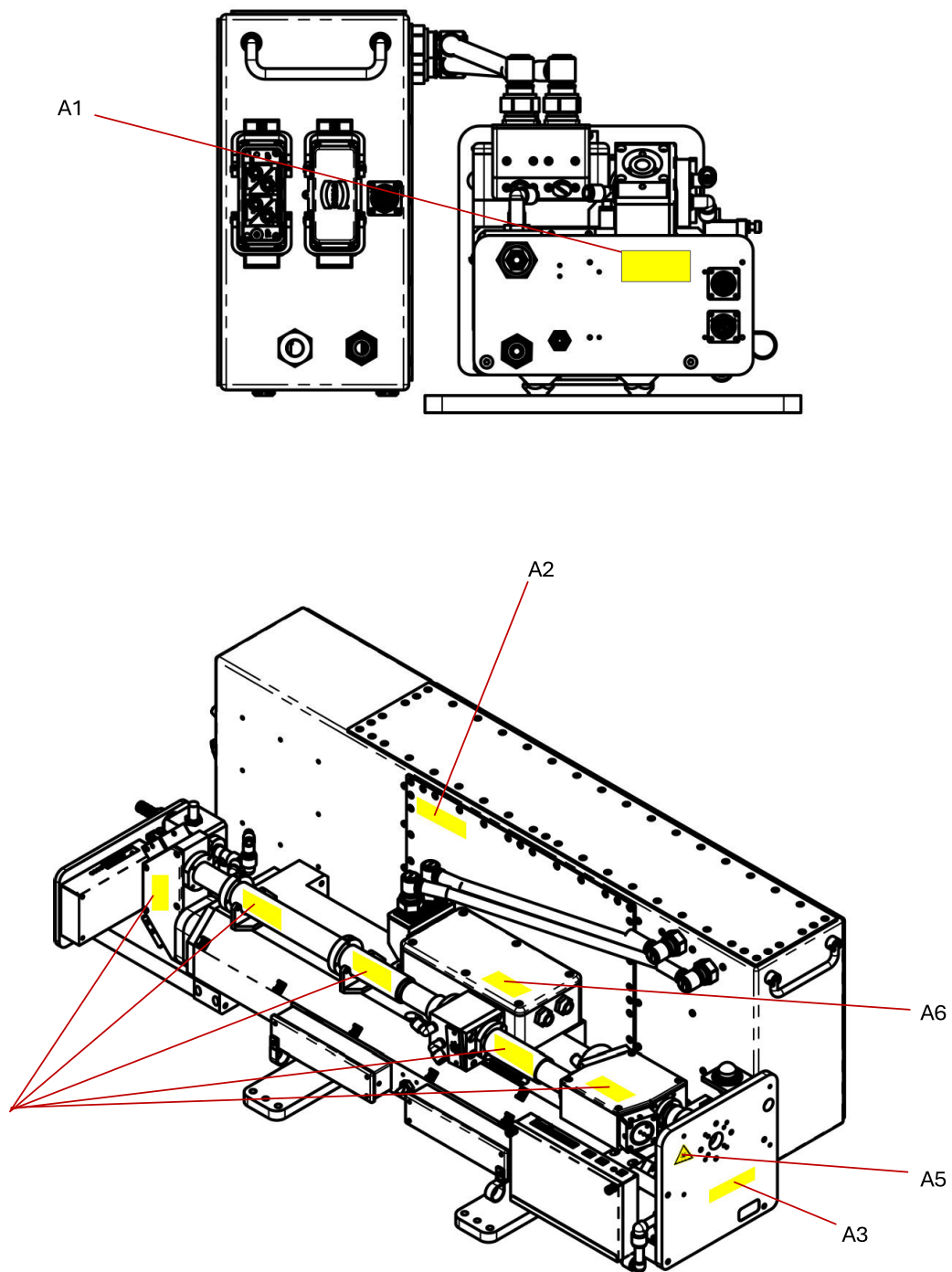


Figure 2 - Location of safety labels — Version without covers

Shutter

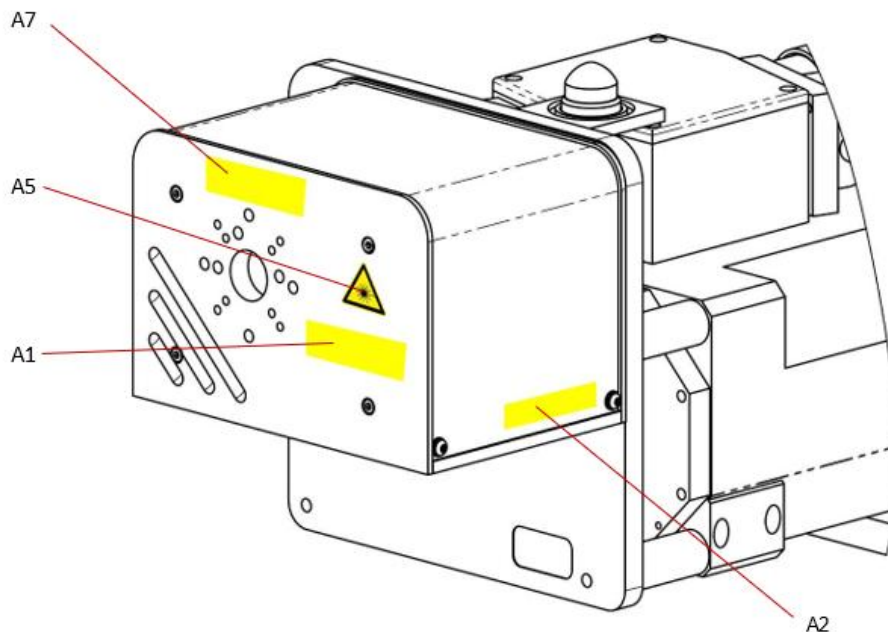


Figure 3 - Location of safety labels — Shutter option

Labels

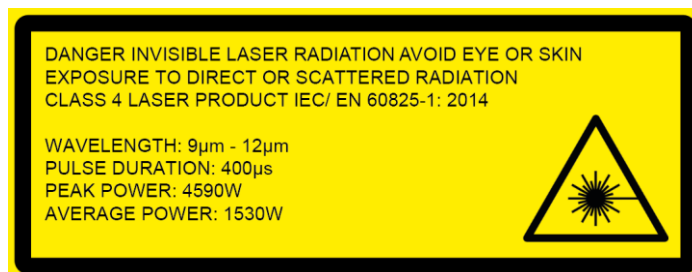


Figure 4 - Label A1 — Output specification without diode option

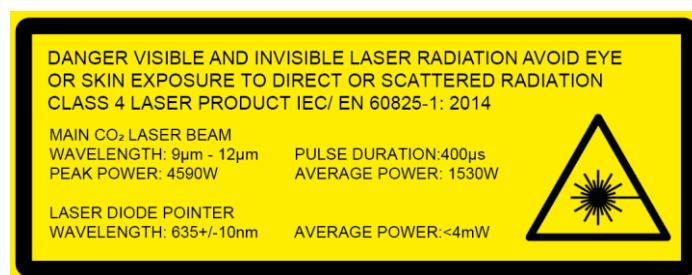


Figure 5 - Label A1 — Output specification with red diode option

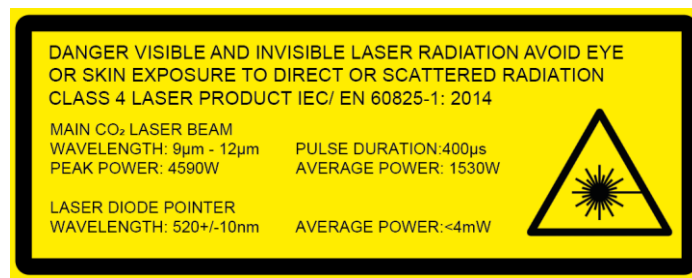


Figure 6 - Label A1 — Output specification with green diode option

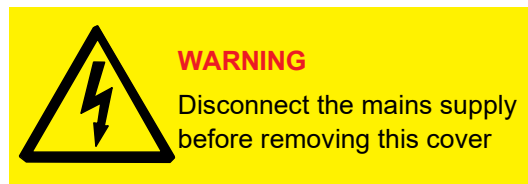


Figure 7 - Label A2 — Mains supply warning

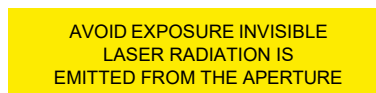


Figure 8 - Label A3 — Laser aperture without shutter option

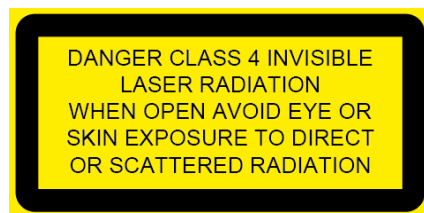


Figure 9 - Label A4 — Non-interlocked panel

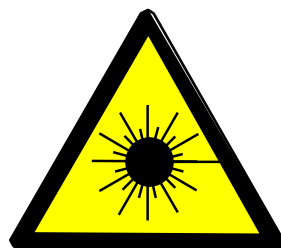


Figure 10 - Label A5 — Laser Hazard



Figure 11 - Label A6 — High temperature hazard

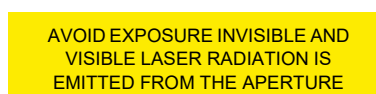


Figure 12 - Label A7 — Laser aperture with shutter option

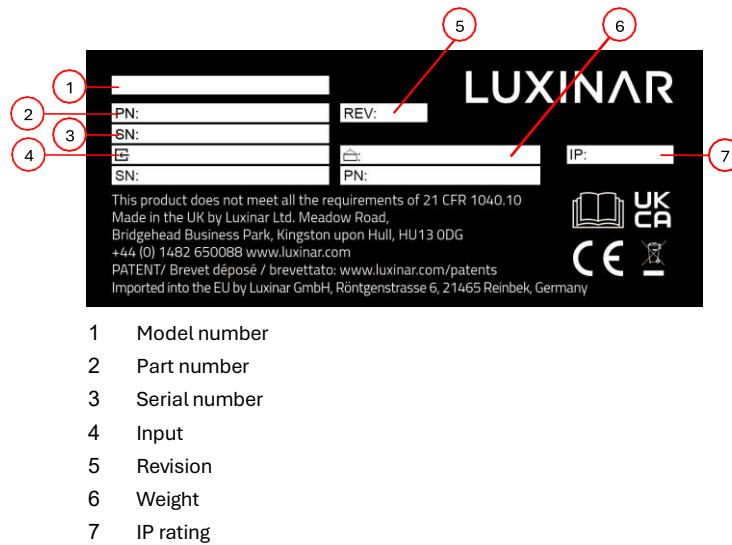


Figure 13 - Label A8 — Product identification and certification

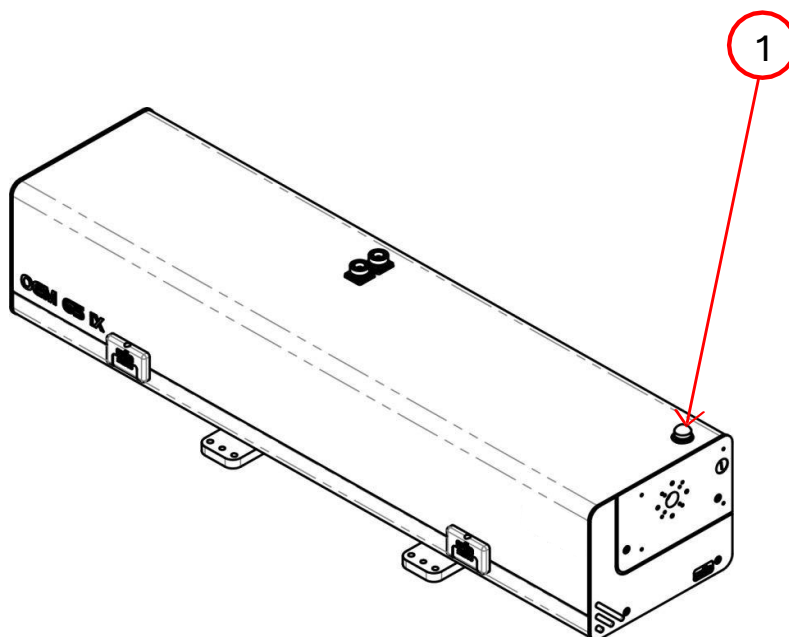
Emission warning indicator

An emission warning indicator is fitted to the laser head cover adjacent to the output aperture. When the indicator is illuminated, the laser is capable of emitting harmful laser radiation.


DANGER


Risk of injury to eyes and exposed skin

This is a Class 4 (Class IV) laser product. All precautions relevant to this class of laser product should be strictly observed. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Strict compliance with the safety precautions set out and referred to in this manual and extreme care in use are essential to minimise the chance of accidental damage to the equipment or personal injury.



1 Emission warning indicator

Figure 14 - Emission warning indicator location

Maximum Permissible Exposure and Nominal Ocular Hazard Distance

The Maximum Permissible Exposure (MPE) is the level of radiation to which, under normal circumstances, persons may be exposed without adverse effects. The MPEs represent the maximum level to which the eye or skin can be exposed without consequential injury and are related to the wavelength of the laser radiation, the pulse duration or exposure duration, and the tissue at risk.

The MPEs given in the following tables are informative and provided so that the integrator can calculate the Nominal Ocular Hazard Distance (NOHD), perform a risk analysis and inform the user about the safe usage of the product. However, exposure limits for the eye and the skin of employees in the work place and the general public are in many countries specified in national laws. These legally-binding national exposure limits might differ from the MPEs given in the tables below.

The NOHD is the distance from the output aperture beyond which the beam irradiance or radiant exposure remains below the appropriate MPE. Importantly, the NOHD is dependent upon the beam waist size and the divergence of the beam. Therefore, the NOHD is dependent upon the optical components acting on the beam. The NOHDs given in the tables below are relevant only when the laser is operated without external beam delivery attached. When beam delivery is attached it is the responsibility of the integrator or end-user to recalculate the NOHDs. Further details of the safe use of lasers are given with IEC/ TR 60824-14 "Safety of laser products – Part 14: A user's guide."

Wavelength (µm)	10.6	10.25
MPE (W/m ²)	1000	1000
NOHD (m)	1700	1700

Decommissioning and disposal

Dispose of the system according to appropriate local regulations



Section 2

General description

Principle of operation

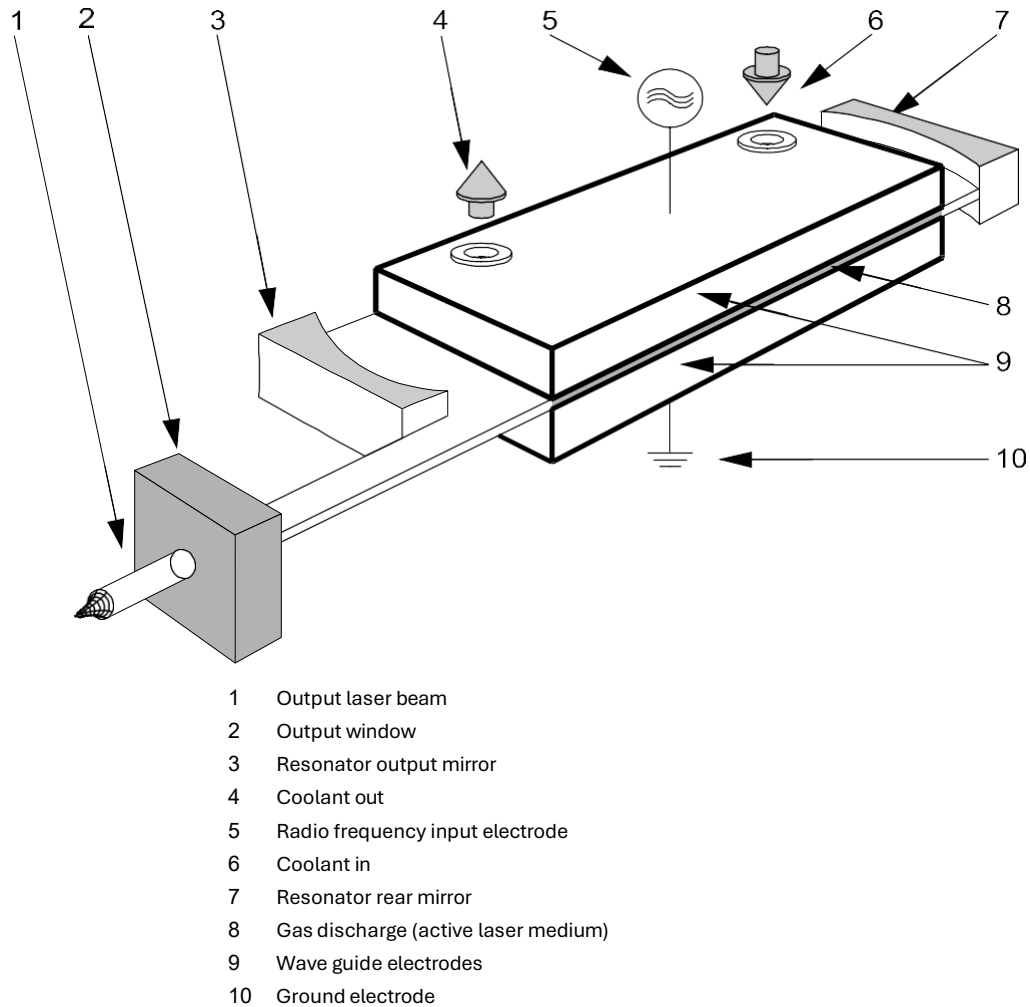


Figure 15 - Diffusion cooled slab laser components

Figure 15 shows the principle of operation of a slab laser. A gas discharge (8) forms the active laser medium and is established between the wave guide electrodes (9) by a radio frequency voltage (5, 10). The rear mirror (7) and output mirror (3) form the optical resonator. The laser beam (1) is produced within the resonator and is emitted through an output window (2). Liquid coolant flowing between the input (6) and output (4) is used to cool the electrodes.

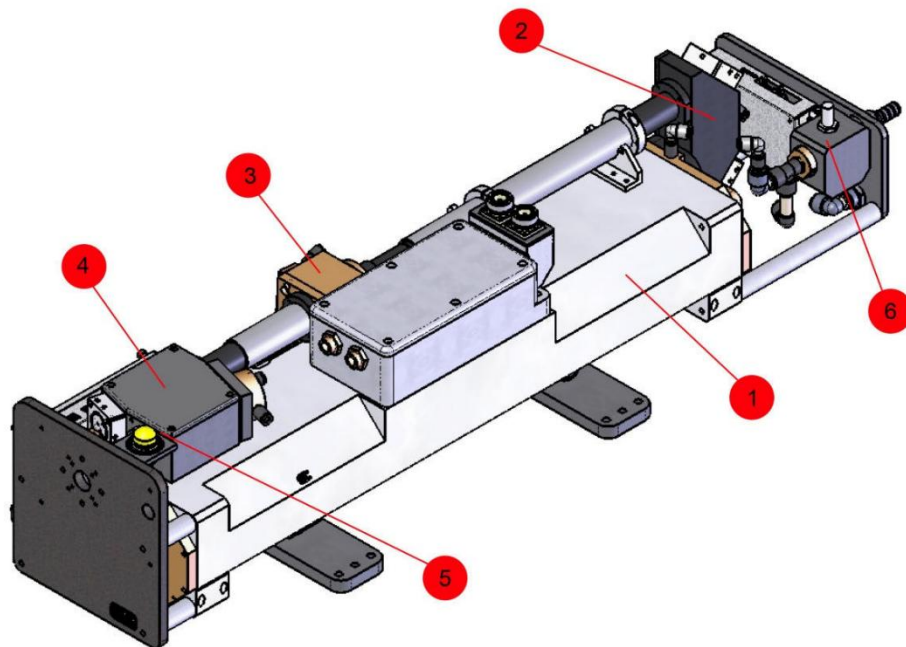
Laser head – standard version

The OEM 65iX laser is a high-frequency RF excited, diffusion-cooled CO₂ slab laser designed for industrial use as a cutting, welding or marking tool.

Due to the configuration of the electrodes in a slab laser, the emitted laser beam diverges at different rates in the x (free space) and the y (waveguide) directions. In order to make the beam circular the output beam is reshaped using reflective correction optics. This may be achieved by using single optical elements or the combination of cylindrical and spherical elements.

Depending on the configuration of the resonator, there may also be diffraction effects due to the output optic of the resonator. This can produce secondary lobes on the main output beam that need to be scraped or filtered out. This is achieved by the use of a spatial filter.

After beam reshaping and spatial filtering, the beam quality is ideal for any material processing operation that requires excellent mode quality and stability.



- 1 Laser resonator
- 2 Beam turning block
- 3 Spatial filter
- 4 Beam correction module
- 5 Output window
- 6 Coolant flow sensor

Figure 16 - Laser head layout

Laser head – shutter version

The OEM 65iX can be fitted with a safety shutter to block the laser output. The shutter is designed as a safety device and is not intended to operate as a continuous beam block or process shutter.

When closed, a mirror within the shutter assembly deflects the beam into a beam dump. *The beam dump absorbs all the energy of the laser beam and will become very hot if the laser is run for a long period with the shutter in the closed position.*

Safety circuitry in the OEM 65iX controller provides interlocking so that laser output is disabled whenever the shutter is in the closed position. In addition, opto-sensors continuously monitor the open and closed status of the shutter.

The shutter module contains a laser diode pointer that outputs a low-power visible red laser beam coaxial with the main laser beam. This visible beam provides an indication of where the main laser beam will hit the material to be processed.

DC power supply (optional)

Contact Luxinar for more details of power supply options.

OEM 65iX three-phase DC power supply (016-0031-00)

General description

Note: This equipment is designed for indoor use only, pollution degree 2 and overvoltage category II as defined within EN 61010-1:2010+A1:2019.

The OEM 65iX three-phase power supply is a free-standing/ rack mountable, AC to DC liquid-cooled power supply (PSU).

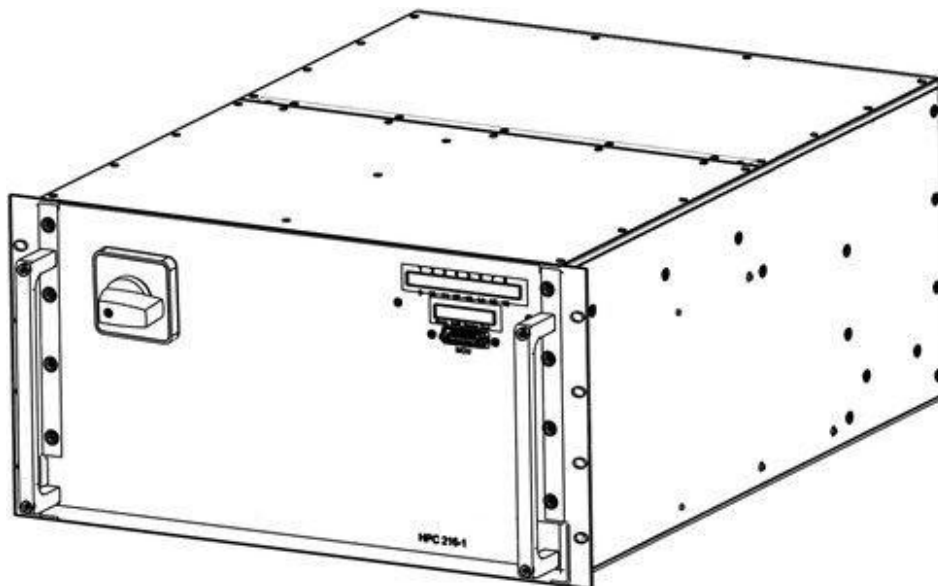


Figure 17 - OEM 65iX three-phase DC power supply

Specifications



WARNING

Heavy equipment — risk of severe lumbar injury

The weight of the DC power supply exceeds the single person lift limit of 18kg, as specified in EN 61010-1:2010+A1:2019. Ensure a minimum of two people lift the power supply or that suitable lifting equipment is employed.

Table 1 - Dimensions, weight and cooling

Dimensions (mm) LxWxH	727x483x244
Weight	51kg
Coolant type	Demineralised, deionised or distilled water with corrosion inhibitor & anti-bacterial additive
Coolant pipe	10mm OD, fitted with 10mm – 12mm push-fit fittings
Coolant flow rate	Refer to page 39
Protection class	IP51

Note: For more detailed dimensional drawings, refer to [Appendix B](#).

Table 2 - Electrical specifications

OEM 65iX	
Input voltage range	400-480VAC (50/60Hz) three-phase ⁽¹⁾
Mains input fuse rating (per phase)	32A
AC inrush current (max)	80A
Output voltage (DC)	50 ± 2%
Output current	300A
Power factor	>0.90 at full power
Power consumption (max)	16kW at full power
Earth leakage current	<8mA

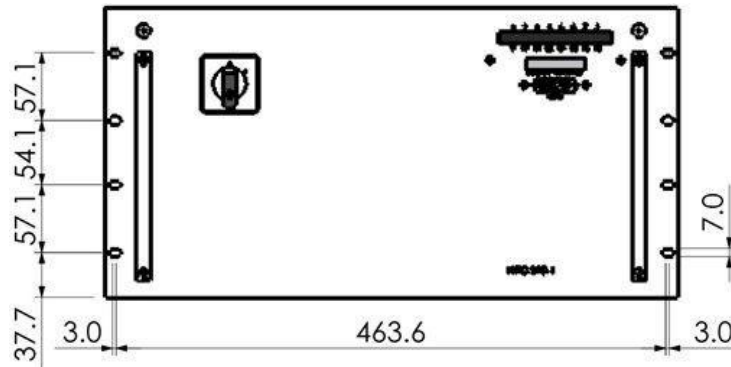
Important!

An external disconnect device must be fitted at the time of installation, and must be accessible without needing to use a tool. This must be suitably located and easily reached and must be marked as the disconnecting device for the power supply.

Installation

Mechanical installation

Using suitable fasteners, mount the power supply within the OEM machine racking using the four mounting holes shown in the following figure.



Mains AC power connections

Important!

Under certain conditions, it may be possible for high voltage and current cables to emit noise energy levels that may interfere with control signal cables. To eliminate the possibility of interference, cables carrying control signals should be routed along a different path to power cables.

The power supply is provided with a 4mm² mains supply cable. If this cable needs to be replaced with a longer cable, ensure the replacement cable is of the correct rating for the power supply.

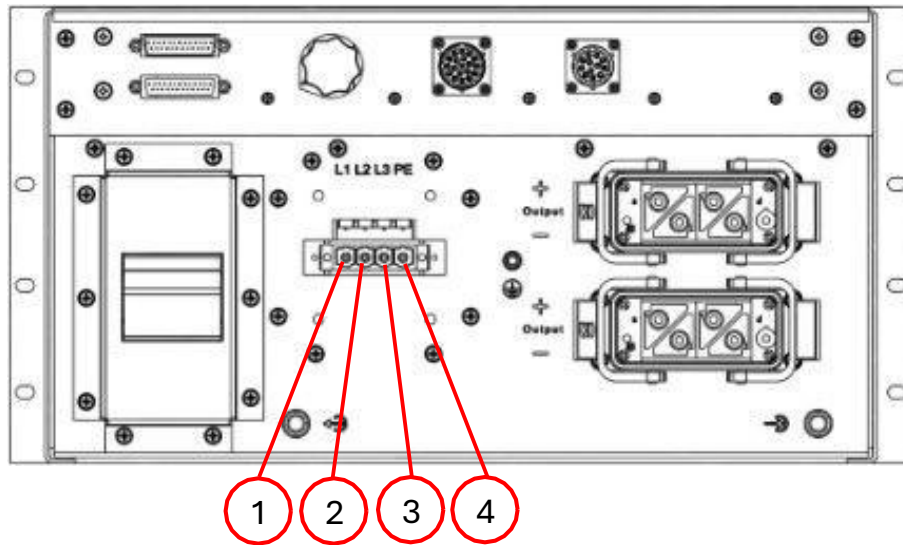


Risk of electric shock or severe damage to the equipment

Ensure that the equipment is disconnected from the mains supply before making this connection.

1. No neutral connection is required. Connection to neutral will cause irreparable damage to the power supply.

Connect the three-phase cable to the L1, L2 and L3 terminals on the rear panel of the power supply. Connect the earth wire to the earth terminal.



- 1 L1
- 2 L2
- 3 L3
- 4 Earth

Figure 19 - Three-phase mains supply connection

Important!

An earth connection is essential. Ensure that the earth wire is connected before connecting the mains supply.



Risk of irreparable damage to the power supply

Do not connect the power supply to neutral.

DC laser supply cables

DC power and DC control cables must be securely fitted to the connectors provided on the rear panel of the power supply and on the laser system.

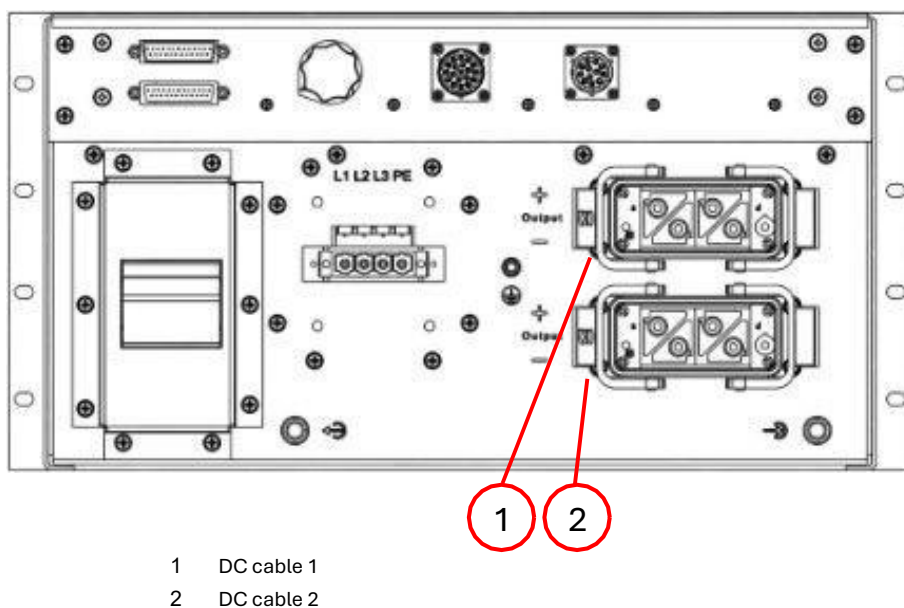


Figure 20 - Cable connectors

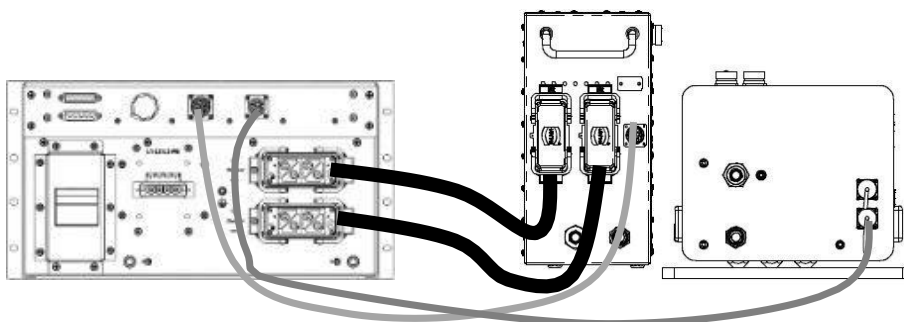
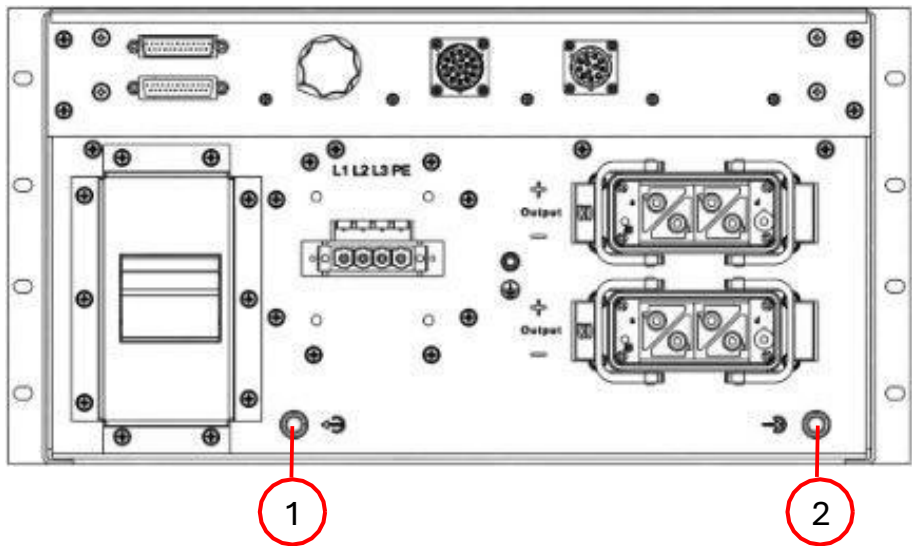


Figure 21 - Cable connectors

DC power cables of the correct specification can be supplied by Luxinar.

Cooling system connections

The power supply requires a liquid cooling source. It is recommended that it is connected in series with the laser system cooling circuit. The coolant connections are located on the rear of the power supply. See [page 64](#) and the following figure.



- 1 Coolant OUT
- 2 Coolant IN

Figure 22 - Coolant connections

The coolant inlet and outlet connectors are labelled as shown in the following table.

Coolant IN		
Coolant OUT		

Note: The DC power supply has internal temperature monitors. If the internal temperature exceeds pre-defined limits, the power supply will shut down.

Operation

The power supply requires a user input to enable it. When powered up, it will automatically carry out diagnostic checks, which will take a maximum of 7 seconds to complete. If no faults are detected, then the DC power supply is ready for use.

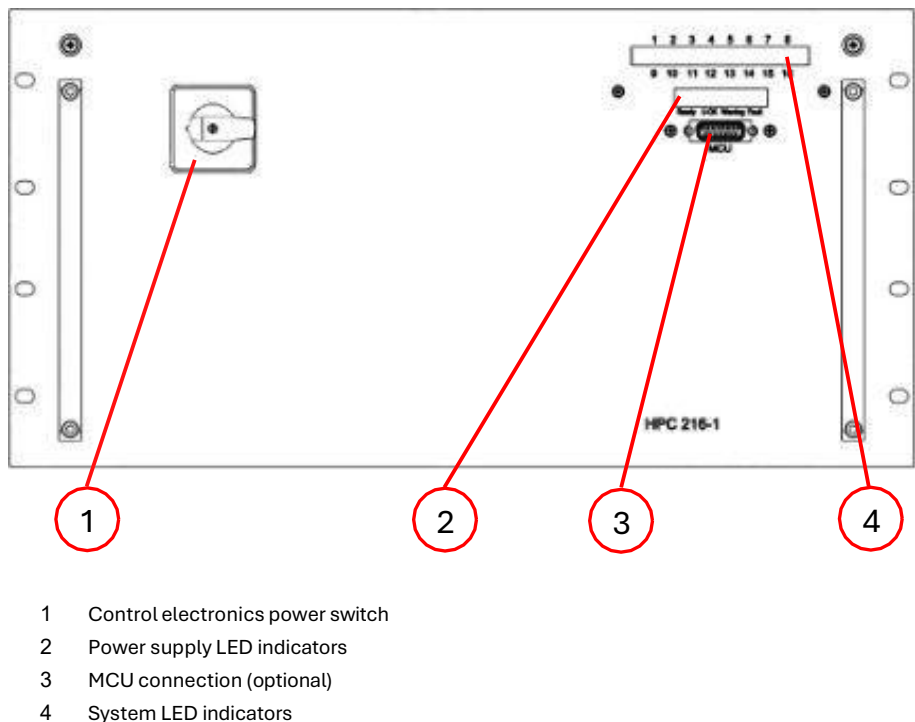


Figure 23 - Power supply front panel connections and LED indicators

Control electronics power switch

When mains voltage is connected to the power supply (see [page 20](#)) the electronics to control the OEM 65iX can be switched on and off using this switch. *This switch does not turn the mains supply on or off*

Power supply indicators

The LED indicators on the front panel provide information about the power supply operating status.

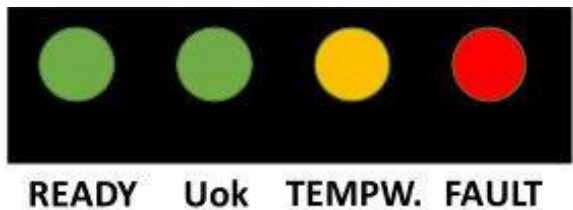


Table 3 - Power supply LED indicators

LED	Meaning
READY	The three-phase mains supply is correctly connected (2)
Uok	Once the PSU Enable signal is applied, the DC output will turn on. The output voltage is internally compared to the set reference voltage. If this is correct, the Uok indicator will illuminate ⁽³⁾

TEMPW	This indicator warns that the internal temperature is too high. Check that the coolant flow and temperature are correct.
FAULT	This indicator illuminates when corrective action is required. At the same time DC output is turned off. Switch off the three-phase mains supply to reset the power supply. If Faults are detected, 1 or more status indicators will be off or displaying red/amber. Disconnect and reconnect the mains supply to restart the power supply. Refer to Table 4.

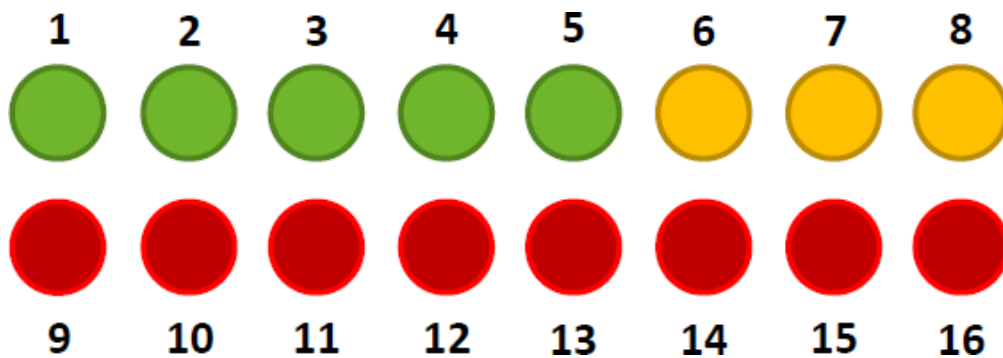
2. The power supply uses a soft-start circuit during power up and the FAULT indicator will illuminate momentarily during this time. This is normal. If the mains supply is switched on and off too often, the soft-start resistors heat up and the FAULT indicator illuminates. If this happens, switch off the mains supply and wait for 5 minutes for the resistors to cool down.
3. If the external voltage is not correct, the DC output is turned off and the FAULT indicator illuminates. Check external wiring.

Important!

If the TEMPW indicator is illuminated and no action is taken and the internal temperature continues to rise, the FAULT indicator will illuminate and the DC output is turned off.

System indicators

The 16 LEDs are used to identify the status of the laser operation, and what action, if any, is required for correct operation.



The LEDs are split into 3 colour groups (Red, Orange and Green).

- Red indicates a fault or the control electronics is waiting corrective action. The laser will not operate.
- Orange indicates a potential fault or the control electronics is waiting for corrective action. Investigation is required.
- Green indicates correct operation. The laser is ready to operate.

When the laser is operating correctly, only green LEDs will be displayed.

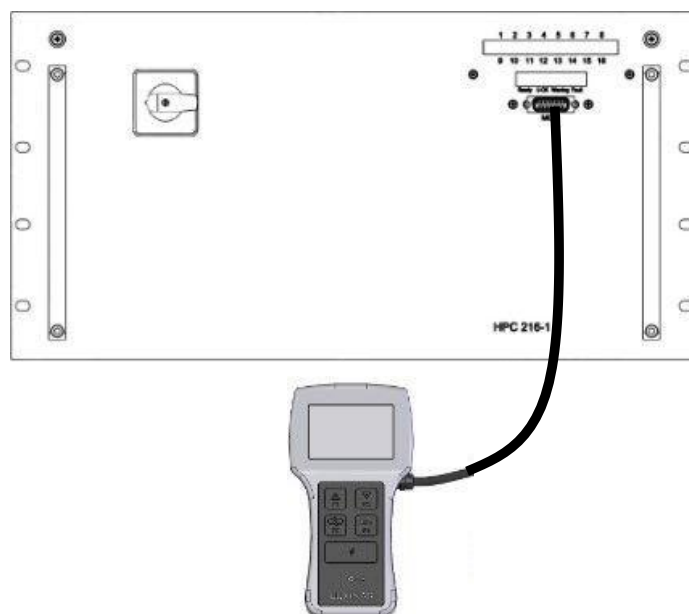
Table 4 - System indicators

LED	Function
1	DC power supply status
2	RF enabled
3	Modulation mode
4	Modulation present
5	Diode pointer enabled
6	Shutter closed monitor

7	RF VSWR status
8	PWM input out of range (Over modulation)
9	Interlock fault
10	RF disabled
11	RF temperature fault
12	RF fault
13	Shutter fault
14	Shutter disabled
15	Laser temperature fault
16	Coolant flow fault

MCU connection (optional)

Connection for MCU, if available.



OEM 65iX three-phase DC power supply (016-0033-00)

General description

Note: This equipment is designed for indoor use only, pollution degree 2 and overvoltage category II as defined within EN 61010-1:2010+A1:2019.

The OEM 65iX three-phase power supply is a free-standing/ rack mountable, AC to DC liquid-cooled power supply (PSU).

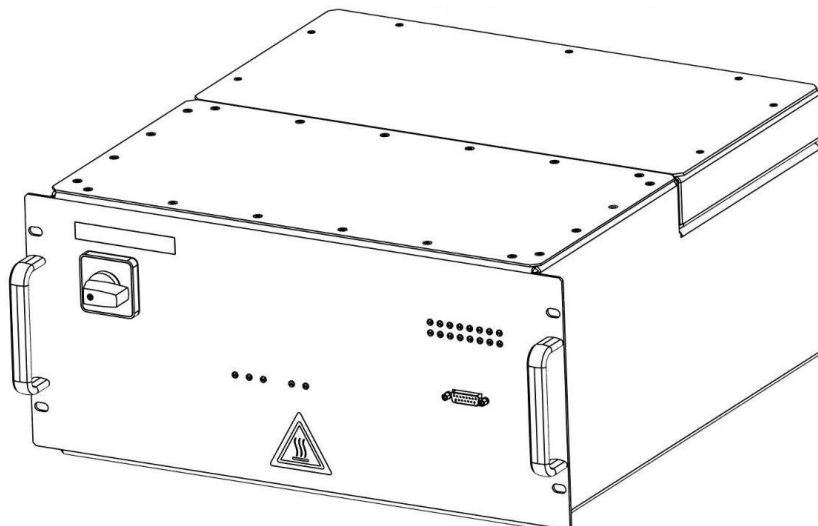


Figure 24 - OEM 65iX three-phase DC power supply

Specification



WARNING

Heavy equipment — risk of severe lumbar injury

The weight of the DC power supply exceeds the single person lift limit of 18kg, as specified in EN 61010-1:2010+A1:2019. Ensure a minimum of two people lift the power supply or that suitable lifting equipment is employed.

Table 5 - Dimensions, weight and cooling

Dimensions (mm) LxWxH	547x483x221
Weight	24kg
Coolant type	Demineralised, deionised or distilled water with corrosion inhibitor & anti-bacterial additive
Coolant pipe	10mm OD, fitted with 10mm – 12mm push-fit fittings
Coolant flow rate	Refer to page 39
Pressure	Maximum 88psi (6bar)
Protection class	IP51

Note: For more detailed dimensional drawings, refer to [Appendix 2](#).

Table 6 - Electrical specifications

OEM 65iX	
Input voltage range	380-480VAC (50/60Hz) three-phase ⁽⁴⁾
Mains input fuse rating (per phase)	40A
AC inrush current (max)	80A
Output voltage (DC)	50 ± 2%
Output current	330A
Power factor	>0.90 at full power
Power consumption (max)	16.5kW at full power
Earth leakage current	<13mA

4. No neutral connection is required. Connection to neutral will cause irreparable damage to the power supply.

Important!

An external disconnect device must be fitted at the time of installation, and must be accessible without needing to use a tool. This must be suitably located and easily reached and must be marked as the disconnecting device for the power supply.

Installation

Mechanical installation

Using suitable fasteners, mount the power supply within the OEM machine racking using the four mounting holes shown in the following figure.

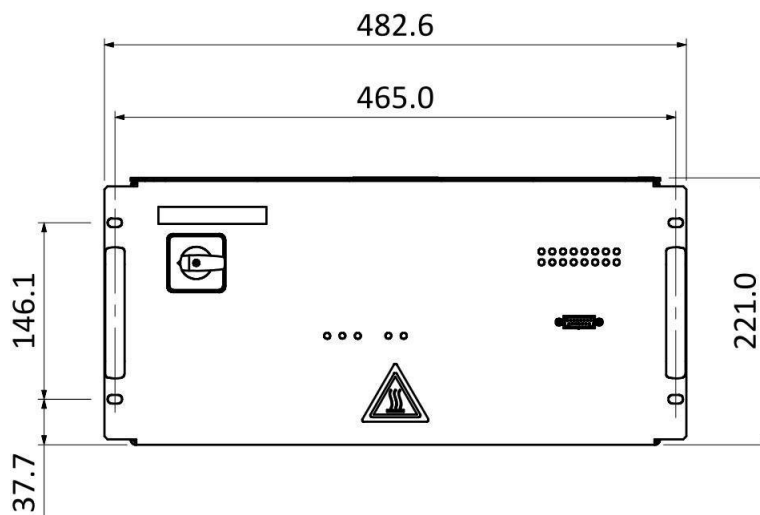


Figure 25 - Fixing locations

Mains AC power connections

Important!

Under certain conditions, it may be possible for high voltage and current cables to emit noise energy levels that may interfere with control signal cables. To eliminate the possibility of interference, cables carrying control signals should be routed along a different path to power cables.

The power supply is provided with a 4mm² mains supply cable. If this cable needs to be replaced with a longer cable, ensure the replacement cable is of the correct rating for the power supply.



DANGER

Risk of electric shock or severe damage to the equipment

Ensure that the equipment is disconnected from the mains supply before making this connection.

Connect the three-phase cable to the L1, L2 and L3 terminals on the rear panel of the power supply. Connect the earth wire to the earth terminal.

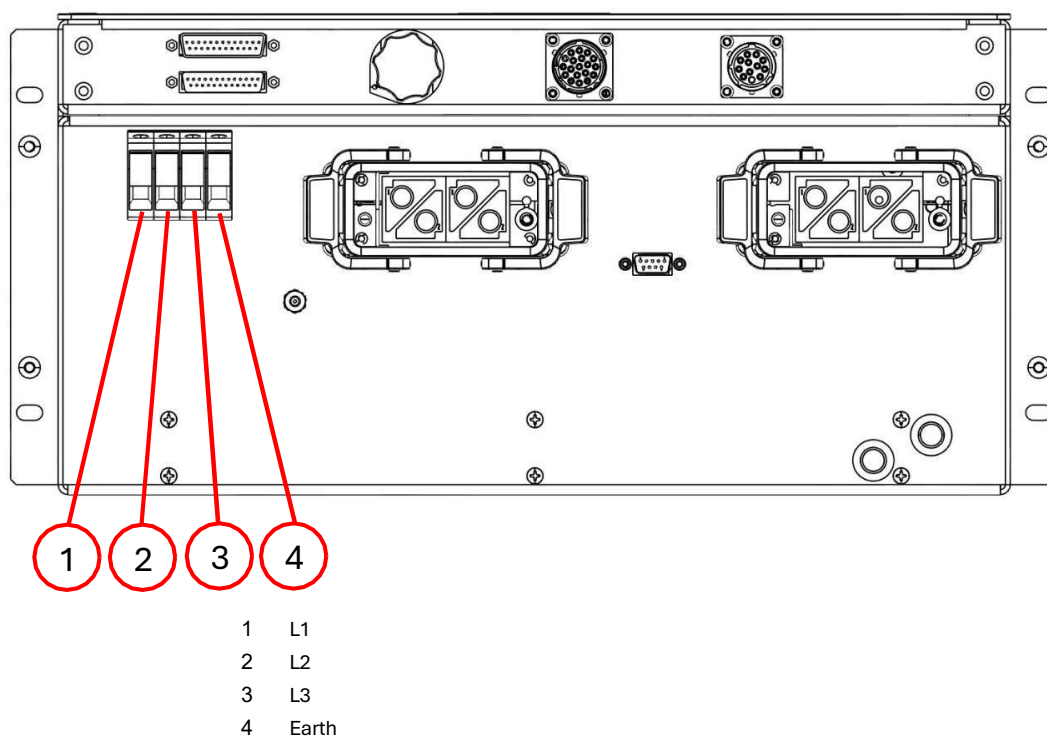


Figure 26 - Three-phase mains supply connection

Important!

An earth connection is essential. Ensure that the earth wire is connected before connecting the mains supply.



Risk of irreparable damage to the power supply
Do not connect the power supply to neutral.

DC laser supply cables

DC power and DC control cables must be securely fitted to the connectors provided on the rear panel of the power supply and on the laser system.

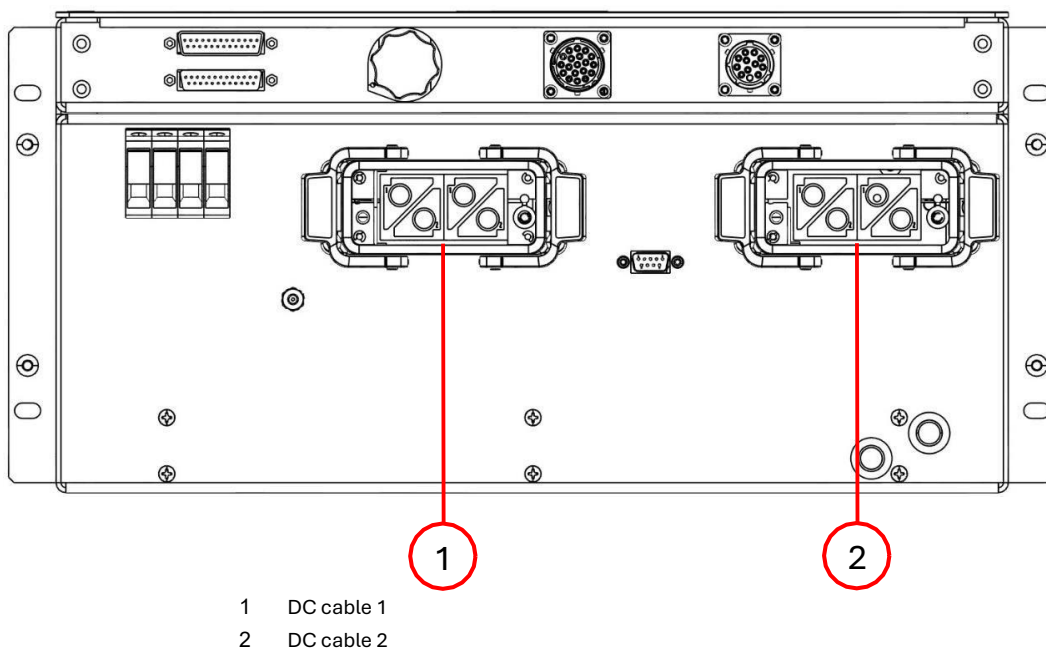


Figure 27 - Cable connectors

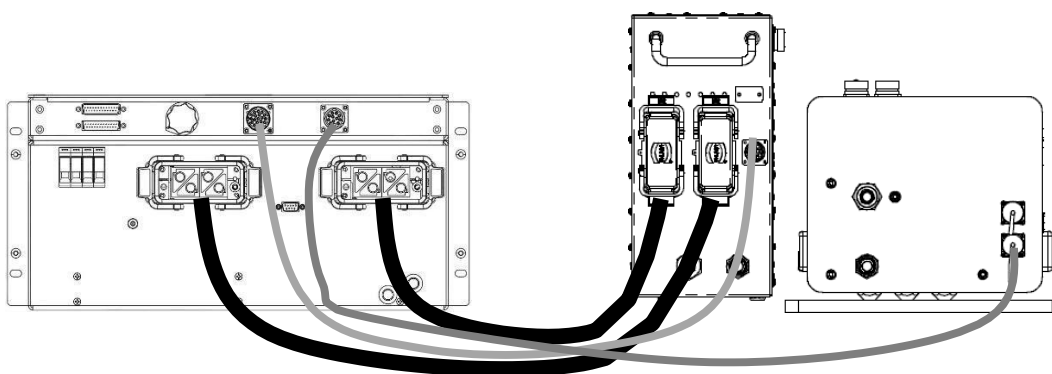


Figure 28 - Cable connectors

DC power cables of the correct specification can be supplied by Luxinar.

Cooling system connections

The power supply requires a liquid cooling source. It is recommended that it is connected in series with the laser system cooling circuit. The coolant connections are located on the rear of the power supply. See [page 64](#) and the following figure.

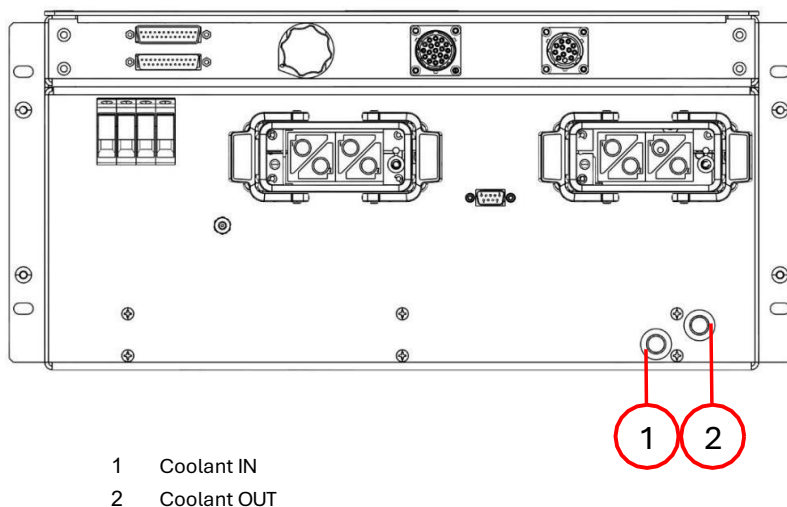


Figure 29 - Coolant connections

The coolant inlet and outlet connectors are labelled as shown in the following table.

Coolant IN		
Coolant OUT		

Note: The DC power supply has internal temperature monitors. If the internal temperature exceeds pre-defined limits, the power supply will shut down.

Operation

The power supply requires a user input to enable it. When powered up, it will automatically carry out diagnostic checks, which will take a maximum of 7 seconds to complete. If no faults are detected, then the DC power supply is ready for use.

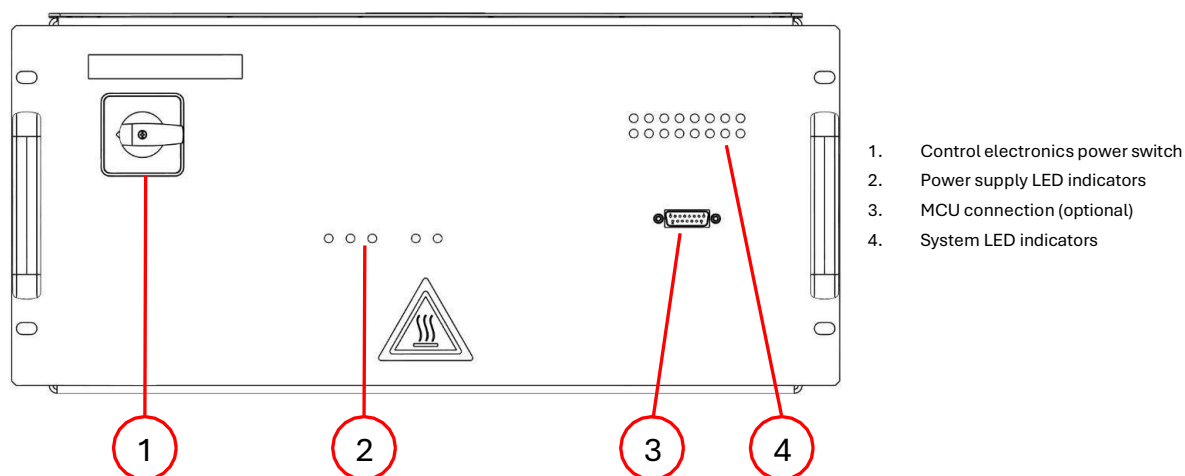


Figure 30 - Power supply front panel connections and LED indicators

Control electronics power switch

When mains voltage is connected to the power supply (see [page 28](#)) the electronics to control the OEM 65iX can be switched on and off using this switch. *This switch does not turn the mains supply on or off*

Power supply indicators

The LED indicators on the front panel provide information about the power supply operating status.

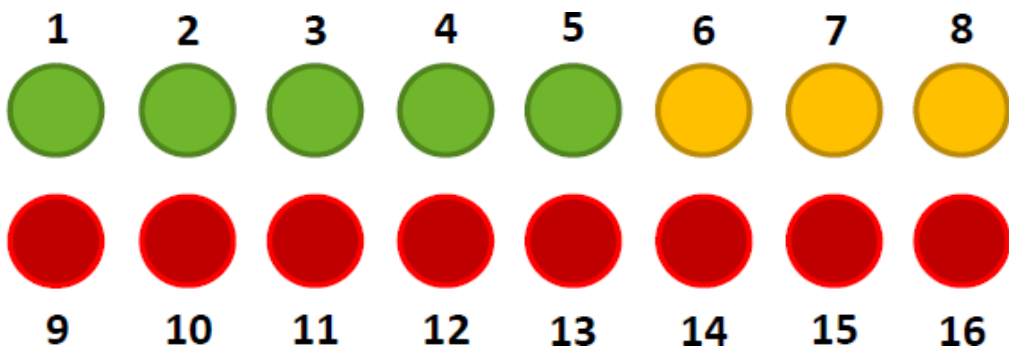


Table 7 - Power supply LED indicators

Indicator	Status definition
STATUS	
AC	○ No AC voltage detected ● AC input voltage within range (correct operation) ● AC input voltage out of range
DC	○ DC output voltage disabled ● DC output voltage present (correct operation) ● DC output voltage out of range
FAULT	
M1, M2, M3	○ PSU disabled ● PSU module enabled (correct operation) ● PSU module fault

System indicators

The 16 LEDs are used to identify the status of the laser operation, and what action, if any, is required for correct operation.



The LEDs are split into 3 colour groups (Red, Orange and Green).

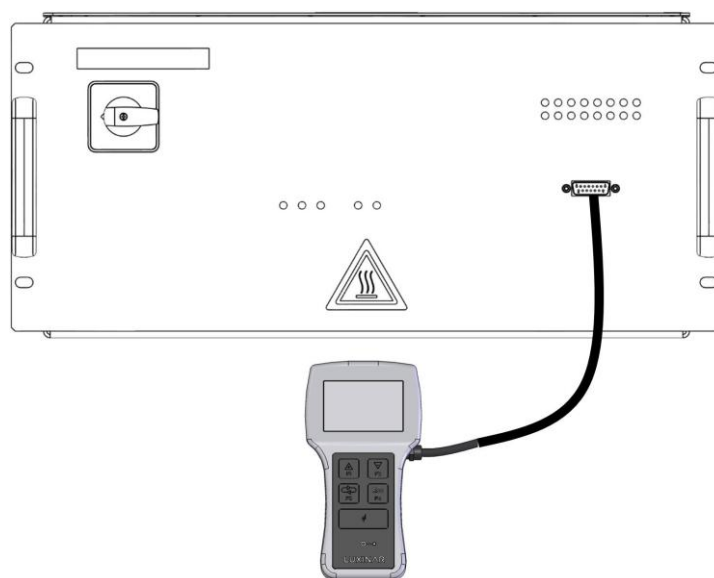
- Red indicates a fault or the control electronics is waiting corrective action. The laser will not operate.
- Orange indicates a potential fault or the control electronics is waiting for corrective action. Investigation is required.
- Green indicates correct operation. The laser is ready to operate.

Table 8 - System indicators

LED	Function
1	DC power supply status
2	RF enabled
3	Modulation mode
4	Modulation present
5	Diode pointer enabled
6	Shutter closed monitor
7	RF VSWR status
8	PWM input out of range (Over modulation)
9	Interlock fault
10	RF disabled
11	RF temperature fault
12	RF fault
13	Shutter fault
14	Shutter disabled
15	Laser temperature fault
16	Coolant flow fault

MCU connection (optional)

Connection for MCU, if available.



OEM-sourced DC power supply and Luxinar controller

General description

Note: This equipment is designed for indoor use only, pollution degree 2 and overvoltage category II as defined within EN 61010-1:2010+A1:2019.

The OEM 65iX controller is free-standing/rack mountable and must be used to interface the laser system to the DC power supply.



Figure 31 - OEM 65iX controller

Specification

Table 9 - Dimensions and weight

Dimensions (mm) LxWxH	483x276x88
Weight	3.5kg
Protection class	IP51

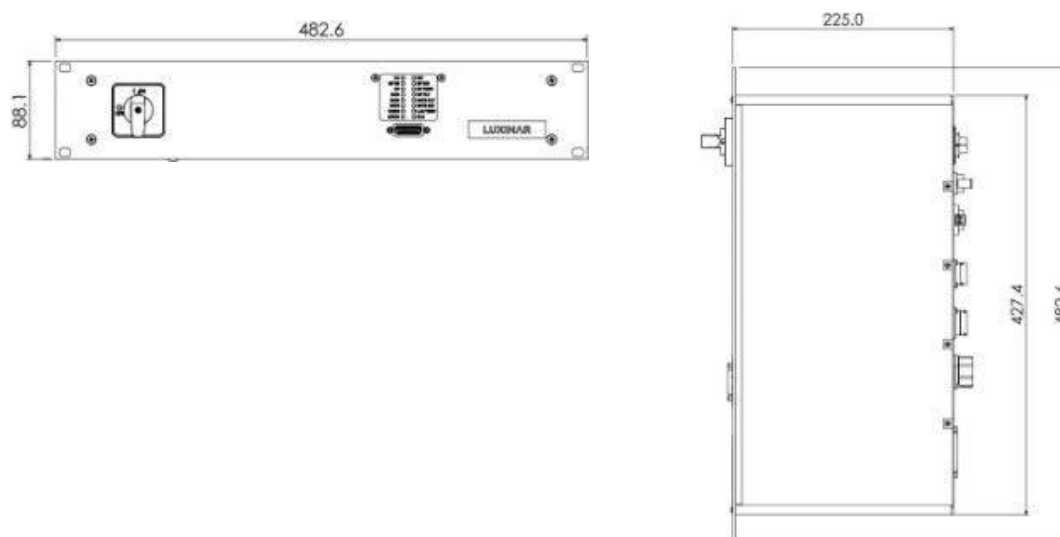


Figure 32 - Overall dimensions

Table 10 - Electrical specifications

OEM 65iX	
Input voltage range	380-480VAC (50/60Hz) three-phase ⁽⁵⁾
Mains input fuse rating (per phase)	0.5A
Mains inrush current (max)	5A
Output voltage (DC)	50 ± 2%
Output current	1A
Power factor	>0.90 at full power
Power consumption (max.)	50W at full power
Earth leakage current	<1mA

5. Only two phases are required. No neutral connection is required. Connection to neutral will cause irreparable damage to the controller.

Important!

An external disconnect device must be fitted at the time of installation, and must be accessible without needing to use a tool. This must be suitably located and easily reached and must be marked as the disconnecting device for the power supply.

Installation

Mechanical installation

Using suitable fasteners, mount the power supply within the OEM machine racking using the four mounting holes shown in the following figure.

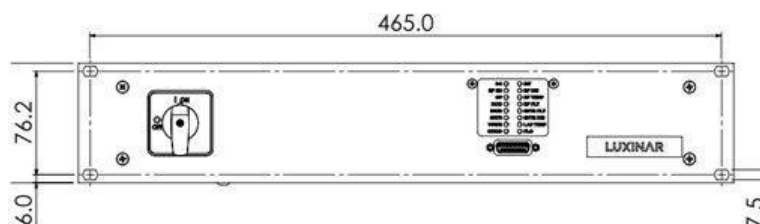
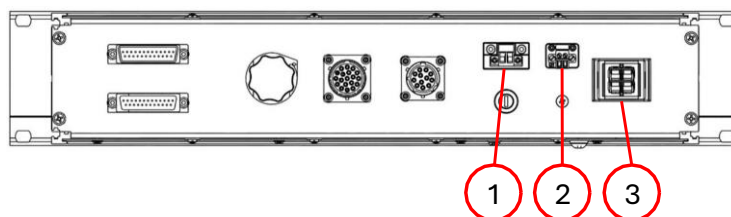


Figure 33 - Fixing locations

Interface connections

The controller requires user interface connections for correct operation.



- 1 50V DC power connector
- 2 DC enable output connector (optional)
- 3 Mains AC power connector

Figure 34 - Controller interface connections

Important!

An earth connection is essential. Ensure that the earth wire is connected before connecting the mains supply.



Risk of irreparable damage to the power supply

Do not connect the power supply to neutral.

Mains AC power connections

Important!

Under certain conditions, it may be possible for high voltage and current cables to emit noise energy levels that may interfere with control signal cables. To eliminate the possibility of interference, cables carrying control signals should be routed along a different path to power cables.

The power supply is provided with a 1.5mm² mains supply cable. If this cable needs to be replaced with a longer cable, ensure the replacement cable is of the correct rating for the power supply.

A pre-configured two-phase and earth cable (part number 091-0359-00) is supplied with the controller. Wires are identified as L1 and L2.

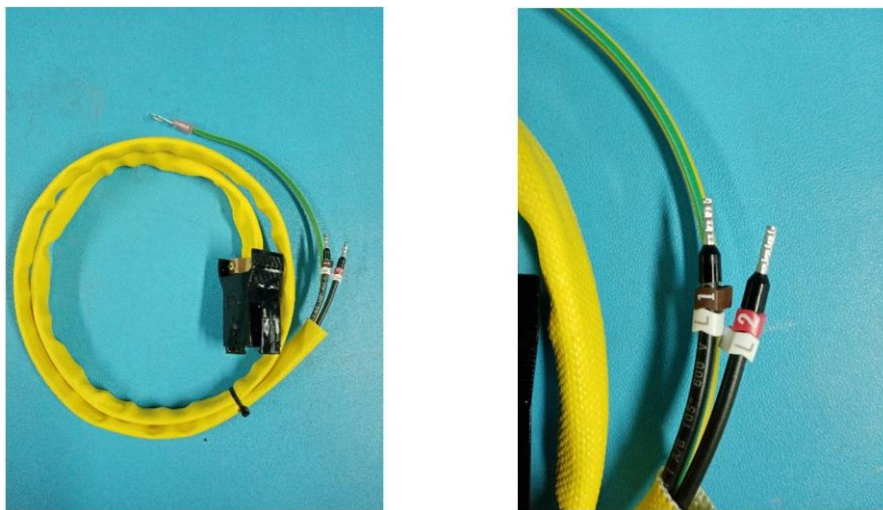


Figure 35 - Mains cable (091-0359-00)



Risk of electric shock or severe damage to the equipment

Ensure that the equipment is disconnected from the mains supply before making this connection.

Connect the two-phase cable to the L1 and L2 terminals on the rear panel of the power supply. Connect the earth wire to the earth terminal.

Important!

An earth connection is essential. Ensure that the earth wire is connected before connecting the mains supply.

50V DC power connection

The controller requires 50VDC from the power supply to monitor and use for driving the OEM 65iX laser head electronics.

This must be provided on the two-way plug provided on the controller.

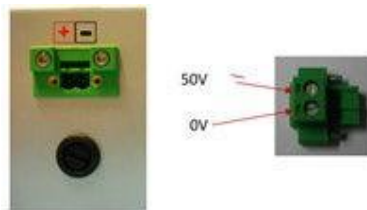


Figure 36 - 50V DC power connection

DC Enable output connector (optional)

A volt-free contact connector is provided to allow the controller to enable and disable the OEM 50V power supply if required. The internal relay type is NEC EA2-12NU.

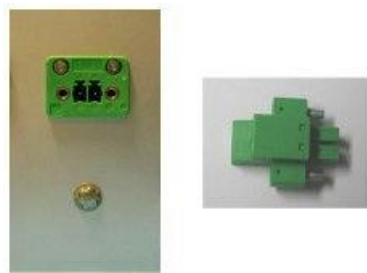


Figure 37 - DC Enable output connector

Controller system connections

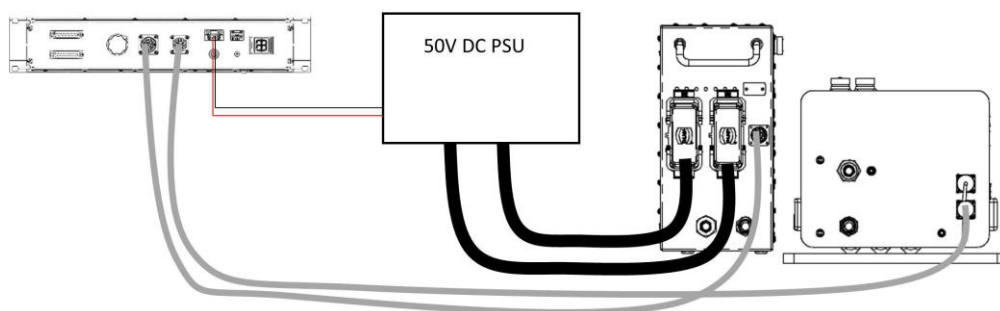


Figure 38 - Controller system connections

Absorbing Thin Film Reflector (ATFR/circular polariser)

The OEM 65iX can be supplied with an ATFR/circular polariser assembly that provides optical isolation to protect the system from back reflections. The assembly mounts directly onto the system front flange output aperture.

Refer to document part number 906-0104-xx; Optical isolation (ATFR) for fitting instructions.

Back reflection considerations

Laser radiation can be reflected back from a workpiece or its supporting fixture within a material processing machine. For example, if plastic sheet is cut on an aluminium supporting plate, a large fraction of the laser beam could be reflected back from the supporting plate into the beam delivery system and the laser head once the laser has cut through the plastic sheet.


CAUTION


Risk of severe damage to the laser and beam delivery system

To prevent damage or destruction of internal laser and beam delivery optics, ensure that back reflections are unable to enter the beam delivery system.

Note: Damage caused by back reflections is not covered by the equipment warranty. It is the responsibility of the system integrator to protect the laser and its optics from back reflections.

Specifications

Note: This equipment is designed for indoor use only and Pollution Degree 2 as defined within EN 61010-1:2010+A1:2019

RF power supply

Table 11 - RF power supply characteristics

DC input (RF)	50VDC $\pm$ 12%
DC input (RF) load capacitance	220mF
DC input (RF) average current	280A
Peak RF output (envelope)	16kW @ 81.36MHz
Maximum average RF output power	9.6kW @ 60%
Duty cycle	Single pulses to 60%
Pulse width range	2–400 μ s
Frequency range ⁽⁶⁾	0–130kHz

7. 500Hz–5kHz unavailable for 10.25 μ m variant

RF cable – RF power supply to laser head

Cable type	Coaxial, double shielded
Cross section diameter	15mm
Static minimum bend radius	152mm
Dynamic minimum bend radius	400mm
RF connector torque setting	25Nm
Cable length	Contact Luxinar Aftersales for details of available cable lengths and other properties.

OEM sourced DC power supply requirements

Table 12 - OEM sourced 50VDC power supply requirements

Output voltage	50V $\pm$ 2%
Average output current	280A
Output power	$\geq$ 14kW

Dimensions

Table 13 - External dimensions

Laser head — LxWxH (mm)	1251x350x289
Laser head (without covers) — LxWxH (mm)	1205x350x289
RF power supply — LxWxH (mm)	1131x181x358
Mobile control unit — LxWxH (mm)	220x115x51

Weights

Note: All weights are approximate.

Table 14 - Laser head and RF power supply weights

Laser head Including covers	134kg
Laser head excluding covers	114kg
RF power supply	41kg
Mobile control unit (including cable)	1kg

Customer connections

Refer to [Section 8](#) for interfacing details.

Cooling system

The OEM 65iX requires a temperature stabilised recirculating coolant circuit in order to operate correctly.

The preferred coolant is deionised water or deionised water with anti-bacterial additive. See [Appendix 3](#).

Important!

To prevent condensation on optical surfaces, the coolant temperature must be maintained above the dew point.

The following look-up table defines minimum coolant temperatures (above the dew point) that avoid condensation with respect to ambient temperature and relative humidity.

Table 15 - Minimum laser resonator coolant temperatures

		Ambient temperature (°C)					
		20	25	30	35	40	45
Relative humidity	45%	19	19	19	24	29	
	50%	19	19	20	25	30	
	55%	19	19	21	26		
	60%	19	19	22	27		
	65%	19	19	23	28		
	70%	19	19	24	29		
	75%	19	20	25	30		
	80%	19	21	26			
	85%	19	22	27			
	90%	19	23	28			
	95%	19	24	29			

Table 16 - Coolant specification

Minimum flow rate (L/min)	8
Maximum flow rate (L/min)	15
Maximum pressure	4.0–6.0bar (58–88psi)
Dissipation	16kW
Required refrigeration capacity	16kW
Coolant temperature Note: Coolant temperature must be above the dew point.	19–25°C (Optimum temperature 21°C. Allow 1% output power drop per 1°C increase.) Refer to document 906-0202-99 for more details.
Inline particle filter	100µm particle size
Pipe connections	12mm, push-fit fittings Hose tail fittings with 12mm ID and 12.7mm OD are supplied with the equipment.

Optics purge gas

Table 17 - Optics purge gas specification

Purge gas pressure	0.07–0.21bar (1–3psi)
Flow rate	1–2L/min
<i>Nitrogen purity</i>	
Nitrogen purity grade	≥ 4.6 (O ₂ ≤ 3vppm, H ₂ O ≤ 2vppm)
<i>Compressed air contamination limits</i>	
Oil	≤ 0.005mg/m ³
Water	≤ 0.05g/m ³
Particles	≤ 0.05µm

Environmental specifications

Note: This equipment is designed for indoor use only and Pollution Degree 2 as defined within EN 61010-1:2010+A1:2019

Table 18 - Environmental specifications

Ambient working temperature	5–40°C
Storage temperature (with drained cooling circuit)	5–70°C
Relative humidity (non-condensing)	10–85%
Maximum altitude	< 2000m

Performance

Table 19 - OEM 65iX output characteristics

Output wavelength	10.6µm (10.45–10.7µm)	10.25µm (10.17–10.33µm)
Rated average power range at 400µs maximum duty (1.5kHz)	35–650W	25-540W
Peak power	1640W	1360W
Pulse energy	26–520mJ	22-430mJ
Pulse rise and fall time	< 60µs	
Typical power stability	± 4.10%	
Typical power stability with power feedback	± 1%	
Guaranteed power stability	± 7%	
Guaranteed power stability with power feedback	± 2%	
Optical pulse rise time (10–90%)	60µs	
Excitation frequency	81MHz	
Expected tube lifetime	20000 hours	
Beam diameter (1/e ²)	11.6 ± 1mm (1/e ²) at the laser output optic	
M ² (K)	< 1.2 (> 0.83)	
Beam divergence	< 1.75mrad (1–10m)	
Beam ellipticity	< 1.2:1	
Pointing stability	< 0.25mrad (half angle)	
Polarisation	Linear parallel to the laser base	

Laser diode pointer option


WARNING


Class 3R visible laser radiation

Avoid eye exposure to direct and scattered radiation.

Table 20 - Laser diode pointer specification (Red)

Wavelength	635 ± 10nm @ 25°C
Maximum output power	4mW
Power stability	5% @ 25°C
Divergence	<1.75 mrad
Beam diameter (at the output aperture)	0.25mm @ the output aperture
Pointing stability	<0.25mrad per °C

Table 21 - Laser diode pointer specification (Green)

Wavelength	520 ± 10nm @ 25°C
Maximum output power	5mW
Power stability	<5% @ 25°C
Divergence	<2.0 mrad
Beam diameter (at 1m)	4.0 x 2.0mm
Pointing stability	<0.2mrad per °C

Section 3

Operation

Overview of control options

Two options may be used to control the OEM 65iX laser:

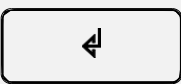
Hand-held MCU (Mobile Control Unit)

The MCU (Mobile Control Unit) may be used to set up and program the system controller. This option is normally used for initial system setup and for troubleshooting or servicing.

The MCU also displays the system operating status, IO status and laser power output. For full programming details, see the MCU user manual, part number 906-0106-xx.



Figure 39 - Hand-held MCU

	Press the F1 key to increase the value in the selected field or to select the F1 menu option.
	Press the F2 key to increase the value in the selected field or to select the F2 menu option.
	Press the F3 key to step the cursor to the next field or to select the F3 menu option.
	Press the F4 key to escape from the current screen without saving changes or to select the F4 menu option.
	Press the ACCEPT key to escape from the current screen and save any changes.

Host machine commands using the U1 connector

The system controller may be directly set up and programmed by the host machine using the U1 connector. This option is used for normal operation of the laser in a production environment. For interfacing details see [Section 8](#).

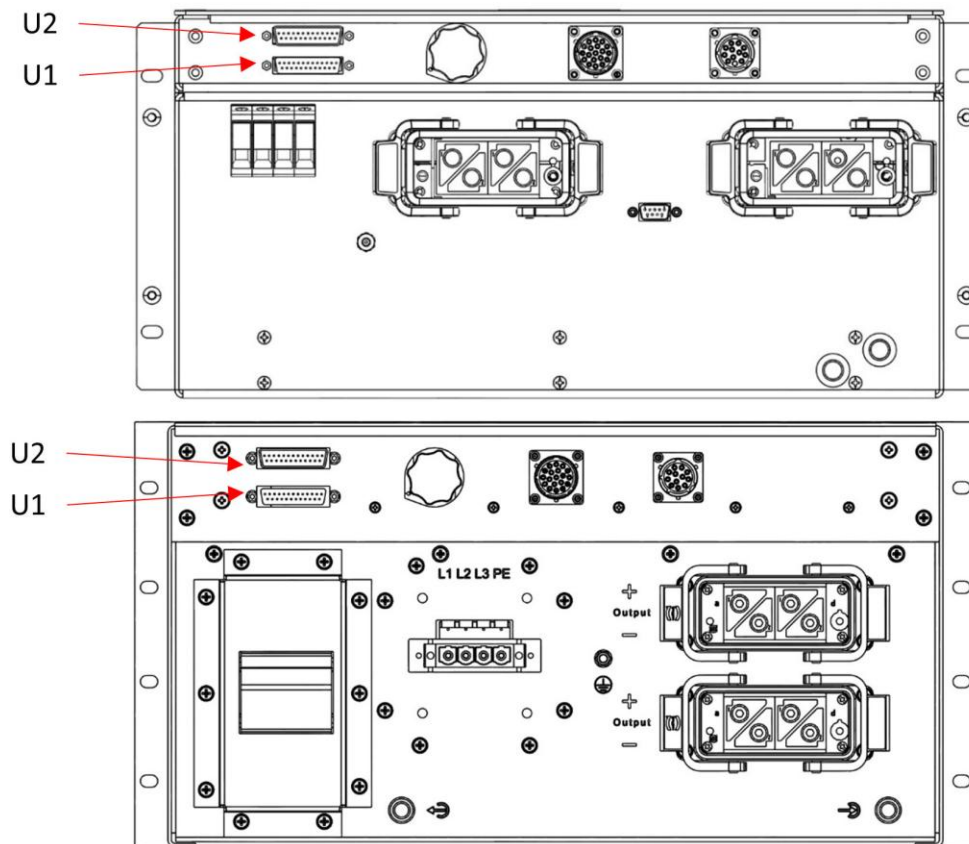


Figure 40 - Combined controller/DC power supply — U1 & U2 connectors

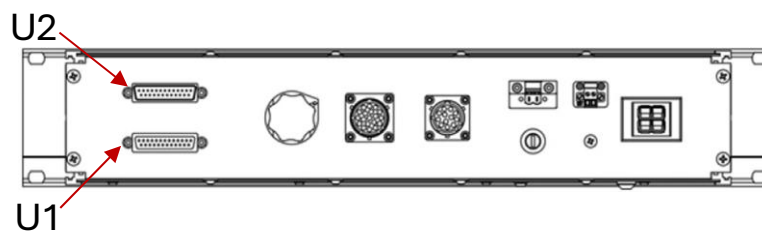


Figure 41 - Stand-alone controller — U1 & U2 connectors

General considerations before starting the laser

- Ensure that the beam path is free from obstructions.
- If the machine is in a maintenance or installation situation with machine guards removed, check that there are no personnel within the area and that safety warning notices are prominently displayed.
- Ensure all interlocks are operating correctly.
- Verify that the material to be processed is suitable for CO₂ laser processing.
- Verify that the material to be processed is correctly positioned and ready for processing.

Note: At operational frequencies between 300–400Hz, 600–800Hz, 1400–1800Hz and 2000–2500Hz acoustic resonance may occur causing an unpleasant sound and possible degradation of the beam quality.

Refer to [Appendix 1](#) for details of frequencies to avoid.

Start-up

1. Ensure that all machine safety features are present and activated.

If the machine is in maintenance mode with enclosure panels removed, ensure that the area surrounding the machine complies with local laser safety regulations and that laser safety warning notices are displayed prominently. All persons in the area must wear laser protection eyewear.



Risk of injury to eyes and exposed skin

This is a Class 4 (Class IV) laser product. All precautions relevant to this class of laser product should be strictly observed. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Strict compliance with the safety precautions set out and referred to in this manual and extreme care in use are essential to minimise the chance of accidental damage to the equipment or personal injury. Luxinar does not accept liability for any damage or injury howsoever caused or arising.

2. Turn on the coolant circulating system and check for correct flow and temperature.
3. Turn on the optics purge gas.
4. Verify that all interlocks are closed.
5. Switch on mains power to the laser and controller.
6. Set the operating parameters on the machine controller.
7. Enable the RF power supply.



Laser radiation hazard

Avoid exposure to direct and scattered radiation.

8. Enable the shutter (shutter version only).

Important!

Certain pulsing regimes can cause acoustic resonance phenomena that perturb beam pointing characteristics. See [Appendix 1](#) for parameters to avoid.

Shutdown

1. Close the shutter (shutter version only).
2. Disable the RF power supply.
3. Switch off mains power to the laser and controller.
4. Turn off the optics purge gas.
5. Turn off the coolant circulating system.

Emergency stop

An emergency stop is initiated by the OEM machine. The machine should automatically:

- Remove the trigger signal (shutter version and power feedback version only).
- Close the shutter (shutter version only)
- Remove the **RF enable** signal
- Break the laser interlock circuit

Important!

For the shutter version and power feedback version, the laser will not restart unless the trigger signal is removed and re-applied. Control signal timings must be respected when restarting. See section [page 95](#)

Section 4

Diagnostics and troubleshooting

Laser status indicator diagnostics controller

Table 22 - Laser status indicator diagnostics – Luxinar PSU with integrated controller

Indicator display	Status	Action
Indicators 1–8  Indicators 9–16 	Normal operation — internal mode	No action required
Indicators 1–8  Indicators 9–16 	Normal operation — external mode	No action required
Indicators 1–8  Indicators 9–16 	Normal operation — internal mode. Waiting for trigger signal.	Trigger signal required
Indicators 1–8  Indicators 9–16 	VSWR error — internal mode	Contact Luxinar Aftersales
Indicators 1–8  Indicators 9–16 	- Shutter closed — internal mode - Laser diode pointer OFF	Shutter open signal required
Indicators 1–8  Indicators 9–16 	- Shutter closed — internal mod - Laser diode pointer ON	Shutter open signal required
Indicators 1–8  Indicators 9–16 	Shutter disabled — internal mode	Shutter enable signal required
Indicators 1–8  Indicators 9–16 	Shutter error — internal mode	Contact Luxinar Aftersales

Indicators 1–8  Indicators 9–16 	• DC PSU error — internal mode • System in standby mode	• Check the DC PSU • Activate the system
Indicators 1–8  Indicators 9–16 	Interlock fault	Check for open machine interlocks
Indicators 1–8  Indicators 9–16 	Coolant flow error — internal mode	Check the coolant flow rate and temperature
Indicators 1–8  Indicators 9–16 	Temperature fault — internal mode	Contact Luxinar Aftersales

Table 23 - Laser status indicator diagnostics – OEM PSU with separate Luxinar controller

Indicators — left	Indicators — right	Status	Action
DC  RF EN  OP  MOD  DIOD  SHTR  VSWR  OMOD 	INT  RF DIS  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Normal operation — internal mode	No action required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLO 	Normal operation — external mode	No action required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Normal operation — internal mode	Trigger signal required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	VSWR error – internal mode	Contact Luxinar Aftersales

DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Shutter closed – internal mode	Shutter open signal required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Shutter closed – internal mode	Shutter open signal required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Shutter disabled – internal mode	Shutter enable signal required
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Shutter error – internal mode	Contact Luxinar Aftersales
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	- DC PSU error – internal mode - System in standby mode	- Check the DC PSU. - Activate the system

DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Interlock fault – internal mode Check for open machine interlocks.
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Coolant flow error – internal mode Check the coolant flow rate and temperatures
DC  RF IN  OP  MOD  DIOD  SHTR  VSWR  CMOD 	INT  RF PSU  RF TEMP  RF FLT  SHTR FLT  SHTR DIS  LAS TEMP  FLOW 	Temperature fault – internal mode Contact Luxinar Aftersales

RS232 error codes

Table 24 - RS232 error codes

Error code ID	Description	Action
01	Shutter error	The shutter module must be replaced. Contact Luxinar Aftersales.
02	Emission indicator failure	- Check the emission indicator wiring loom for damage. - The emission indicator array is faulty and must be replaced. Contact Luxinar Aftersales.
Error code ID	Description	Action
03	DC voltage low	- Check J1 and J2 are connected correctly. - Check the power supply status indicators. - Check the DC output voltage. - Replace the DC module. Contact Luxinar Aftersales.
04	DC voltage high	- Check the power supply status indicators. - Check the DC output voltage. - Replace the DC module. Contact Luxinar Aftersales.
05	DC current too high	- Check the error log for previous problems. (1) - Record the output power and performance of the system. Contact Luxinar Aftersales with the results.
06	Emergency stop	Contact Luxinar Aftersales.
07	External interlock	- Reset the external interlock on the OEM machine. - Check all cable connections between the laser head and the PSU/control unit. - Link connector U1, pins 9 and 21 to override the external interlock circuit. If the error clears, check the operation of all external interlocks connected to the system. (2)
08	Laser head disconnected	- Check that cable 093-0026-xxxx is connected between the laser head and the controller connector LI. - Check that the cable is not damaged.
09	Laser head disabled	Check the error log history for the last error.
10	RF over temperature	Check all coolant connections for leaks.
11	T1 over temperature	Check that all system components are connected.
12	T2 over temperature	If required
13	Coolant flow low	Check that the chiller is filled to the correct level and

14	Coolant flow high	- Check that coolant pipe diameters are as specified and that the pipes are not damaged. - Check that the coolant temperature and the ambient temperature of the surrounding area are within specification.
15	VSWR	- Check that the RF cables are securely connected to the correct terminals. - Check that the RF cables are not damaged.
16	Overmodulation — External mode	Check that the External input modulation signal is within the specified operating parameters.
16	Overmodulation — Internal mode	- Test the system using Engineering mode. - Check the PID parameters. ⁽³⁾ - Test the system with adaptive control switched off.
17	Laser power low	- Check the output mode quality. - Isolate the system from the mains supply and check the output lens and beam delivery system mirrors for contamination or signs of damage. - Check the laser system for any signs of external damage. - Check that the RF cables are securely connected to the correct terminals. - Purge the internal and external beam delivery systems using a purge gas supply. - Measure the laser output power using a calibrated power meter.
18	Laser power high	Test the system with adaptive control switched off. If the error clears, reset the PID correction tables. ⁽⁴⁾
19	At control limit	Test the system with adaptive control switched off. If the error clears, reset the PID correction tables. ⁽⁵⁾
20	CanBus fault	- Check that all control cables are correctly attached and free from damage. - Restart the system. If the error persists, contact Luxinar Aftersales.
21	User PWM limited	Check the external modulation signal is within the specified operating parameters.

- For information concerning use of the OEM 65iX controller, refer to 906-0106-00.
- Pins 19 and 20 if system is operating in SCX 30 Emulation Mode.
- For information concerning use of the OEM 65iX controller, refer to 906-0106-00.
- For information concerning use of the OEM 65iX controller, refer to 906-0106-00.
- For information concerning use of the OEM 65iX controller, refer to 906-0106-00.

Section 5

Routine Maintenance

The OEM 65iX has been designed to be low maintenance. Internal routine maintenance procedures are not required. The system's sealed construction and limited number of moving parts ensure trouble-free and reliable operation.

General cleaning



Laser radiation and electrical hazards

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure. This is a Class 4 (Class IV) laser and the beam is invisible to the eye.

Please review all safety instructions and precautions given in the Safety chapter before attempting to operate or service this system.

Always ensure that the laser system is switched off and isolated from the mains supply before attempting any cleaning or maintenance procedures.

- The external surfaces of the system can be cleaned with a mild detergent. It is advisable to use a damp cloth to facilitate the cleaning of the external cabinets, etc.
- Take care not to allow entry of water into any of the electrical cabinets or onto the output window or final beam delivery optic.

Safety shutter

Under normal operating conditions, the shutter has been designed for a lifetime of two million open/close operations. The shutter should be inspected during each routine maintenance procedure and must be replaced if there is any sign of damage to the reflector blade, solenoid mechanism, blade sensors or electronic parts, or if the operational lifetime has been reached.

Purge gas filter

The purge gas maintains a slight positive pressure within the internal and external beam delivery system to prevent ingress of contamination that could degrade the optical components. The purge gas specification is detailed in [section 2.9.8](#).

The purge gas inlet is fitted with a filter which must be inspected on a regular basis. If the filter appears discoloured or contaminated, the filter must be replaced immediately and the gas supply must be checked to find the cause of the contamination. Filter locations are shown in the following figures.



Figure 42 - Purge gas filter — version with covers



Figure 43 - Purge gas filter — version without covers

Replacement filters (part number 402-0006-00) are available from Luxinar Aftersales.

Important!

Damage caused by a contaminated purge gas supply is not covered by the warranty. It is the responsibility of the OEM system integrator to ensure a correct and adequate purge gas supply is installed.

Fuse replacement


DANGER


Risk of electric shock

Ensure that the equipment is disconnected from the mains supply before replacing fuses.

Table 25 - Fuses and circuit breakers (DC PSU 016-0031-00)

Part number	Current and type	Quantity	Location	Function
552-0035-00	500mA fuse	2	Inside the control unit, rear panel (OEM-supplied DC power supply)	Control unit protection
552-0007-00	Fuse 5x20mm CERM T HRC 1A	1	Inside the control unit, rear panel (OEM-supplied DC power supply)	Add 1A fuse to rear of controller (OEM supplied DC PSU) Part 552-0007-00, FUSE 5x20mm CERM T HRC 1A
569-0002-00	32A miniature circuit breaker	1	DC power supply rear panel	Mains input protection for the DC power supply.
552-0019-00	1A fuse	3	Laser head power supply board (009-0092-00)	- F1 — Pre-ioniser 1 - F2 — Pre-ioniser 2 - F3 — Shutter driver

Note: If a fuse fails again after replacement, this may indicate a more serious fault. For more information and advice, contact Luxinar Aftersales.

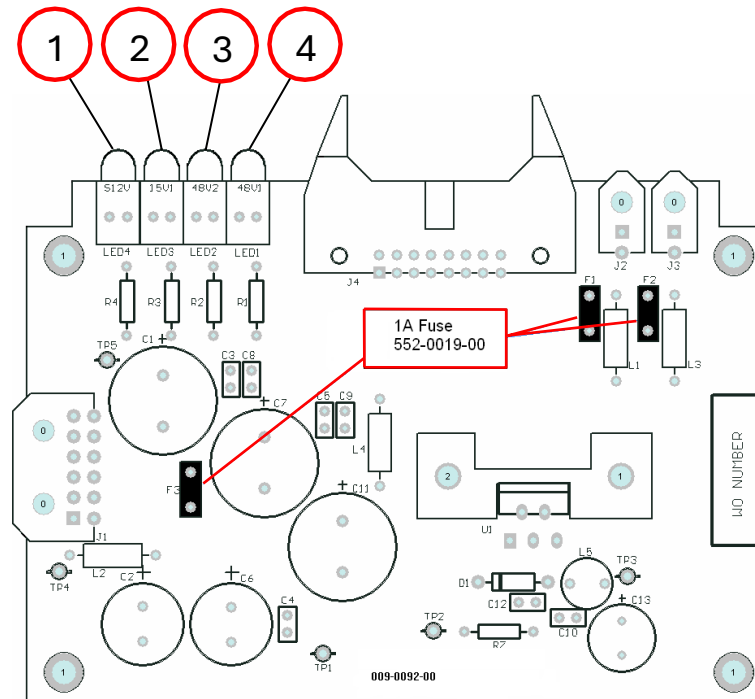


Figure 44 - Control unit rear panel fuse holder location

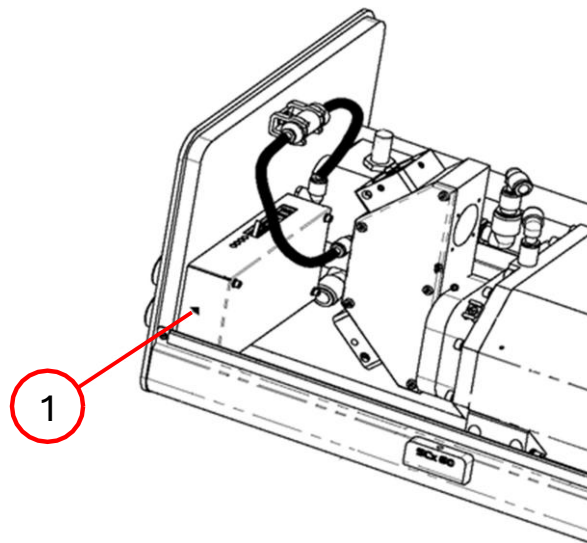
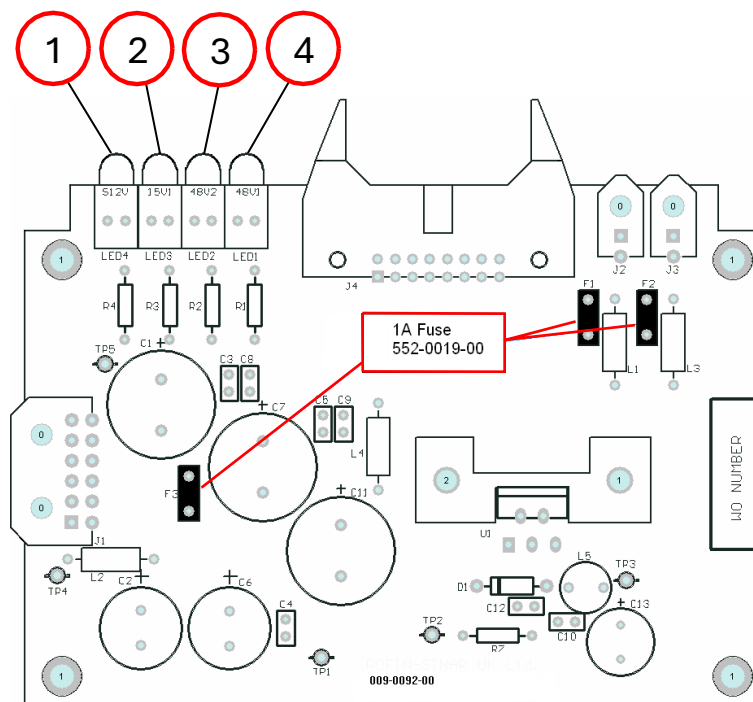


Figure 45 - Laser head power supply location



- 1 12V supply
- 2 18V supply
- 3 50V pre-ioniser supply 2
- 4 50V pre-ioniser supply 1

Figure 46 - Laser head power supply fuses and indicators

Cooling system contamination

If the coolant is contaminated with bacteria or has been treated with other chemicals it will be necessary to clean the cooling circuit:

The pH value, conductivity and dissolved solids levels can be measured using a portable meter. The bacterial contamination level can be checked using a test kit. For more information and advice, contact Luxinar Aftersales.

Pay particular attention to the instructions provided by the manufacturer of the NALCO water treatment kit:

1. Drain off the contaminated coolant
Ensure that disposal of all the materials used in this product is conducted according to all local and national regulations.
2. Flush the coolant circuit with tap water by filling and draining once only.
3. Mix tap water with deionised water in a 1:1 ratio and fill the coolant circuit.
4. Add a NALCO biocide water treatment kit and mix well with the cooling water.
5. Operate the system for two to four days, then drain off the coolant.
6. Flush the coolant circuit twice.
7. Fill the cooling system with fresh deionised water and add the contents of a fresh NALCO water treatment kit.

Frost protection

If the cooling system or chiller which supplies the cooling for the laser system is located in an area where the temperature may drop below 0°C, then the cooling circuit must be equipped with a winter-proof heating tank to prevent the coolant temperature from dropping below 15°C.

Section 6

Installation

Installation procedure

Before unpacking the laser, prepare for the installation by making sure that the required equipment, resources and materials are available. Carefully inspect the package contents for shipment damage and notify Luxinar immediately if any damage is found.

Ensure that the following are available before starting installation:

- The means to transport and lift the laser into position. See [page 39](#) for equipment weights.
- A flat surface with prepared fixing locations to match the laser mounting feet. See [page 62](#).
- A DC power supply supplied by Luxinar or sourced locally.
- A beam delivery system and support brackets with a prepared connection for the laser output window mounting point
- A source of cooling water or a chiller for laser cooling. See [page 64](#)
- A source of high purity nitrogen or compressed air to provide a positive purge pressure for the laser optics. See [page 65](#)
- An emergency stop interlock circuit.
- Laser control interface circuitry.

Perform the following steps to install the laser:

1. Carefully unpack the laser and place it on the prepared mounting surface, then fasten it in place using M8 bolts. Do not remove the protection cap from the laser output window at this stage.
See [page 62](#).
2. Connect the laser to the cooling water source or chiller using 10mm OD tubing (see [page 64](#)). To connect the cooling tubing:
 - a. Push the tube into the connector until it reaches the stop. Pull back on the tube to ensure that the connector has gripped the tube firmly.
 - b. To remove the tube, press the release ring on the end of the connector end and pull out the tube.
3. Connect the optics purge gas supply using 6mm OD tubing (see [page 65](#)). To connect the gas purge tubing:
 - a. Push the tube into the connector until it reaches the stop. Pull back on the tube to ensure that the connector has gripped the tube firmly.
 - b. To remove the tube, press the release ring on the end of the connector end and pull out the tube.
4. Connect the laser to the DC power supply.



Exposed terminals — risk of electrocution

Switch off and disconnect the equipment from the mains electrical supply before exposing electrical terminals. Only trained and authorised personnel should make electrical connections.

5. Connect the DC power supply to the mains. See [page 66](#).
6. Connect the emergency stop interlock circuit.
7. Connect the control interface circuitry.
8. Test the laser output before fitting the beam delivery system.
Place a suitable beam block or power monitoring device in the beam path. Do not place it close to optical surfaces to avoid risk of contamination by evaporated material.



WARNING

Hazardous laser radiation

Always wear protective eyewear matched to the emission wavelength and output power of the laser. Instruct all personnel in the vicinity to wear identical protective eyewear.

9. Mount the beam delivery system and connect it to the laser output window using the prepared connector.
See [page 75](#)

Unpacking, mounting and connections

Refer to [page 38](#) for details of weights and dimensions.

Unpacking

1. Perform a delivery check

An itemised list of the ordered equipment is provided by Luxinar on delivery. Check the equipment against the list to ensure that all items are present. If any equipment is missing inform Luxinar immediately.

Check the outside of the packing boxes for obvious signs of damage or change of the shock or tilt labels.

If any damage to the packaging or change to the tilt or shock labels has occurred in transit, inform both Luxinar and the relevant shipping company, before taking any other action.

2. Cut the bands on the outside of each of the three packing boxes. Open the box lids and remove the cardboard outer packaging.
3. Remove the cables, spares kit, documentation and store them in a secure location in preparation for installation.
4. Remove the top and side sections of the support packaging to expose the laser head, the RF power supply and the controller or combination controller/DC power supply.
5. Check each component for signs of damage. If any damage has occurred in transit, inform both Luxinar and the relevant shipping company before taking any other action.
6. Carefully lift each component out of its packaging.

Important!

This will require the correct lifting equipment for the weights involved. See [page 60](#)

7. Place each component on a clean, flat, dry surface in preparation for installation.

Lifting techniques and precautions

Before attempting to install the laser system, all installation staff should be made aware of the advice given regarding manual handling, for example in European Directive 90/269/EEC 29 May 1990.



WARNING

Heavy equipment — risk of severe lumbar injury

Do not manually lift the laser head. The RF power supply must be lifted by at least two people.

Due to the size and weight of the laser head, a forklift truck must be used when lifting or moving it.

For a laser head with covers, wide webbing lifting strops should be placed underneath the head outside the mounting feet. Do not place the strops between the mounting feet.

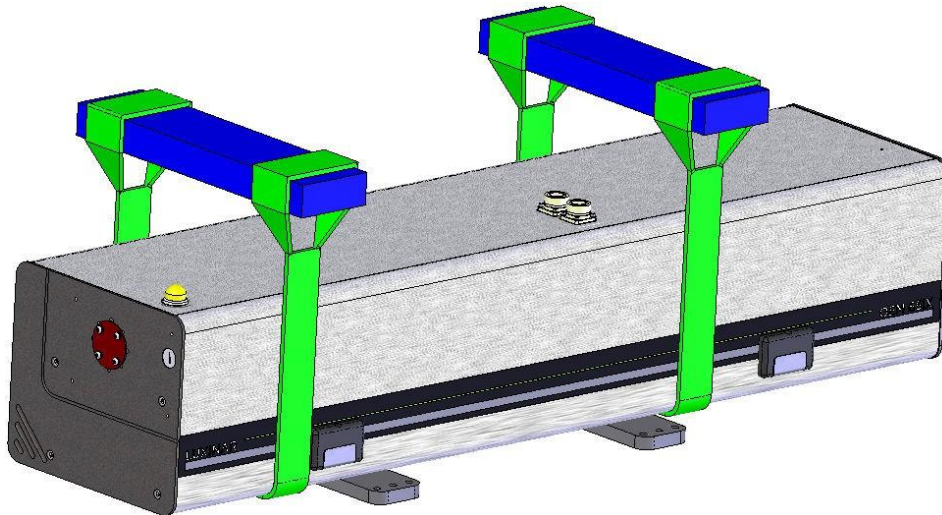


Figure 47 - Lifting strop positioning — laser head with covers

Important!

Do not under any circumstances manually lift the head using the stainless steel covers.

For a laser head without covers, fit lifting eyes to the M10 threaded holes on the mounting feet and attach lifting strops to the eyes.

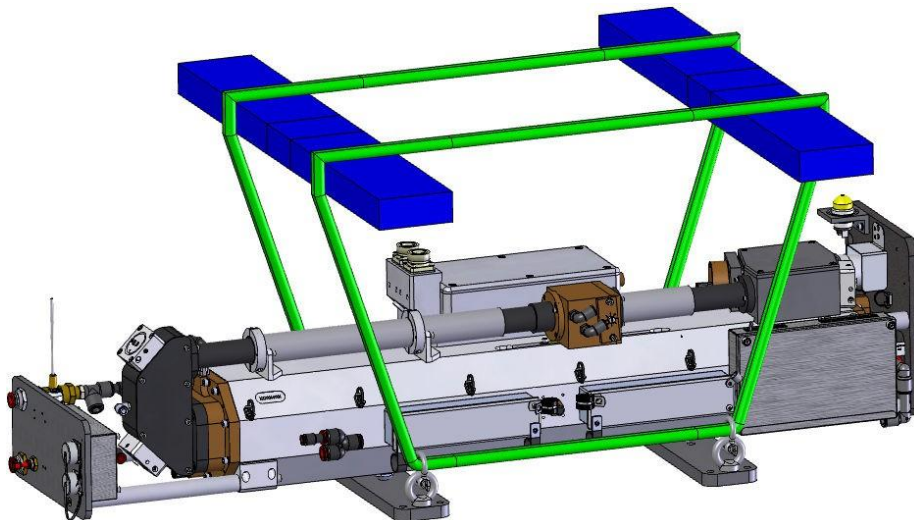


Figure 48 - Lifting strop positioning — laser head without covers

Due to the weight of the RF power supply, the lifting and positioning of the unit should only be undertaken by two people. The RF power supply unit handles are fitted on opposite ends of the structure and are fixed to the frame of the unit. *These handles cannot be removed.* When installing the RF power supply, care must be taken to ensure that it is in such a position that the RF cables are not twisted or stretched in any way. This could cause the premature failure of the cable and this may in turn eventually damage the power supply or laser head.

Note: Luxinar can supply a mounting rail kit (part number 120-0001-00) to assist with system integration.

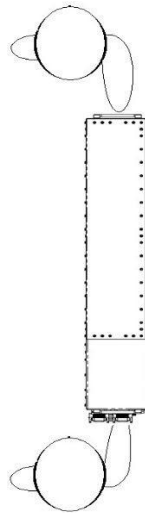


Figure 49 - Manual lifting with two people — RF power supply

Mechanical fixing

Secure the laser head to the host machine using the mounting feet on the base. Each mounting position has an M10 threaded hole and two Ø9 holes.

Secure the RF power supply to the host machine using the four M8 threaded holes in the base. Mounting position dimensions are shown in the following figure.

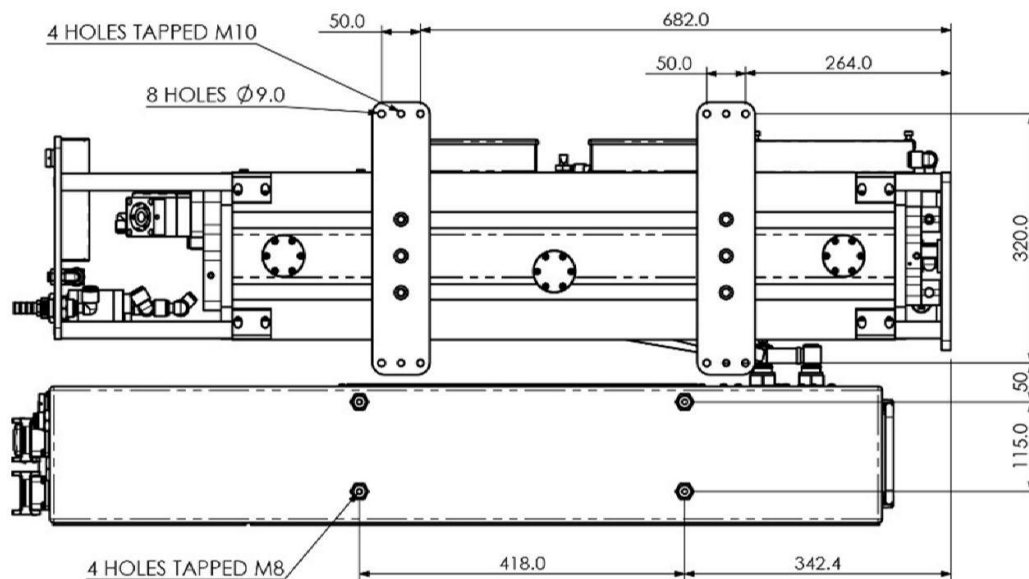


Figure 50 - Laser head and RF power supply fixing locations

Note: For more detailed dimensional drawings, refer to [Appendix 1](#)

To ensure correct operation, the laser head must be mounted in one of the approved orientations identified by the check mark in the following figure.

For the shutter version, the A orientations must not be used. Safe operation of the shutter requires that the laser is mounted horizontally with the feet underneath.


CAUTION


Risk of optical damage due to vertical orientation

Vertical mounting, as shown by orientations B and C, can result in premature failure of laser optics and should be avoided. Mounting with the output window on top of the laser, shown in orientation B, is totally prohibited.

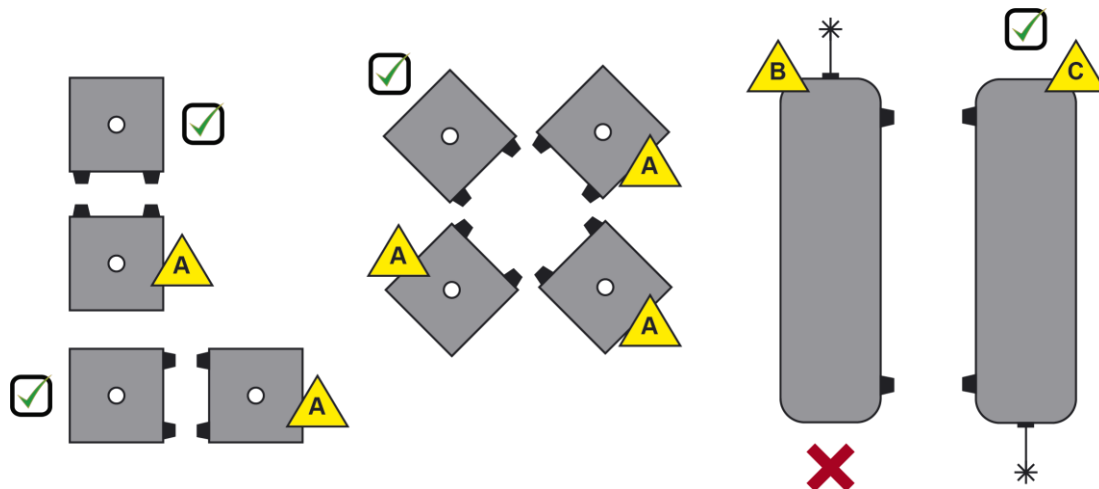


Figure 51 - Correct and incorrect mounting orientations

Laser output aperture location

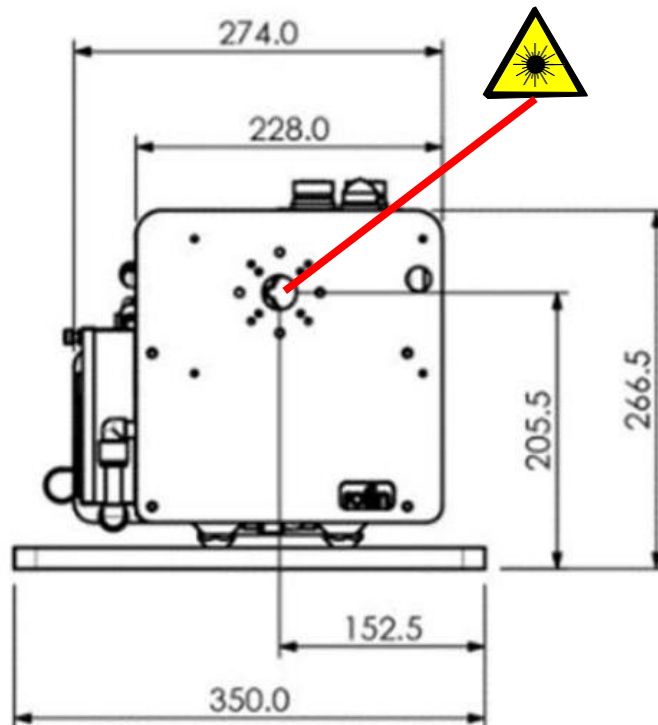


Figure 52 - Laser output aperture location

Note: The aperture location relative to the mounting feet is identical for the shutter version.

Coolant connections and pipework

If the optional Luxinar DC power supply is fitted and the power supply is connected in series with the laser and RF power supply, the coolant must flow through the DC and RF power supplies before the laser head.

The following figure shows the coolant flow direction for serial and parallel power supply connections and the position of the 100µm particle filter (marked "A"). Coolant flow rate is monitored by a direction sensitive flow sensor within the laser head.

If it is not possible to achieve the required flow rate with the DC power supply in series with the laser it is also possible to connect it in parallel with the laser and RF power supply.

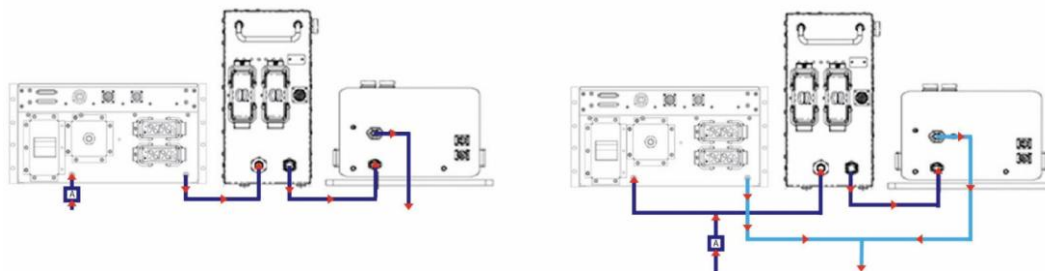


Figure 53 - Coolant connections and flow direction

Coolant inlet and outlet connectors are marked on each module with the following symbols:

- **Coolant in**



- **Coolant out**



Use 12mm OD tubing for all connections.

Important!

Materials used in the external cooling circuit must be chosen to avoid corrosion. Never use aluminium, zinc, mild steel or cast iron components. Suitable materials are stainless steel, copper, copper alloys and opaque plastics. Only use pipework that is impervious to light in order to reduce the possibility of bacterial contamination of the cooling system.

The coolant temperature must be kept above the dew point in order to prevent formation of condensation on internal laser components.

Completely drain the cooling system before shipment or storage.

See [page 39](#) for coolant specification details.

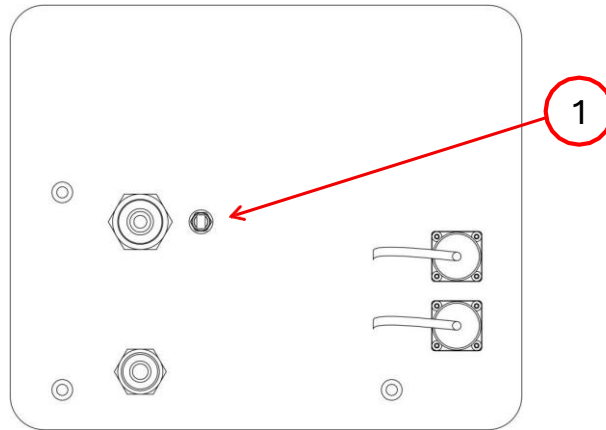
Important!

Damage caused by insufficient coolant flow, corrosion, condensation or freezing are not covered by the warranty.

Beam delivery optics purge gas

If the internal or external beam delivery system is contaminated with fume, water vapour or debris then these contaminants can absorb the laser energy and cause laser power fluctuations and deviation of the laser beam. In severe cases, laser optics can be contaminated and damaged.

The laser internal beam delivery system is fitted with an optics purge system using contaminant-free compressed air or nitrogen. See [page 40](#) for purge gas specification details.



1 Purge gas input connector

Figure 54 - Internal optics purge gas connector



Risk of contamination of laser head optics

Do not remove the red blanking plug from the input connector if purge gas is not used.
Removal of the plug exposes a contamination path into the laser head.

Use 6mm OD tubing for the purge gas supply connection.

Important!

If compressed air is used as a purge gas, the inlet to the compressor intake must be sited away from fume or debris contamination sources, such as the laser processing zone or the exhaust port of a fume extraction system.

Luxinar combined controller/DC power supply

The laser requires a 50VDC power supply, either sourced locally or available from Luxinar as part of a combined controller/DC power supply module. For specifications refer to [page 18](#) and [page 27](#)


DANGER


Risk of electric shock or severe damage to the equipment

Ensure that the equipment is disconnected from the mains supply before making these connections.

Respect the polarity of the terminals on the DC power supply and the RF power supply.

The Luxinar combination controller/DC power supply requires a three-phase mains supply with a supply voltage of 360–440VAC. The cable connections are:

- L1 — Brown
- L2 — Black
- L3 — Grey
- N — Blue (Neutral) — Not used


CAUTION


Irreparable damage to the DC power supply

Under no circumstances connect the neutral (blue) wire.

- **Earth — Green & yellow**

Ensure that a good earth connection is made to the terminal stud on the rear panel.



Figure 55 - Mains terminal cover and earth terminal stud

Remove the cover next to the mains circuit breaker for access to the three-phase terminal strip.



L1 L2 L3 EARTH

Figure 56 - Three-phase terminal strip



Figure 57 - Three-phase terminal strip (016-0033-00)

The cross-section of the cable connecting the DC power supply to the RF power supply depends on the cable length. Contact Luxinar Aftersales for details of pre-configured cables.



Figure 58 - Pre-configured DC cable

Two DC cables are required to link the DC power supply and the RF power supply. Two four-pin connectors are provided on the rear panel of the DC power supply as shown in the following figure.

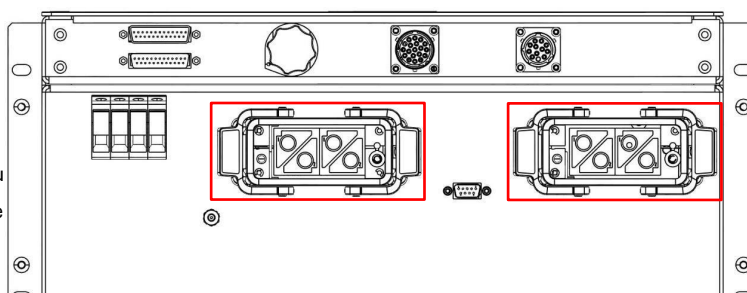


Figure 59 - DC power supply rear panel connectors

**WARNING**

Risk of electric shock and irreparable damage to the controller and DC power supply

Before separating the control unit from the DC power supply, ensure that the system is isolated from the mains supply. Hazardous energy levels are present at the rear of the controller.

OEM-sourced DC power supply and Luxinar controller

The laser requires a 50VDC power supply, either sourced locally or available from Luxinar as part of a combined controller/DC power supply module. For specifications refer to [page 39](#)

The power supply must be capable of responding to rapidly changing, high-current demands. If its voltage control loop response is too slow it may result in significant over-voltage spikes that activate the laser protection circuits. In this case, the laser will switch off. If this happens on a regular basis, buffer capacitors must be connected to the power supply output in order to smooth out current demands.

The buffer capacitors must be fitted close to the DC supply connector on the laser and must be able to support ripple currents up to 60A. It is recommended to use at least two capacitors with a rating of 47000µF at 63V and a ripple current of > 25A.

Note: In order to get optimum performance from the laser, check the capacitor life-time at the nominal operating temperature when specifying the capacitors.

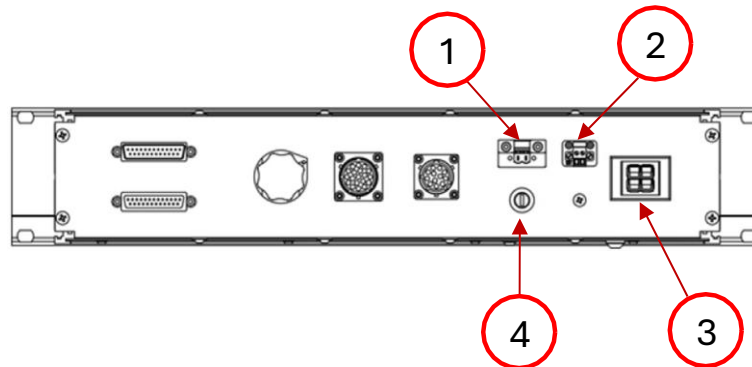
Contact Luxinar Aftersales for help and advice concerning selection and installation of buffer capacitors.

**DANGER**

Risk of electric shock or severe damage to the equipment

Ensure that the equipment is disconnected from the mains supply before making these connections.

Respect the polarity of the terminals on the DC power supply and the RF power supply.



- 1 50VDC input
- 2 Volt-free relay contact
- 3 Two-phase mains input
- 4 1A fuse for 50VDC input part number 552-0007-00)

Figure 60 - Controller rear panel connections

The Luxinar controller requires a three-phase mains supply with a supply voltage of 360–440VAC, however, only two phases are required to power the controller. The cable connections are:

- L1 — Brown
- L2 — Black
- L3 — Grey — Not used
- N — Blue (Neutral) — Not used


CAUTION


Irreparable damage to the DC power supply

Under no circumstances connect the neutral (blue) wire.

- Earth — Green & yellow
- Ensure that a good earth connection is made to the terminal stud on the rear panel.

A pre-configured two-phase and earth cable (part number 091-0359-00) is available from Luxinar. Contact Luxinar Aftersales for details.

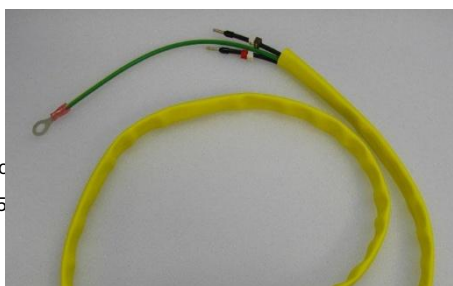


Figure 61 - Two-phase and earth mains cable

The mains input is protected by two 500mA fuses located within the controller.

The OEM integrator must provide a 50VDC @1A to the controller. The controller monitors this voltage which is used to power electronics within the laser head. The input is protected by a 1A fuse located below the connector. A connector (Phoenix part number 1777989) is supplied with the controller.

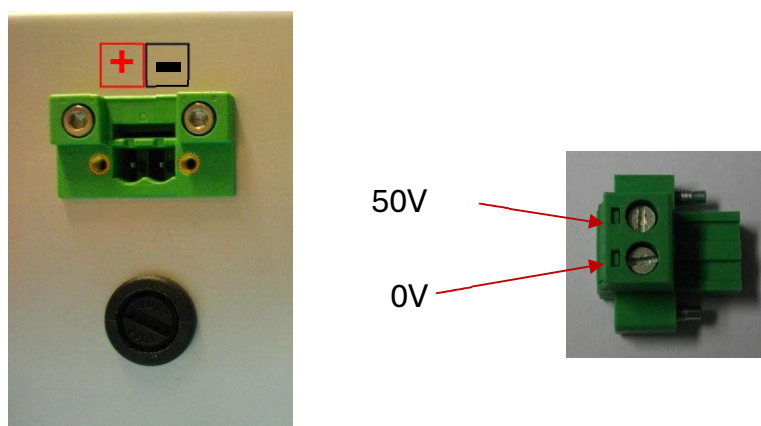


Figure 62 - 50V socket and connector

A volt-free contact socket is provided to allow the controller to enable and disable the OEM power supply. The internal relay type is NEC EA2-12NU. A connector (Phoenix part number 1850851) is supplied with the controller.

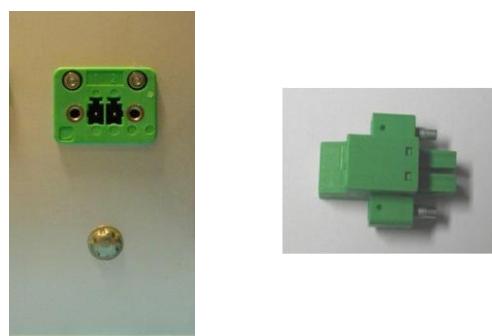


Figure 63 - Volt-free socket and connector

DC cabling

Choice of the cabling required to deliver the correct DC voltage to the laser depends on the cable length. The cable cross-sectional area must be calculated to ensure a maximum voltage drop of 1V at peak currents.

The following table shows recommended cross-sections for typical cable lengths.

Table 26 - Recommended DC cable cross-sections

Cable length range (m)	2–9	10–13
Recommended cross-sectional area (mm ²)	25	35
	Note: Tighten the terminal to 7Nm	Note: Tighten the terminal to 8Nm

Important!

Eight cables (four pairs) are required, each with the recommended cross-section.

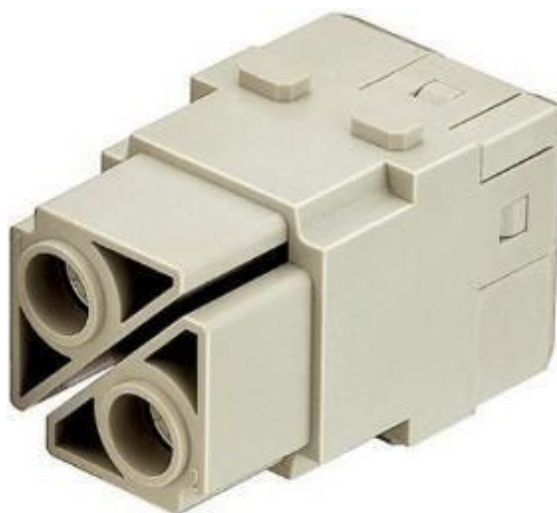
Important!

Under certain conditions, it may be possible for power cables carrying high voltages and currents to emit electrical noise levels that may interfere with control cable signals. To eliminate the possibility of interference, control signal cables must be screened and routed along a different path to power cables.

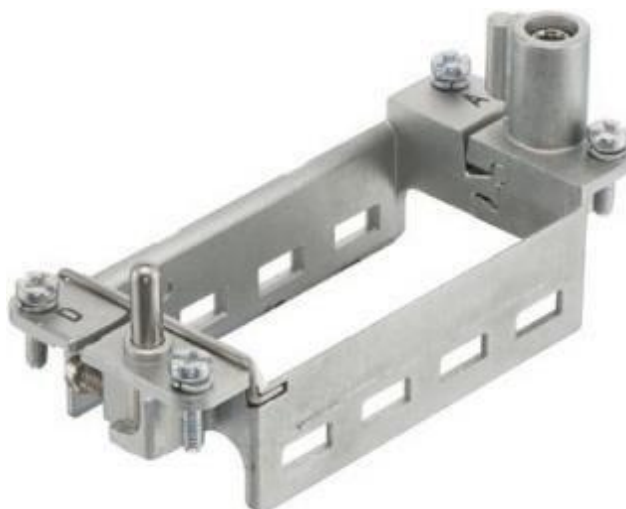
DC connectors

A DC connector kit (part number 010-0163-00) is provided for connection from the OEM sourced power supply to the laser system and comprises the following components:

Harting 0914 002 2751 female axial module (Luxinar part number 558-0177-00)



Harting 0914 016 0361 hinged frame (Luxinar part number 558-0179-00)



Harting 0930 016 0521 side entry hood (Luxinar part number 558-0182-00)



Harting 0900 000 5106 PG cable gland (Luxinar part number 551-0010-00)



To fit a connector:

1. Insert a 4mm hexagonal key into the front of the Harting axial module and turn it anti-clockwise to fully open the module.
2. Strip back the DC cable 12–14mm and push the stripped end fully into the back of the axial module, then tighten the terminal to the torque shown in [Table 26](#).
 - Connect the positive cable to pin 1.
 - Connect the negative cable to pin 2.
3. Insert the axial module into the frame.

Note: The connectors are polarised and will only fit in one orientation.

4. Add a 4mm² earth cable to the frame screw terminal.

Important!

The connector kit provides the parts to build two connectors. Both connectors must be used. The laser system requires two connectors.

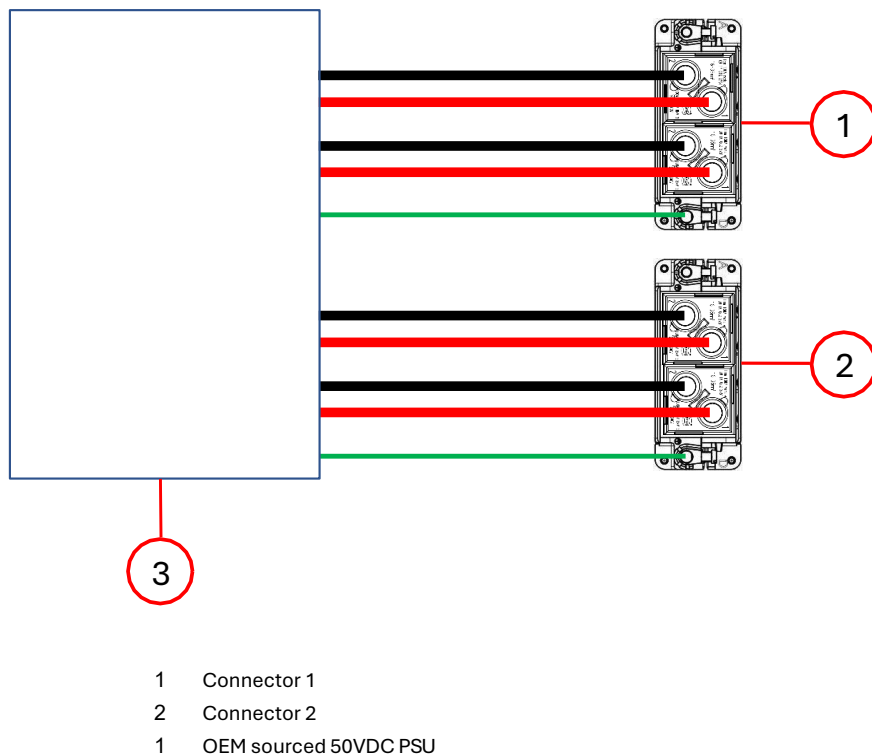


Figure 64 - OEM sourced power supply — DC connections

RF cables

RF cables linking the RF power supply to the laser head are supplied with the system. RF cables are manufactured to a matched cable length and must not be altered.

The RF power supply has been designed to be installed in close proximity to the laser head to ensure that the RF cable lengths are kept to a minimum. The OEM integrator must ensure that any bends in the cables are not reduced below the minimum bend radius specified for the particular RF cable used.

The RF cables supplied with the system, are matched to RF connectors on the RF power supply and laser head. RF connectors are identified by labels showing red circles on a black background. Typical examples are shown in the following figure.

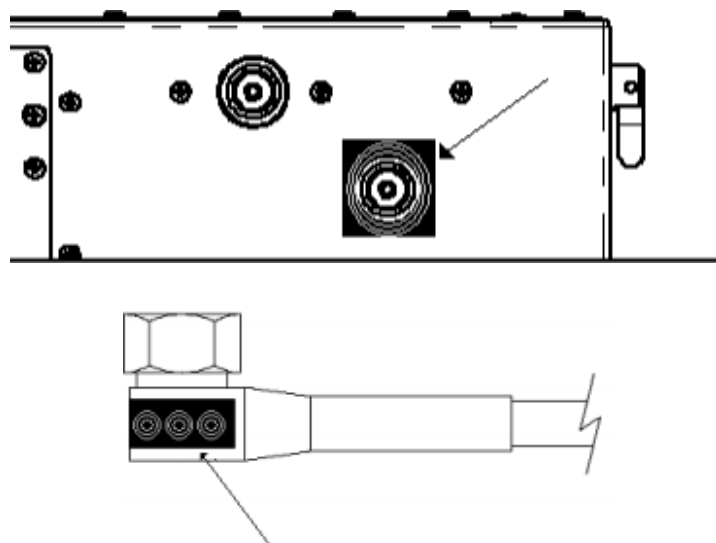


Figure 65 - RF connector and cable labels

The RF connections on the laser head are not matched to a specific cable i.e. either cable can be fitted to either of the RF connectors. The cables should be fitted in line with the following good practice guidelines:

- Use the shortest length of RF cable possible.
- Allow as large a bend radius on the cable as possible. Pay close attention to the minimum bend radius specification for the cable.
- When connecting the cable, ensure that the connectors at either end of the cable are not over-stressed i.e. do not try to bend the cable as soon as it exits the connector. Note that right-angle RF connectors and/or converters are available for the cable and may help to alleviate this installation issue.
- Do not hard clamp the RF cable with 'cable ties' or other clamping devices — allow free movement of the cable.
- Do not run the RF cable with other cables or coolant pipes — use a separate cable routing.
- Always ensure that the RF connectors are tightened to the required torque setting. Do not over-tighten.

In addition, for applications where the laser head moves:

- Ensure that the RF cable can move freely over the full range of motion of the system with no danger of abrasion to the cable.
- Where possible, allow the complete RF cable to move and bend freely to avoid repeated bending of the cable in the same position.
- Ensure that the RF cable is oriented or positioned to avoid twisting along the axis of the cable.

Cables for robotics applications

If the OEM 65iX will be used as part of a robotics system, Luxinar can supply a range of high flexibility cables. For details, contact Luxinar Aftersales.

Beam delivery system



Risk of damage to the laser output window mount

The laser output window mount is not capable of supporting a beam delivery system. Always provide strong and stable mechanical support for the beam delivery system and other external optics.

Important!

Remove the blanking cap from the output window before attempting to attach the beam delivery system.

Attach the beam delivery system to the M5 mounting hole group on the output window mount. The hole group has a 44.0mm pitch circle diameter and is identical for standard and shutter versions.

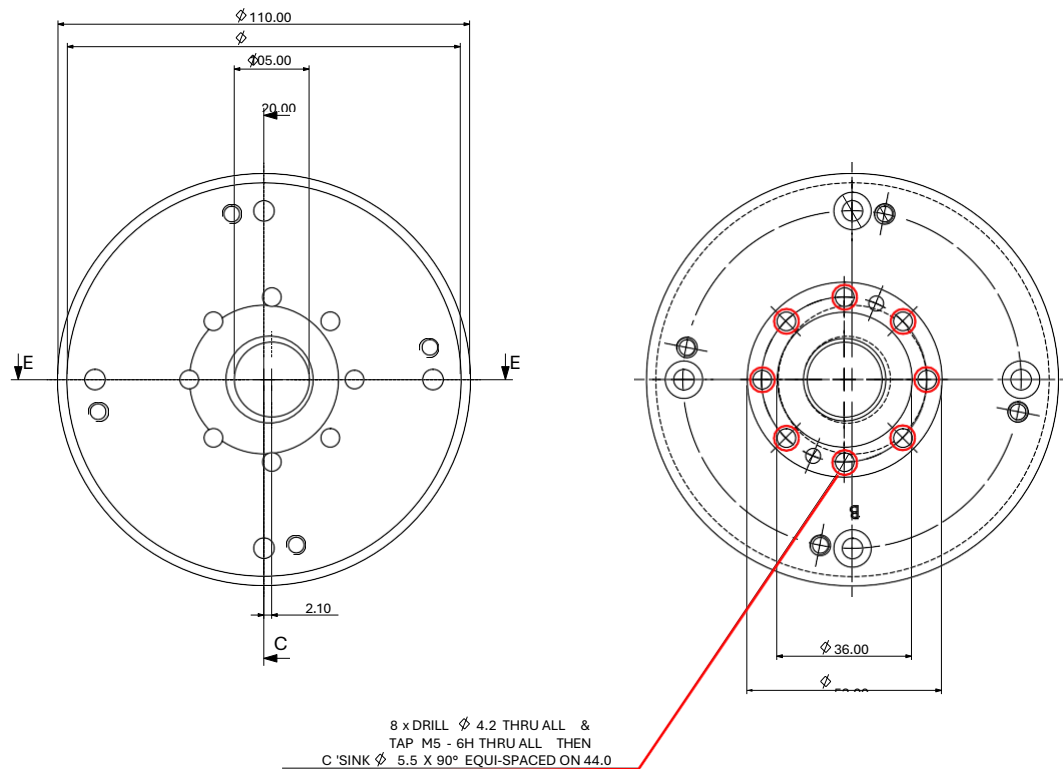


Figure 66 - Beam delivery system mounting dimensions

Note: The shutter version has a visible light laser diode pointer to assist with beam delivery system alignment. The rated power of the laser diode pointer is 4mW.



WARNING

Class 3R visible laser radiation

Avoid eye exposure to direct and scattered radiation.

Absorbing Thin Film Reflector (ATFR/circular polariser)

An optional ATFR/circular polariser can be fitted to the laser output to protect the laser from damaging back reflections. For details, refer to document part number 906-0104-xx.

Section 7

Transport and recommissioning

Before transporting the laser, observe the following precautions:

- Completely drain the laser cooling system to prevent damage during shipping. Use clean compressed air, at a maximum pressure of 2bar, to blow out all traces of coolant in the cooling system pipework.



Risk of contamination due to leaking coolant

Failure to remove coolant from the system prior to transport can cause damage to the laser.
Damage caused in this way will invalidate the warranty.

- If the external beam delivery system has been removed, replace the output window protection cap to prevent damage or contamination during shipping.

Section 8

Interfacing

User interface connections for the OEM 65iX are made through the 25-pin connectors on the rear panel of the combined controller/DC power supply or the stand-alone controller.

Important!

Under certain conditions, it may be possible for power cables carrying high voltages and currents to emit electrical noise levels that may interfere with control cable signals. To eliminate the possibility of interference, control signal cables must be screened and routed along a different path to power cables.

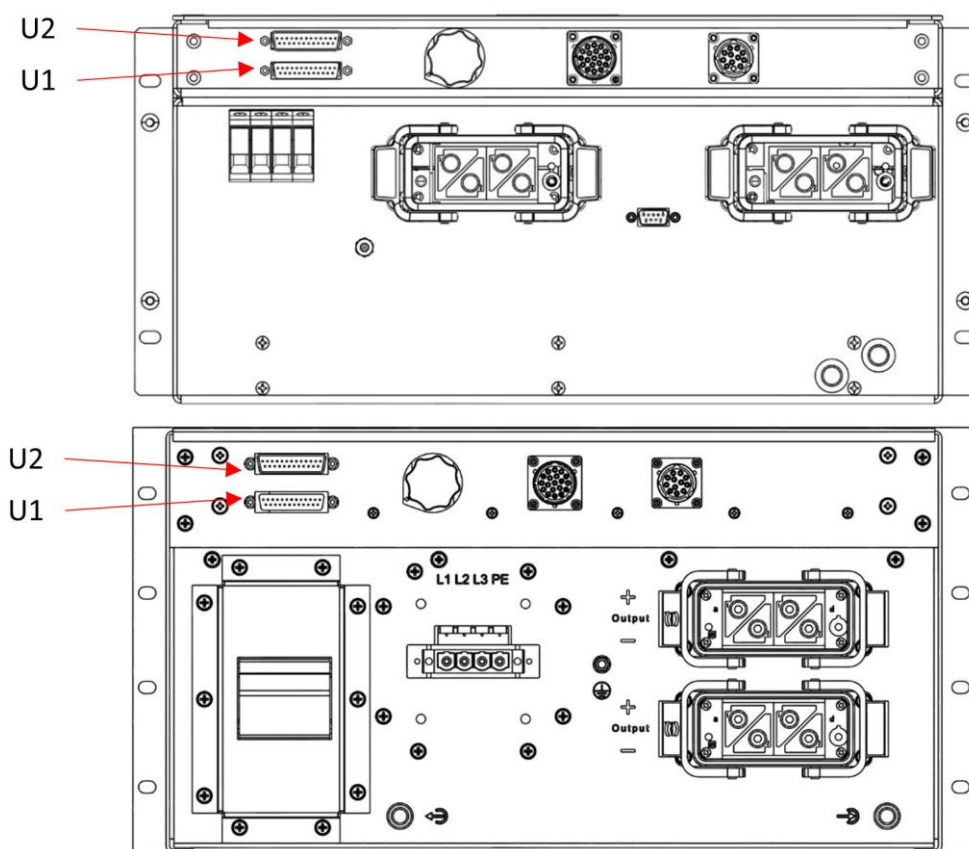


Figure 67 - Combined controller/DC power supply — U1 & U2 connectors

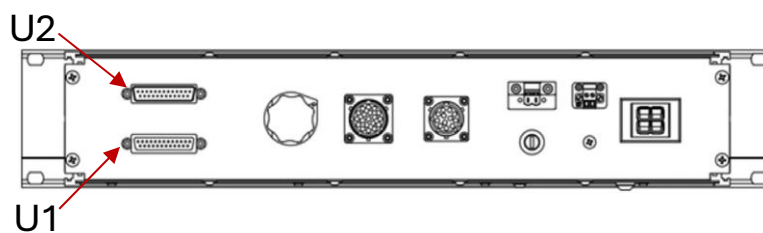


Figure 68 - Stand-alone controller — U1 & U2 connectors

Standard interface

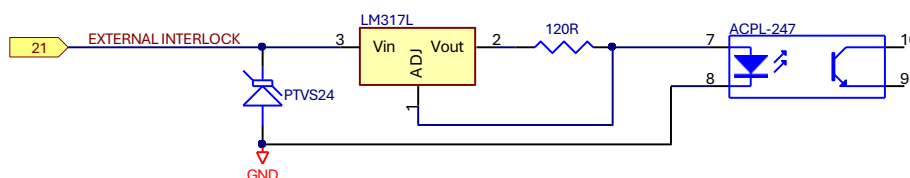
Table 27 - Standard interface — U1 pin designations

Pin N°	Function	I/O type	Description	Signal
1	Program 4	Opto-isolated input	Remote program selector bit 4	5–24V @ 10mA (max)
2	Shutter enable	Opto-isolated input	Enables operation of the shutter (shutter version only)	5–24V @ 10mA (max)
3	Program 1	Opto-isolated input	Remote program selector bit 1	5–24V @ 10mA (max)
4	12V	Output	12V voltage source for external use	12V @ 300mA
5	NC voltage	Input	NC mode control voltage (when in NC control mode)	0–10V @ 140µA (max)
6	Ground	Ground	Signal ground reference	0V
7	RS232 Tx	Output	RS232 transmit	± 10V
8	Trigger	Opto-isolated input	Fires the laser in any of the internal modes	5–24V @ 10mA (max)
9	External interlock	Output	Connect to pin 21 if an external interlock voltage source is required	12V @ 300mA
10	VSWR status	Volt-free output	Relay 1 (NO)	30VDC @ 1A (max)
11	Laser enable	Opto-isolated input	Enables the laser in Auto mode	5–24V @ 10mA (max)
12	Shutter open	Open-drain output	Shutter open position sensor	< 30V @ 50mA (max)
13	Laser on	Open-drain output	Laser ready to fire	< 30V @ 50mA (max)
14	External PWM	Input	Used in external PWM mode	TTL levels, 5V @ 5mA (max)
15	Shutter closed 2	Open-drain output	Shutter closed position sensor 2	< 30V @ 50mA (max)
16	Program 2	Opto-isolated input	Remote program selector bit 2	5–24V @ 10mA (max)
17	Not used	—	—	—
18	Program 3	Opto-isolated input	Remote program selector bit 3	5–24V @ 10mA (max)
19	Ground	Ground	Signal ground reference	0V
20	RS232 Rx	Input	RS232 Receive	± 10V
21	External interlock	Opto-isolated input	Connect to pin 9 or an external voltage source	5–24V @ 10mA (max)
22	VSWR status	Volt-free output	Relay 1 (P)	30VDC @ 1A (max)
23	Shutter control	Opto-isolated input	Operates the shutter when in Auto mode (shutter version only)	5–24V @ 10mA

24	Laser diode pointer enable	Opto-isolated input	Enables the laser diode pointer (shutter version only)	5–24V @ 10mA (max)
25	Shutter closed 1	Open-drain output	Shutter closed position sensor	< 30V @ 50mA (max)

External interlock (pin 21)

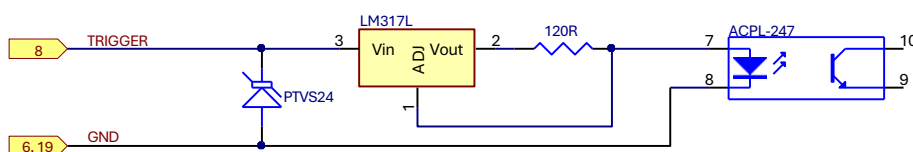
This input signal is always required and forms part of the safety channel. Removing this signal will turn off the DC power supply and will stop the laser firing. If fitted, the shutter will also close.



A voltage input of 5–24V is required on U1, pin 21. A 12V source is available on U1, pin 9 and can be linked to pin U1, pin 21.

Trigger input (pin 8)

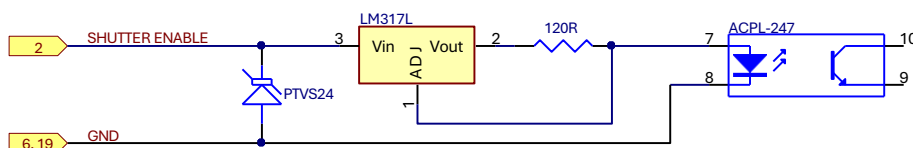
This input signal is required to fire the laser in all internal modes of operation. A transition of the input signal is required to fire the laser if operation is stopped and needs to be restarted.



To enable, a voltage input of 5–24V is required on U1, pin 8. A 12V source is available on pin U1, pin 4.

Shutter enable input (pin 2)

For the shutter version, this input signal is required to enable operation of the shutter. The shutter can only be opened by the control electronics, but can always be closed by removing the signal from this pin.

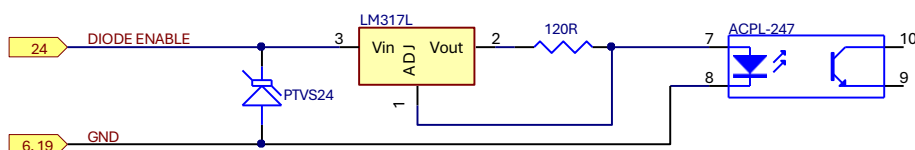


To enable, a voltage input of 5–24V is required on U1, pin 2. A 12V source is available on pin U1, pin 4.

Laser diode pointer enable input (pin 24)

For the shutter version, this input is used to show the location of the laser beam without firing the laser. The shutter must be in the closed position for the laser diode beam to be visible.

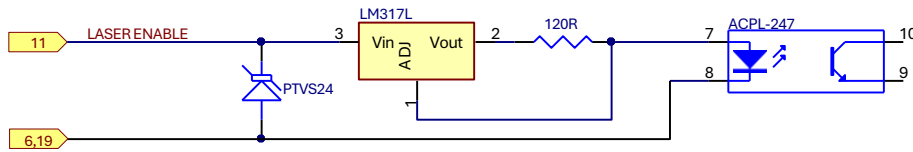
Note: When the shutter is opened, the laser diode pointer is turned off by the control electronics.



To enable, a voltage input of 5–24V is required on U1, pin 24. A 12V source is available on pin U1, pin 4.

Laser enable (pin 11) — Auto mode only

This input will enable the laser from standby without using the MCU. Removal of the input returns the laser back to standby.

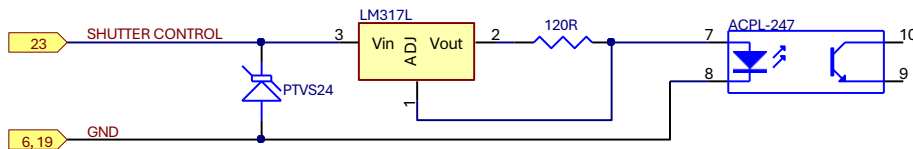


To enable, a voltage input of 5–24V is required on U1, pin 11. A 12V source is available on pin U1, pin 4.

Shutter control (pin 23) — Auto mode only

For the shutter version, this input will open and close the shutter without using the MCU.

Note: A shutter enable input on pin 2 is also required to activate the shutter.

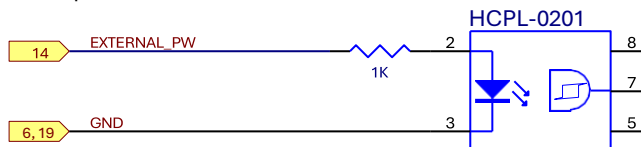


To enable, a voltage input of 5–24V is required on U1, pin 23. A 12V source is available on pin U1, pin 4.

External PWM (pin 14) — External PWM mode only

In this mode, an external modulation input signal can be applied. If signal parameters exceed the preset limits of the system, an overmodulation signal is generated and the signal is limited by the control electronics.

- Maximum frequency = 130kHz
- Maximum duty cycle = 60%
- Maximum pulse width = 400μs
- Minimum pulse width = 2μs

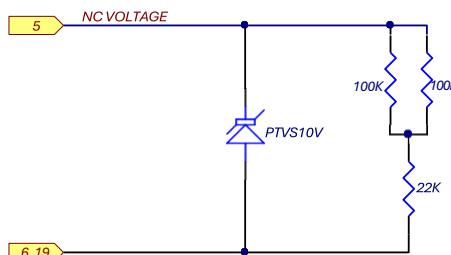


Note: In external PWM mode, the trigger input is not required. If a valid PWM signal is received, and the shutter is open the laser will fire.

NC voltage (pin 5) — NC power mode only

When NC power mode is selected, a voltage between 0–10V must be applied to this input to control the laser output power. Maximum power is achieved with an input of 10V. An input below 1V turns off laser output. Any voltage above 10V is ignored and is interpreted as 10V for maximum laser output.

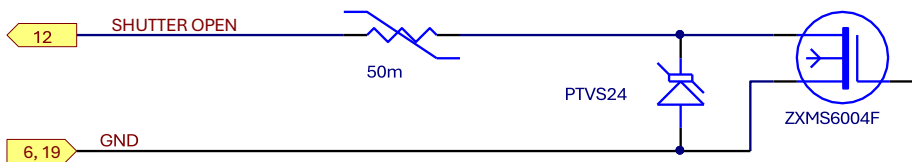
Note: Shutter enable and trigger inputs are still required before any laser output is emitted.



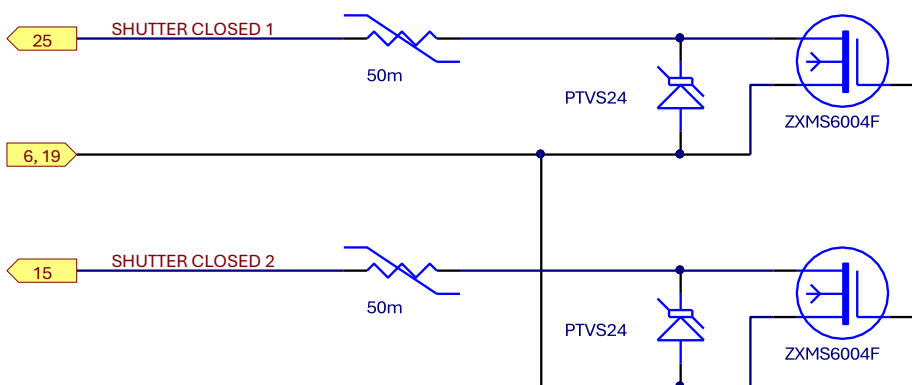
Shutter open/closed monitoring (pins 12, 15 and 25) — Shutter version only

The safety shutter unit includes three shutter position sensors. One sensor to detect the shutter open position and two sensors to detect the shutter closed position. The sensors are monitored by the controller, and will prevent the laser from firing when a fault condition is detected. The signals are open drain and active high.

- Shutter open (pin 12)**



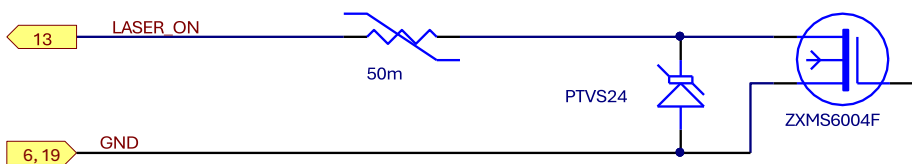
- Shutter closed (pins 15 and 25)**



Sensor 1, shutter open (pin 12)	Sensor 2, shutter closed 1 (pin 25)	Sensor 3, shutter closed 2 (pin 15)	Status
0	0	0	Shutter open sensor failure/system disabled
0	0	1	Shutter closed sensor 1 failure/system disabled
0	1	0	Shutter closed sensor 2 failure
0	1	1	Shutter closed/normal operation
1	0	0	Shutter open/normal operation
1	1	1	Sensor fault

Laser on (pin 13)

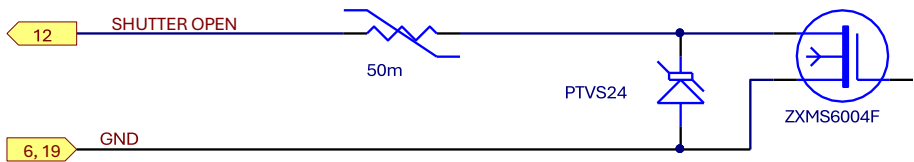
This open drain output is high once the laser is enabled and ready to fire.



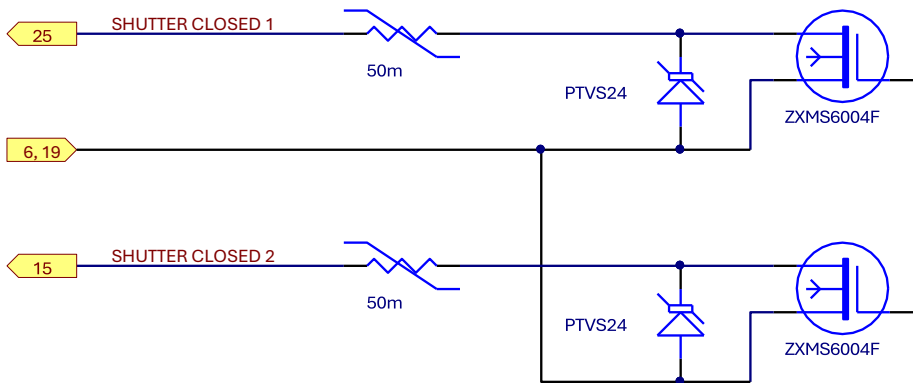
Shutter open/closed monitoring (pins 12, 15 and 25) — Shutter version only

The safety shutter unit includes three shutter position sensors. One sensor to detect the shutter open position and two sensors to detect the shutter closed position. The sensors are monitored by the controller, and will prevent the laser from firing when a fault condition is detected. The signals are open drain and active high.

- Shutter open (pin 12)**



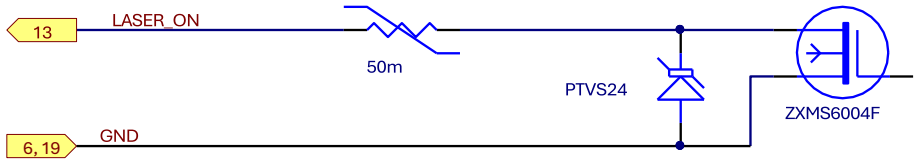
- Shutter closed (pins 15 and 25)**



Sensor 1, shutter open (pin 12)	Sensor 2, shutter closed 1 (pin 25)	Sensor 3, shutter closed 2 (pin 15)	Status
0	0	0	Shutter open sensor failure/system disabled
0	0	1	Shutter closed sensor 1 failure/system disabled
0	1	0	Shutter closed sensor 2 failure
0	1	1	Shutter closed/normal operation
1	0	0	Shutter open/normal operation
1	1	1	Sensor fault

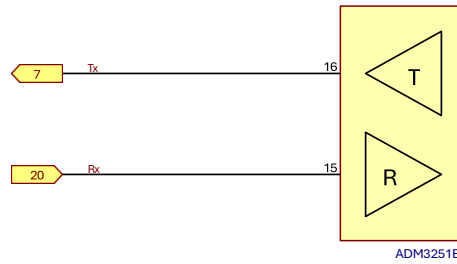
Laser on (pin 13)

This open drain output is high once the laser is enabled and ready to fire.



RS232 transmit and receive (pins 7 and 20)

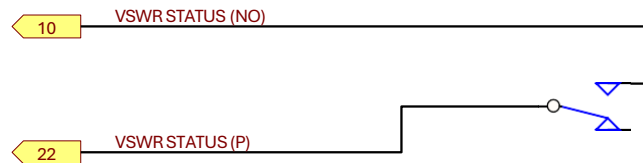
The RS232 interface can be used to communicate with a remote PC in order to monitor the laser



For details refer to the Serial interface manual, part number 906-0109-00.

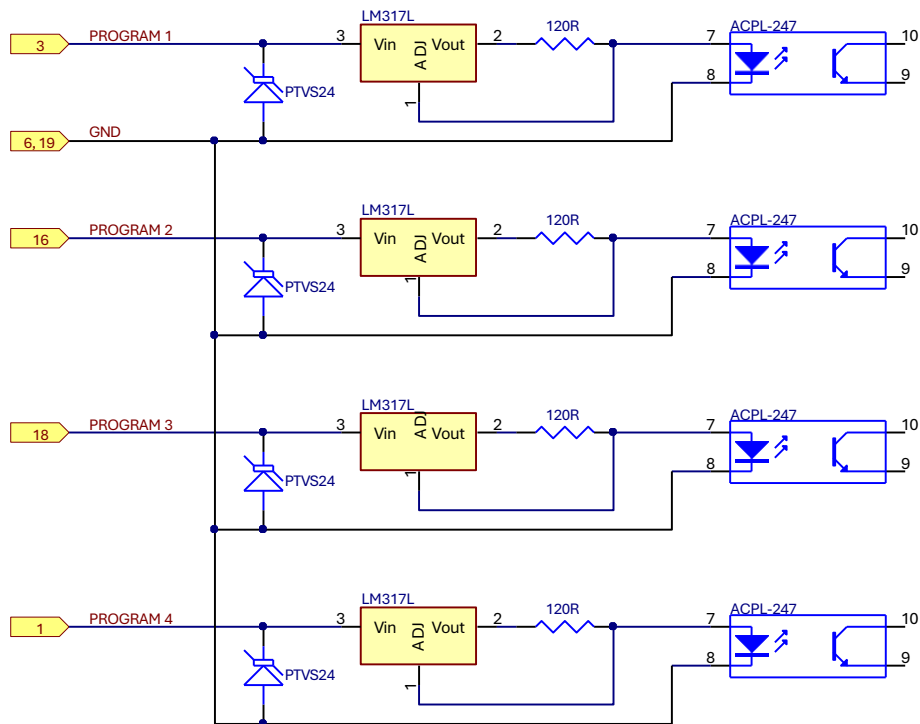
VSWR status (pins 10 and 22)

The VSWR signal is used to monitor the health of the system. If a fault occurs, the volt-free relay closes. In normal operation, the relay is open.



Program select (pins 1, 3, 16 and 18)

For each internal mode of operation, a total of 16 programs can be selected to match processing requirements. The chosen program can be selected using a combination of the four digital inputs on connector U1. If the inputs remain unconnected, the controller will select the default program 0.



B4 (pin 1)	B3 (pin 18)	B2 (pin 16)	B1 (pin 3)	Program number
0	0	0	0	0 (default)
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

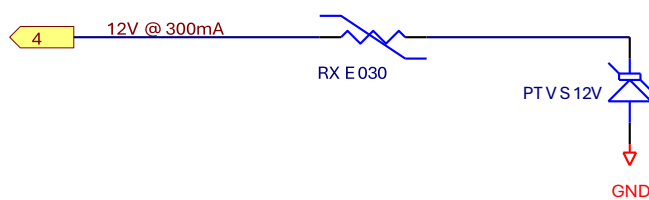
Auto mode

In Auto mode, once the system is enabled, the system can be operated without using the MCU. Laser enable (U1, pin 11) and Shutter control (U1, pin 23) are used to enable the DC power supply and to open and close the shutter.

Note: Shutter enable and trigger inputs are still required before any laser output is emitted.

Voltage output (pin 4)

If required, this 12V @ 300mA voltage source is available to interface with the machine I/O through connectors U1 and U2.



SCX 30 emulation mode interface

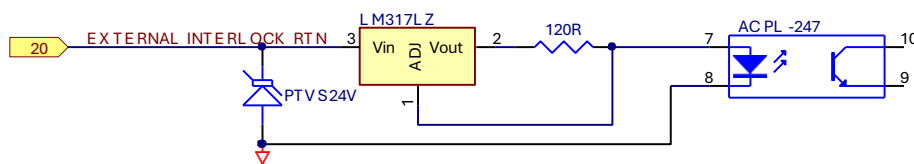
Table 28 - SCX 30 emulation mode interface — U1 pin designations

Pin N°	Function	I/O type	Description	Signal
1	Shutter enable	Opto-isolated input	Enables operation of the DC power supply and shutter (if fitted)	5–24V @ 10mA (max)
2	Not used	—	—	—
3	Shutter open	Open-drain output	Shutter open position sensor	< 30V @ 50mA (max)
4	Ground	Ground	Signal ground reference	0V
5	Shutter closed 1	Open-drain output	Shutter closed position sensor 1	< 30V @ 50mA (max)
6	Ground	Ground	Signal ground reference	0V
7	DC power supply status	Opto-isolated output	DC power supply monitor	< 30V @ 50mA (max)
8	Emission indicator status	Opto-isolated output	Emission indicator monitor	< 30V @ 50mA (max)
9	Not used	—	—	—
10	Not used	—	—	—
11	Not used	—	—	—
12	RF enable	Opto-isolated input	Connect to an external voltage source or pin 19	5–24V @ 10mA (max)
13	Modulation +	Input	RS422 modulation	0.5–5V
14	Modulation -	Input	RS422 modulation	5–0.5V
15	Overmodulation	Opto-isolated output	Modulation status monitor, active low	0 or 5V
16	VSWR status +	Output	RS422 VSWR status monitor	0.5–3.5V
17	VSWR status -	Output	RS422 VSWR status monitor	3.5–0.5V
18	RS232 Tx	Output	RS232 transmit	± 10V
19	External interlock 12V source	Output	Connect to pin 20 if an external interlock voltage source is required	12V @ 300mA
20	External interlock	Opto-isolated input	Connect to an external voltage source or to pin 19	5–24V @ 10mA (max)
21	Laser diode pointer enable	Opto-isolated input	Enables the laser diode pointer (shutter version only)	5–24V @ 10mA (max)
22	RS232 Rx	Input	RS232 receive	± 10V

23	Shutter closed 2	Open-drain output	Shutter closed position sensor 2	< 30V @ 50mA (max)
24	Not used	—	—	—
25	Ground	Ground	Signal ground reference	0V

External interlock (pin 20)

This input signal is always required and forms part of the safety channel. Removing this signal will turn off the DC power supply and will stop the laser firing. If fitted, the shutter will also close.

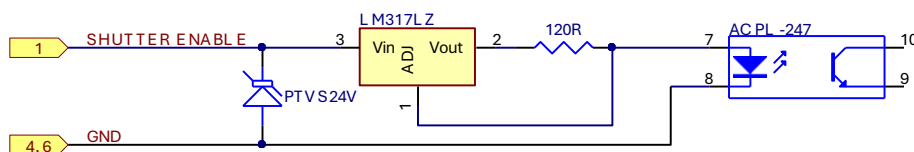


A voltage input of 5–24V is required on U1, pin 20. A 12V source is available on U1, pin 19.

DC power supply and shutter enable (pin 1)

This input signal is taken high to enable the DC power supply from the standby state.

For the shutter version, this input signal also enables operation of the shutter. The shutter can only be opened by the control electronics, but can always be closed by removing the signal from this pin.

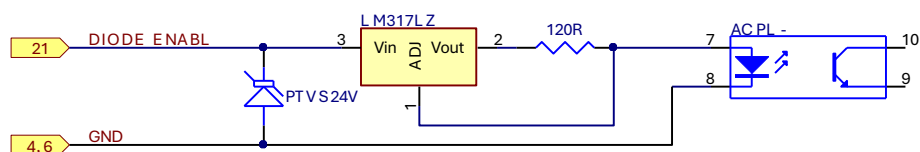


A voltage input of 5–24V is required on U1, pin 1. A 12V source is available on U1, pin 19.

Laser diode pointer enable (pin 21)

For the shutter version, this input is used to show the location of the laser beam without firing the laser. The shutter must be in the closed position for the laser diode beam to be visible.

Note: When the shutter is opened, the laser diode pointer is turned off by the control electronics.

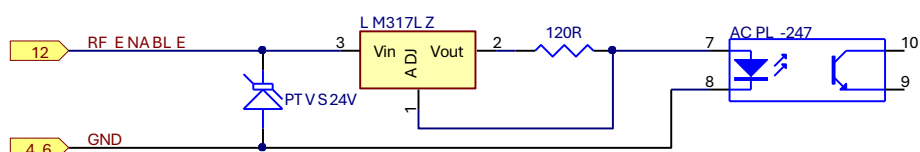


To enable, a voltage input of 5–24V is required on U1, pin 21. A 12V source is available on pin U1, pin 19.

RF enable (pin 12)

This input signal is always required in SCX 30 emulation mode. It enables the controller to turn on the RF power supply. Without this signal, there can be no laser output.

Note: For all fault modes, the RF power supply is disabled by the control electronics.

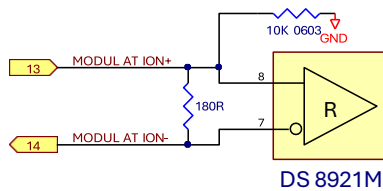


To enable, a voltage input of 5–24V is required on U1, pin 12. A 12V source is available on pin U1, pin 19.

RS422 modulation (pins 13 and 14)

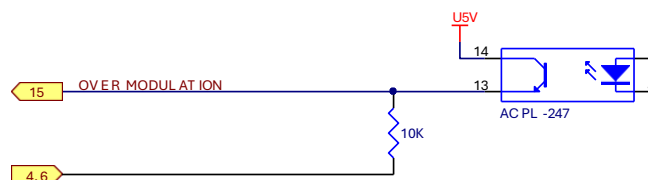
A modulation signal using RS422 signal levels must be applied in order to fire the laser. If modulation parameters exceed the preset system limits, an overmodulation signal is generated and the modulation signal is automatically limited by the control electronics.

- Maximum frequency = 130kHz
- Maximum duty cycle = 60%
- Maximum pulse width = 400µs
- Minimum pulse width = 2µs



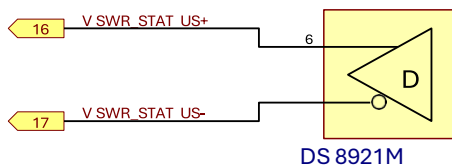
Overmodulation (pin 15)

When the modulation signal exceeds any of the preset system limits, the overmodulation output is switched to active low.



RS422 VSWR status (pins 16 and 17)

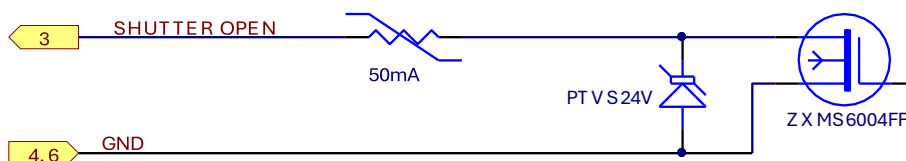
The VSWR signal is used to monitor the health of the system. If a fault occurs, the signal becomes active and laser output power is automatically reduced.



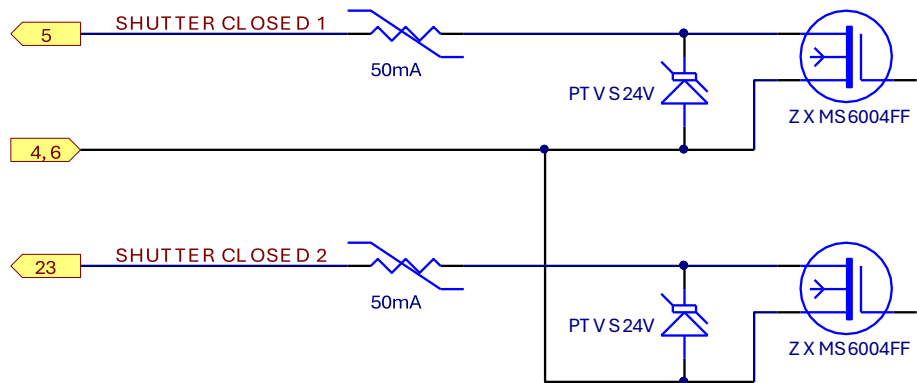
Shutter open/closed monitoring (pins 3, 5 and 23) — Shutter version only

The safety shutter unit includes three shutter position sensors. One sensor to detect the shutter open position and two sensors to detect the shutter closed position. The sensors are monitored by the controller, and will prevent the laser from firing when a fault condition is detected. The signals are open drain and active high.

- Shutter open (pin 3)



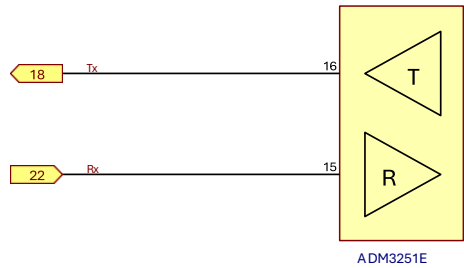
- Shutter closed (pins 5 and 23)



Sensor 1, shutter open (pin 3)	Sensor 2, shutter closed 1 (pin 5)	Sensor 3, shutter closed 2 (pin 23)	Status
0	0	0	Shutter open sensor failure/system disabled
0	0	1	Shutter closed sensor 1 failure/system disabled
0	1	0	Shutter closed sensor 2 failure
0	1	1	Shutter closed/normal operation
1	0	0	Shutter open/normal operation
1	1	1	Sensor fault

RS232 transmit and receive (pins 18 and 22)

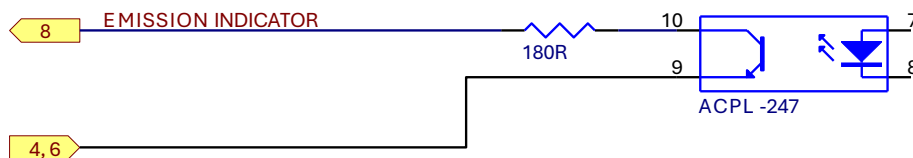
The RS232 interface can be used to communicate with a remote PC in order to monitor the laser.



For details refer to the Serial interface manual, part number 906-0109-00.

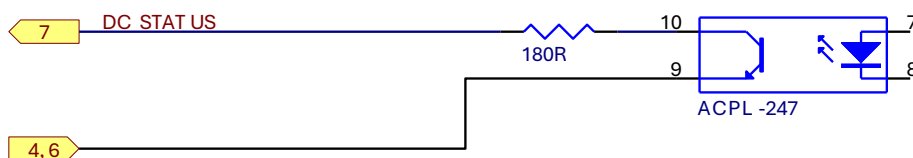
Emission indicator status monitor (pin 8)

The laser emission indicator is located on top of the laser head, close to the laser output window. When illuminated, it warns that the laser is enabled and is capable of emitting a laser beam. The emission indicator is monitored for correct operation. If the indicator does not illuminate when the laser is enabled, the monitor output circuit is switched to active.



DC power supply status (pin 7)

The 50VDC power supply is monitored for correct operation. If the power supply output exceeds the preset limits, the system will turn off and the monitor output circuit is switched to active.



Connector U2 – all modes

Table 29 - U2 pin designations

Pin N°	Function	I/O type	Description	Signal
1	Analogue power (Vin)	Output	Analogue laser power control	4–20mA
2	Not used	—	—	—
3	Not used	—	—	—
4	Not used	—	—	—
5	Not used	—	—	—
6	Not used	—	—	—
7	Not used	—	—	—
8	Ground (0V)	Ground	Ground reference for I/O pins	—
9	VSWR status	Volt-free output	Relay 1 (NO)	30VDC @ 1A (max)
10	VSWR status	Volt-free output	Relay 1 (NC)	30VDC @ 1A (max)
11	Laser ready ⁽¹⁾	Volt-free output	Relay 2 (P)	30VDC @ 1A (max)
12	System enable	Volt-free output	Relay 3 (NO)	30VDC @ 1A (max)
13	System enable	Volt-free output	Relay 3 (NC)	30VDC @ 1A (max)
14	Analogue power (RTN)	Input	Analogue laser power control	4–20mA

15	Not used	—	—	—
16	Not used	—	—	—
17	Not used	—	—	—
18	Not used	—	—	—
19	Not used	—	—	—
20	Not used	—	—	—
21	Ground (0V)	—	Ground reference for I/O pins	—
22	VSWR status	Volt-free output	Relay 1 (P)	30VDC @ 1A (max)
23	Laser ready	Volt-free output	Relay 2 (NO)	30VDC @ 1A (max)
24	Laser ready	Volt-free output	Relay 2 (NC)	30VDC @ 1A (max)
25	System enable	Volt-free output	Relay 3 (P)	30VDC @ 1A (max)

4–20mA current output

A loop-powered 4–20mA current output circuit is available on connector U2, pins 1 and 14. The laser power output can be mapped against the current signal using the following graph.

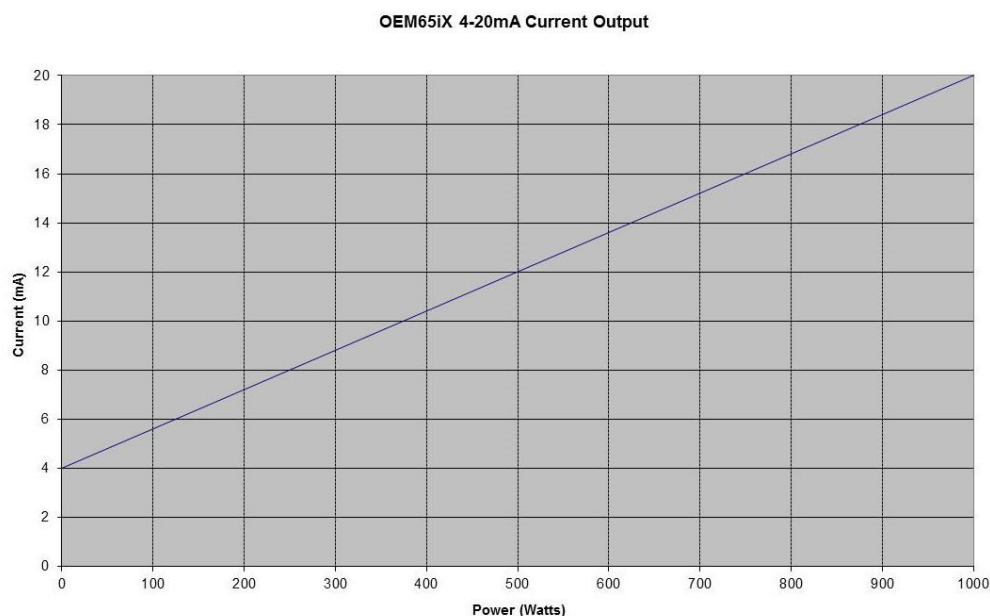


Figure 69 - Output loop current to laser output power mapping

Connect a 7–40V source and load resistor between pins 1 and 14. Ensure that the load resistor allows a current of 20mA for the chosen voltage ($R=V/I$).

1. The Laser Ready relay will activate once the shutter has opened and the RF signal is present.

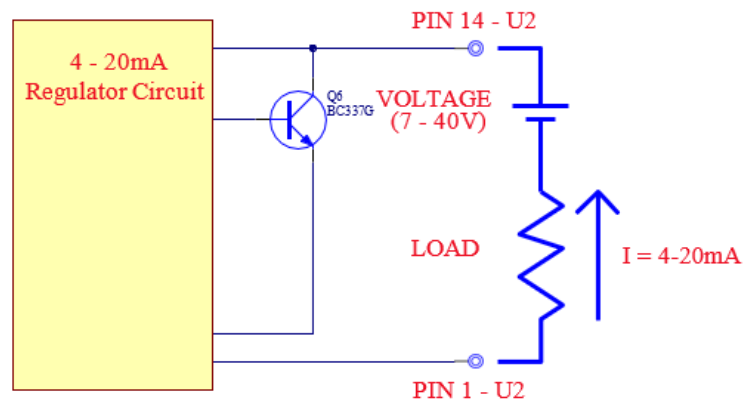
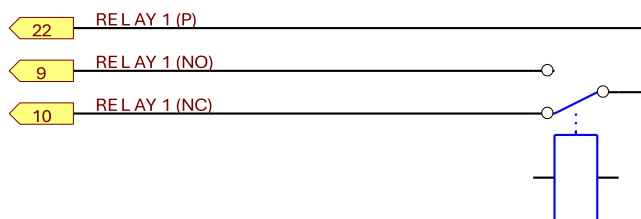


Figure 70 - Loop current circuit

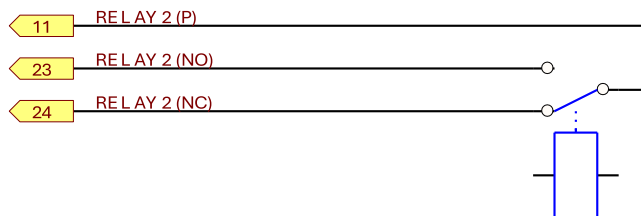
VSWR status, relay 1 (pins 9, 10 and 22)

The VSWR relay is used to monitor the health of the system. If a fault occurs, the volt-free relay closes. In normal operation, the relay is open.



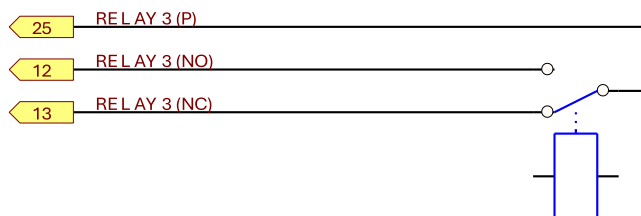
Laser ready status, relay 2 (pins 11, 23 and 24)

The laser ready relay is used to indicate if the laser is ready to fire with DC power supply enabled and the shutter open (shutter version only).



System enabled, relay 3 (pins 12, 13 and 25)

The system enabled relay is used to indicate a fault condition. If a fault occurs, the volt-free relay closes. In normal operation, the relay is open.



Connector U1 – standard connections for laser output

These are the minimum connections required to achieve laser output and should only be used when testing or installing the system.

For normal machine operation, safety interlock circuits must be added to conform to the relevant safety standards. See [Section 1](#) for details of safety standards.

Minimum connections – internal PWM mode

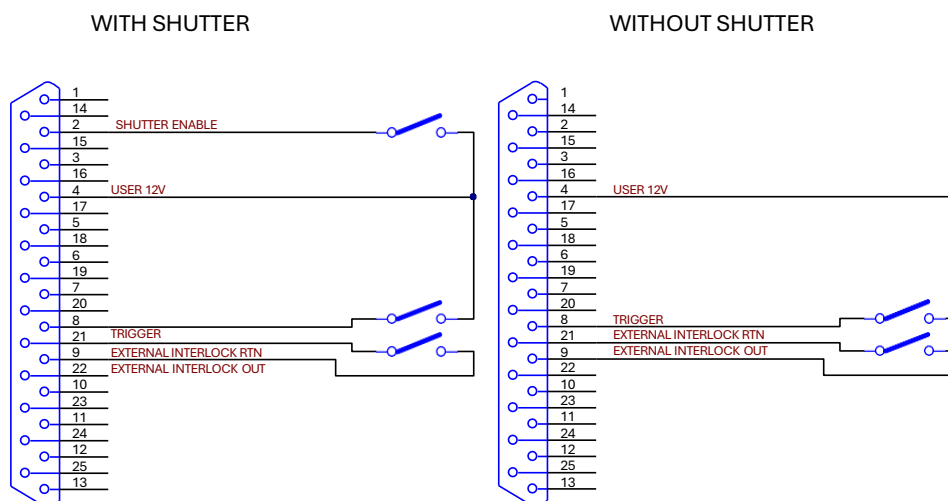


Figure 71 - Internal PWM mode connections

Minimum connections – Auto mode

Note: When operating in auto mode, the system defaults to standby at power up and the shutter and mode of operation can be controlled by external signals.

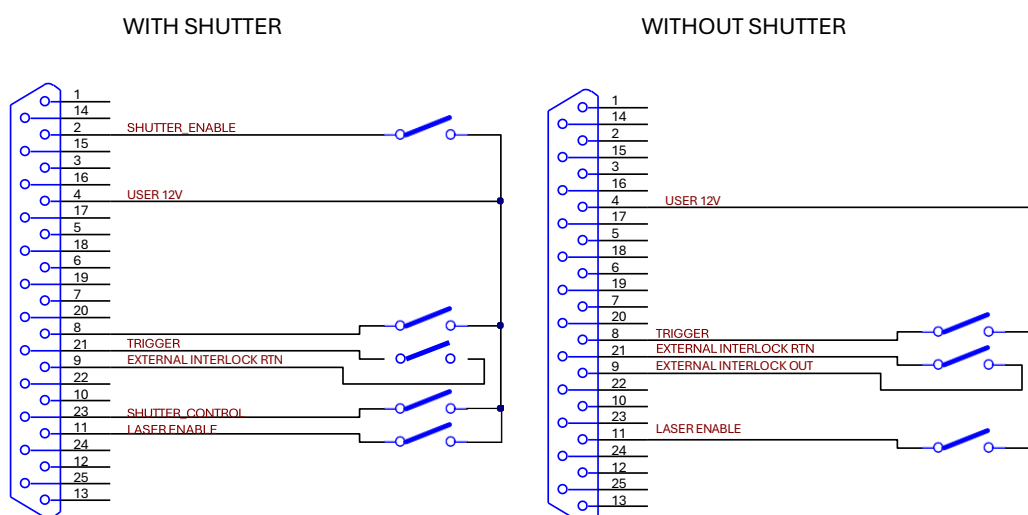


Figure 72 - Auto mode connections

Minimum connections – external PWM mode

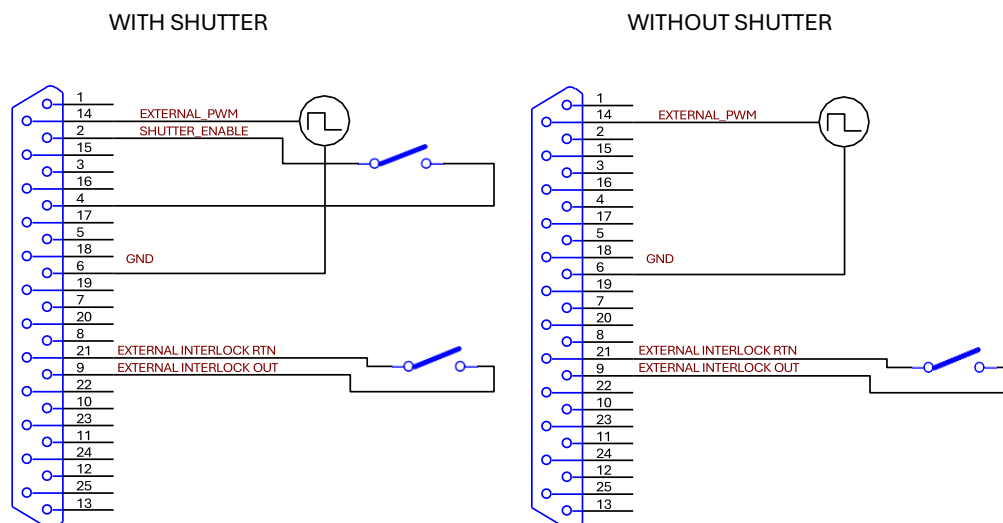


Figure 73 - External PWM mode

Connector U1 SCX 30 emulation connections for laser output

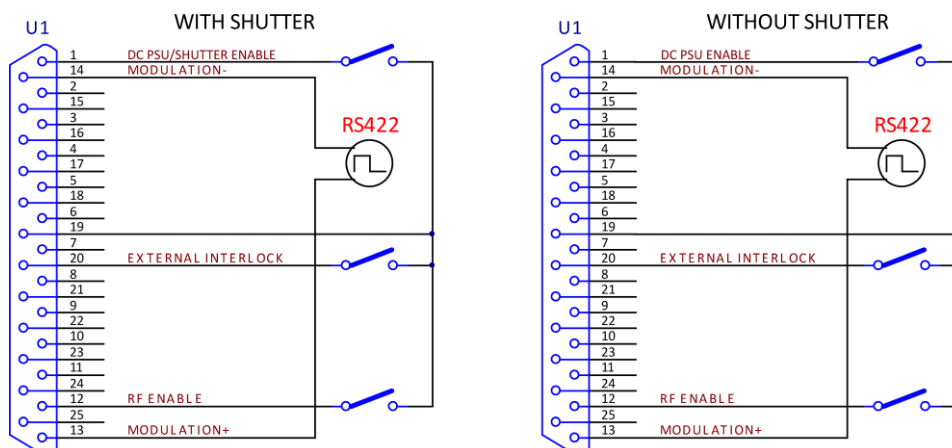


Figure 74 - SCX 30 emulation connections

Timing diagram

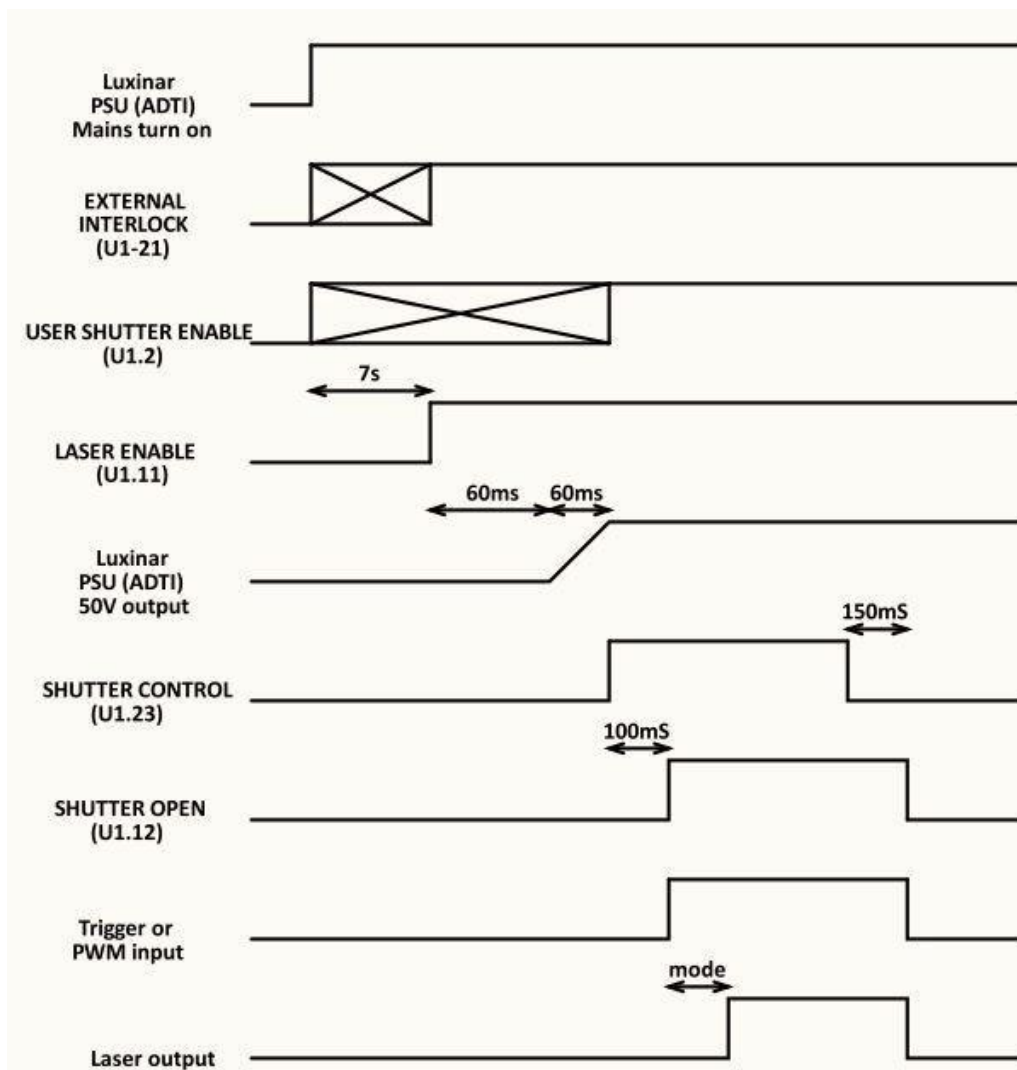


Figure 75 - Auto mode timing

- When using the Luxinar DC power supply, there will be a 7 second setup time delay before the power supply can be used. This is only valid when mains voltage is first applied.
- **External Interlock** (U1.21) must be taken high at any point before **Laser Enable** (U1.11).
- **User Shutter Enable** (U1.2) can be taken high at any point before or after **Laser Enable** (U1.11).
- **Laser Enable** (U1.11) will take the system from standby mode to execute mode and enable the Luxinar DC power supply. The Luxinar DC power supply takes 120ms to fully turn on.
- **Shutter Control** (U1.23) should be applied at least 120ms after **Laser Enable** (U1.11). The shutter will not open until 50V has been detected. The shutter will be fully open 100ms after the command to open is made.
- Once the shutter is open, the laser is ready to fire. Apply the **Trigger Signal** (U1.8) or **Modulation Signal** (U1.14) depending on the mode of operation chosen, for laser output. ^{(2) (3)}

1. If using **EXT PWM** mode, there will be a delay of 21ms from the shutter opening and the laser firing.

2. If using any internal modes, there will be a delay of 1ms from the trigger signal (U1.8) being applied and the laser firing.

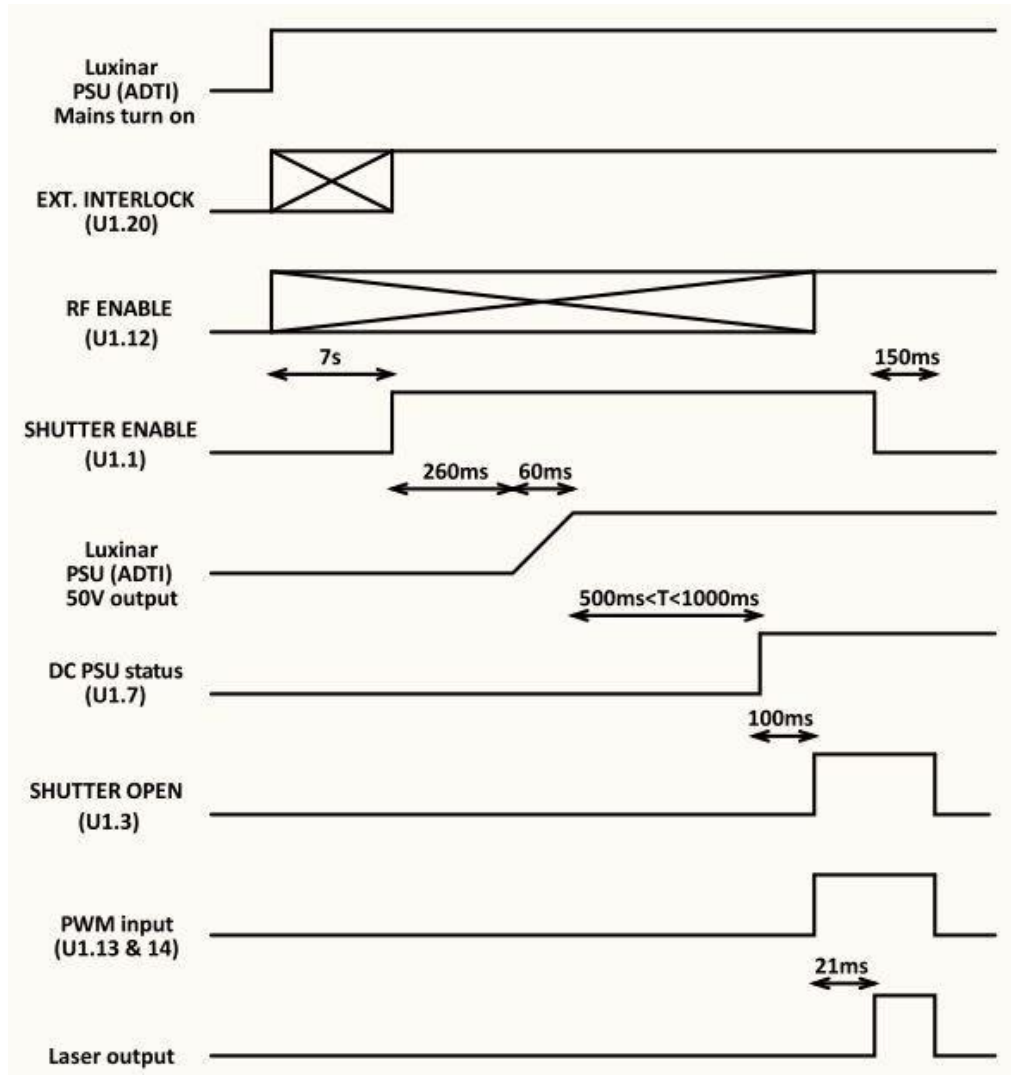


Figure 76 - Emulation mode timing

- When using the Luxinar DC power supply, there will be a 7 second setup time delay before the power supply can be used. This is only valid when mains voltage is first applied.
 - **External Interlock** (U1.20) must be taken high at any point before **Shutter Enable** (U1.1).
 - **RF Enable** (U1.12) can be taken high at any point before **PWM Input** (U1.13 and U1.14)
 - **User Shutter Enable** (U1.1) will take the system from standby mode to execute mode and enable the Luxinar DC power supply. The Luxinar DC power supply will take 320ms to fully turn on.
 - **DC PSU Status** (U1.7) will become high once the DC PSU output has reached 50V (A delay between 500ms and 1000ms will be seen).
 - The shutter will be fully open 100ms after the **DC PSU Status** (U1.7) becomes high, and the system is ready to fire.
- Once **PWM Input** (U1.13 and U1.14) is applied, there will be a delay of 21ms from the shutter opening and the laser firing.

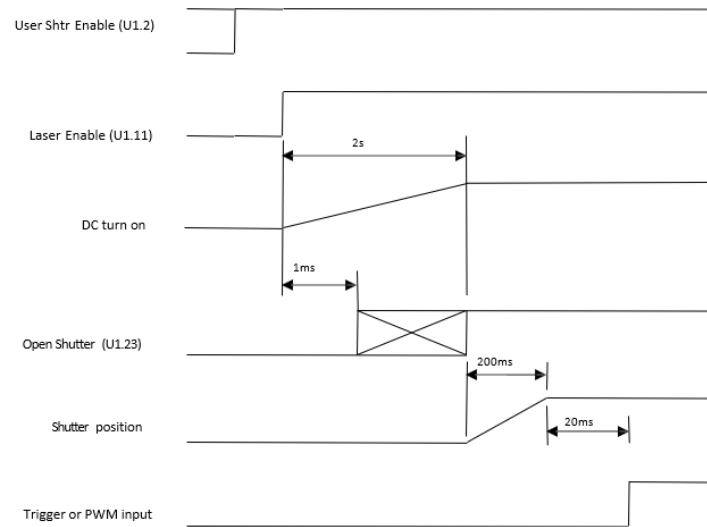


Figure 77 - "Open Shutter" command within DC turn-on period

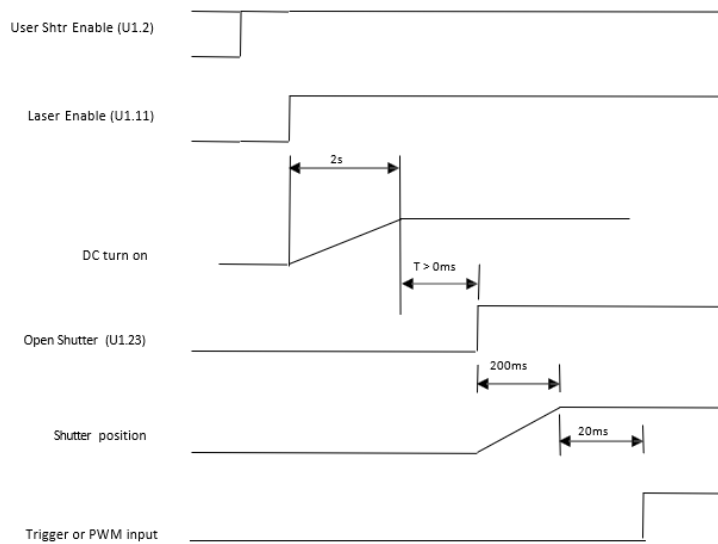


Figure 78 - "Open Shutter" command after DC turn-on period

APPENDIX 1

Acoustic zones

Under certain pulsing regimes, acoustic resonances are set up in the laser which perturb the beam pointing characteristics. To ensure stable beam pointing, avoid operating the laser within the grey shaded areas in the graphs.

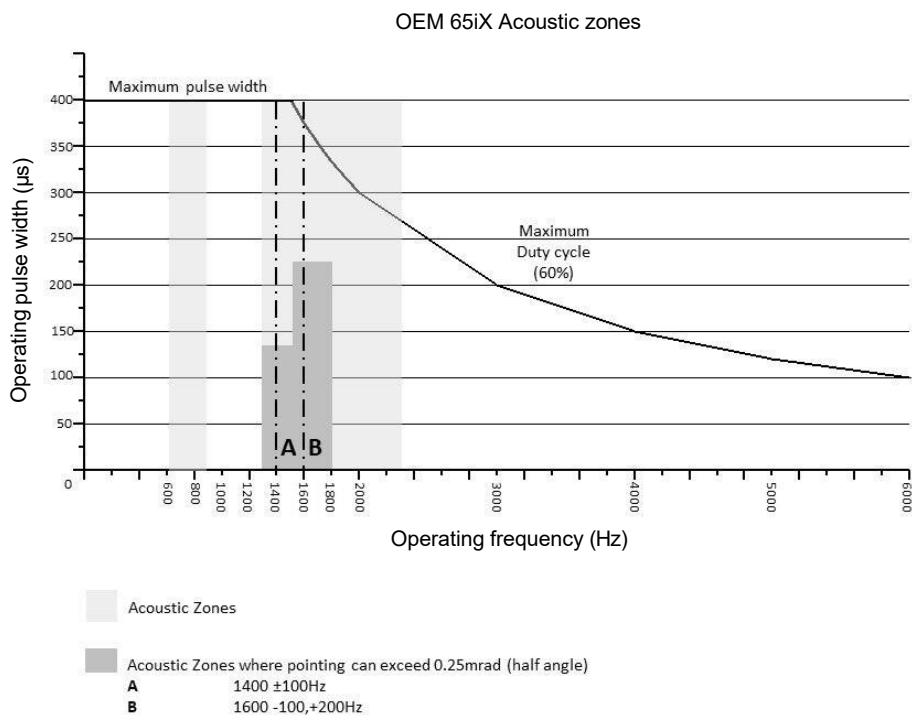
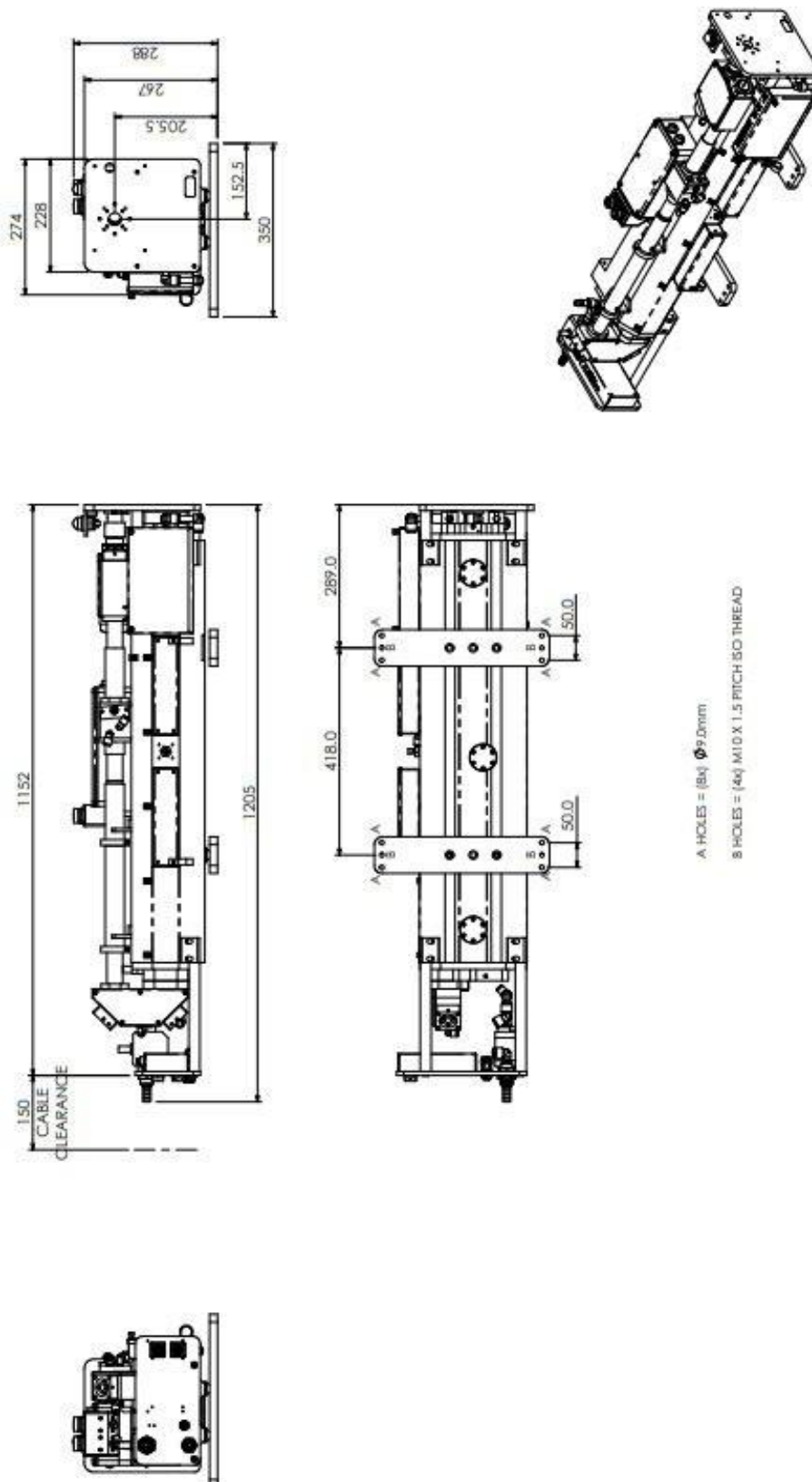


Figure 79 - OEM 65iX acoustic zones

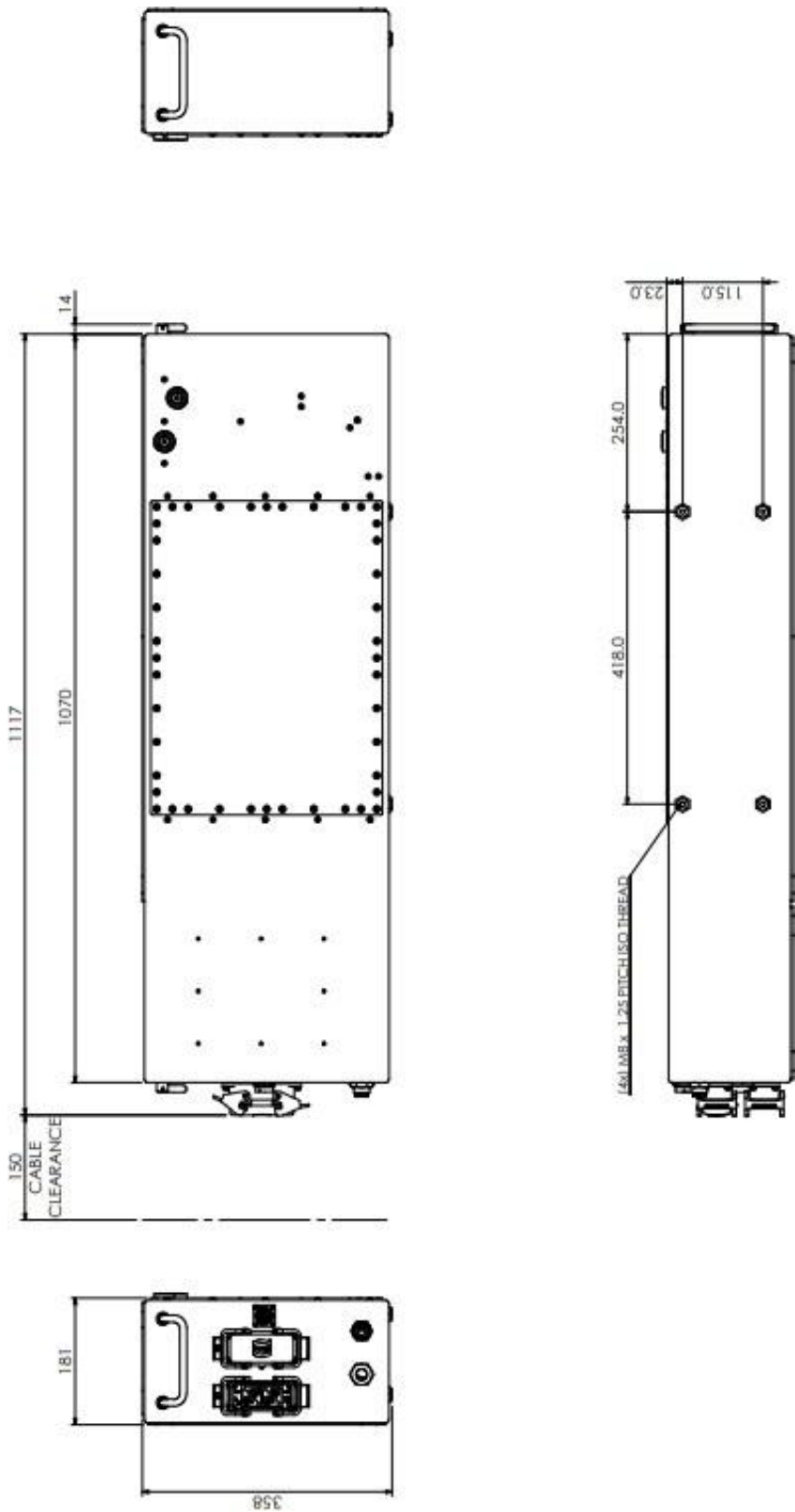
APPENDIX 2

Dimensional drawings

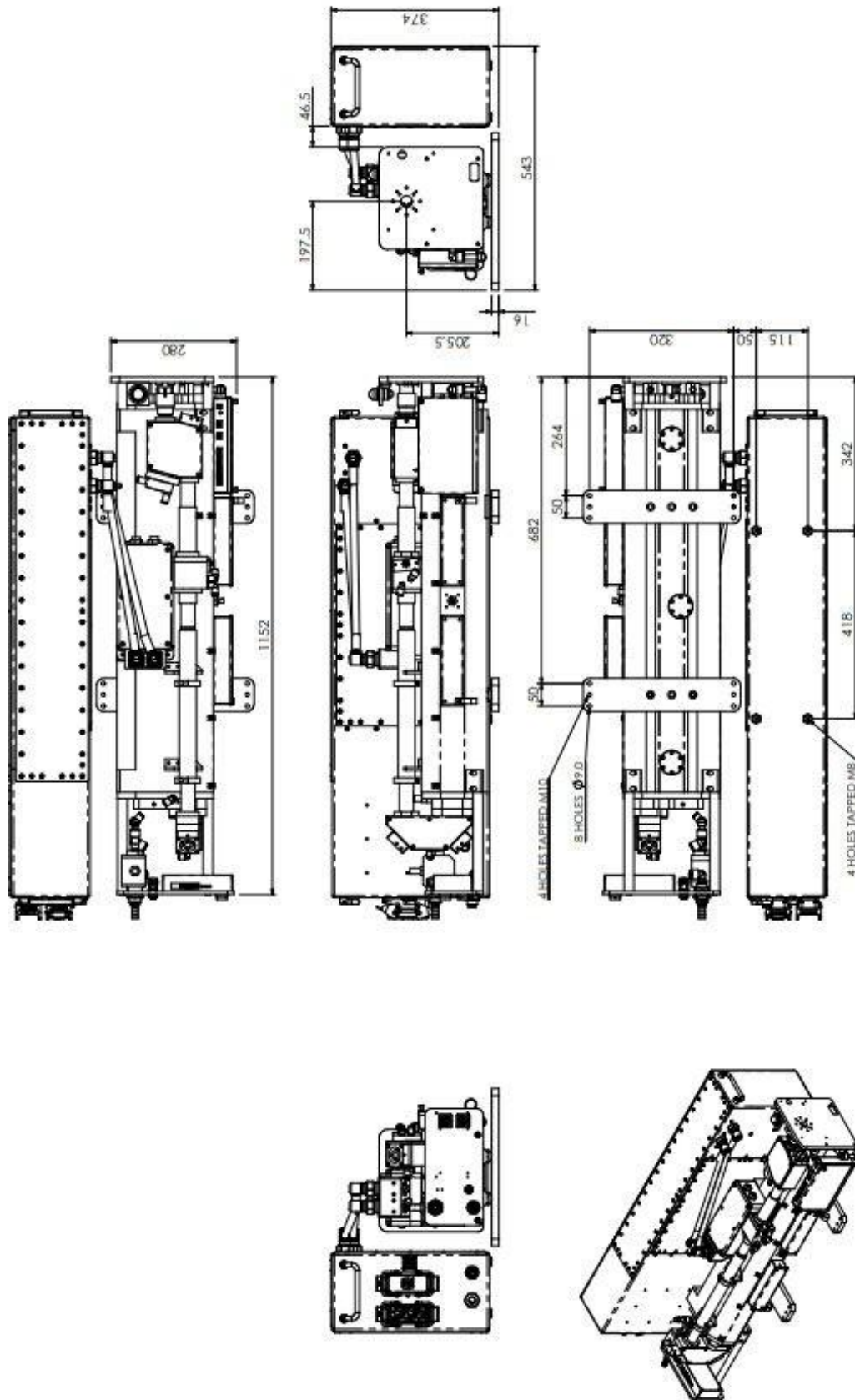
Laser head overall dimensions — version without covers



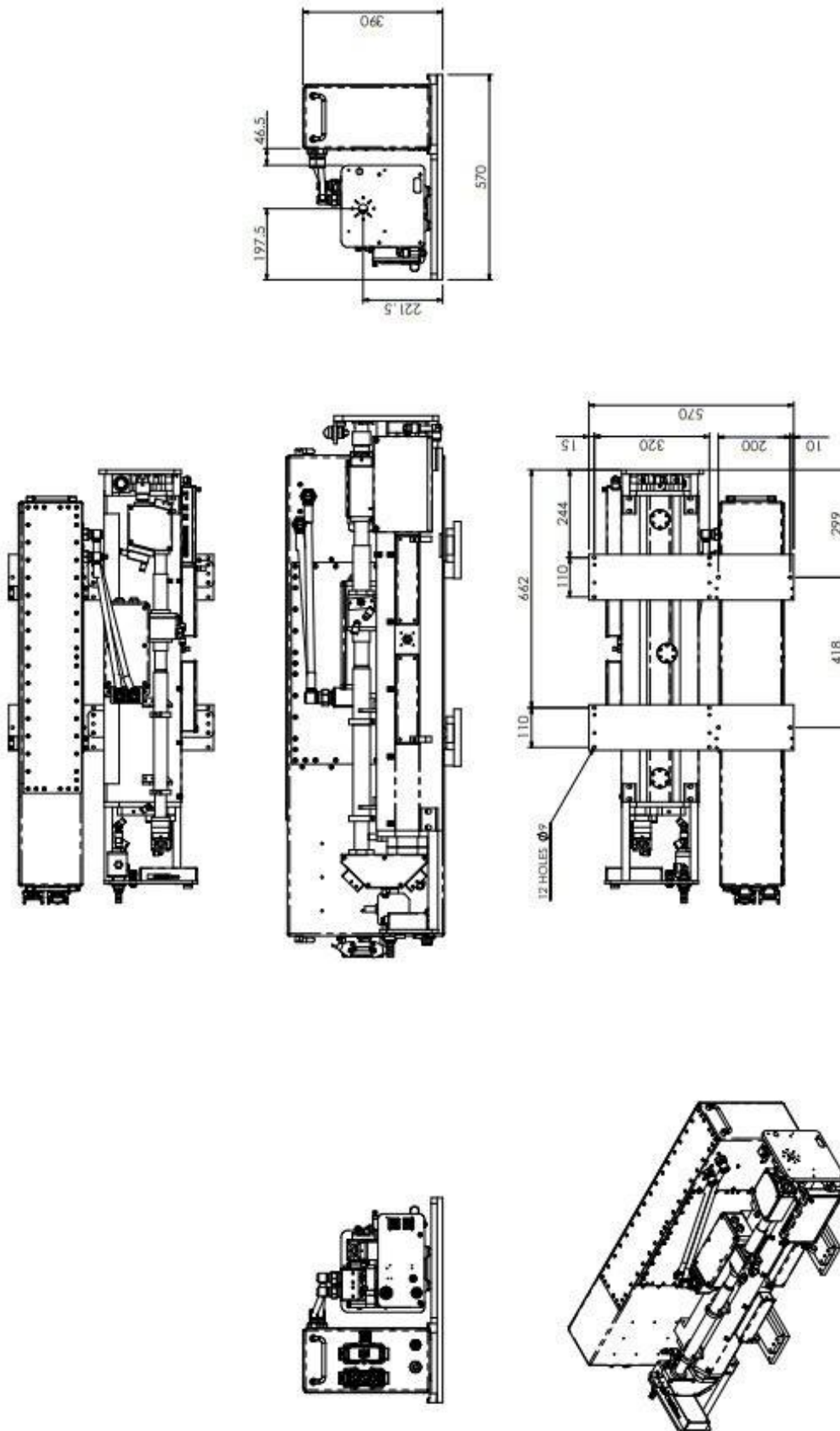
RF power supply overall dimensions



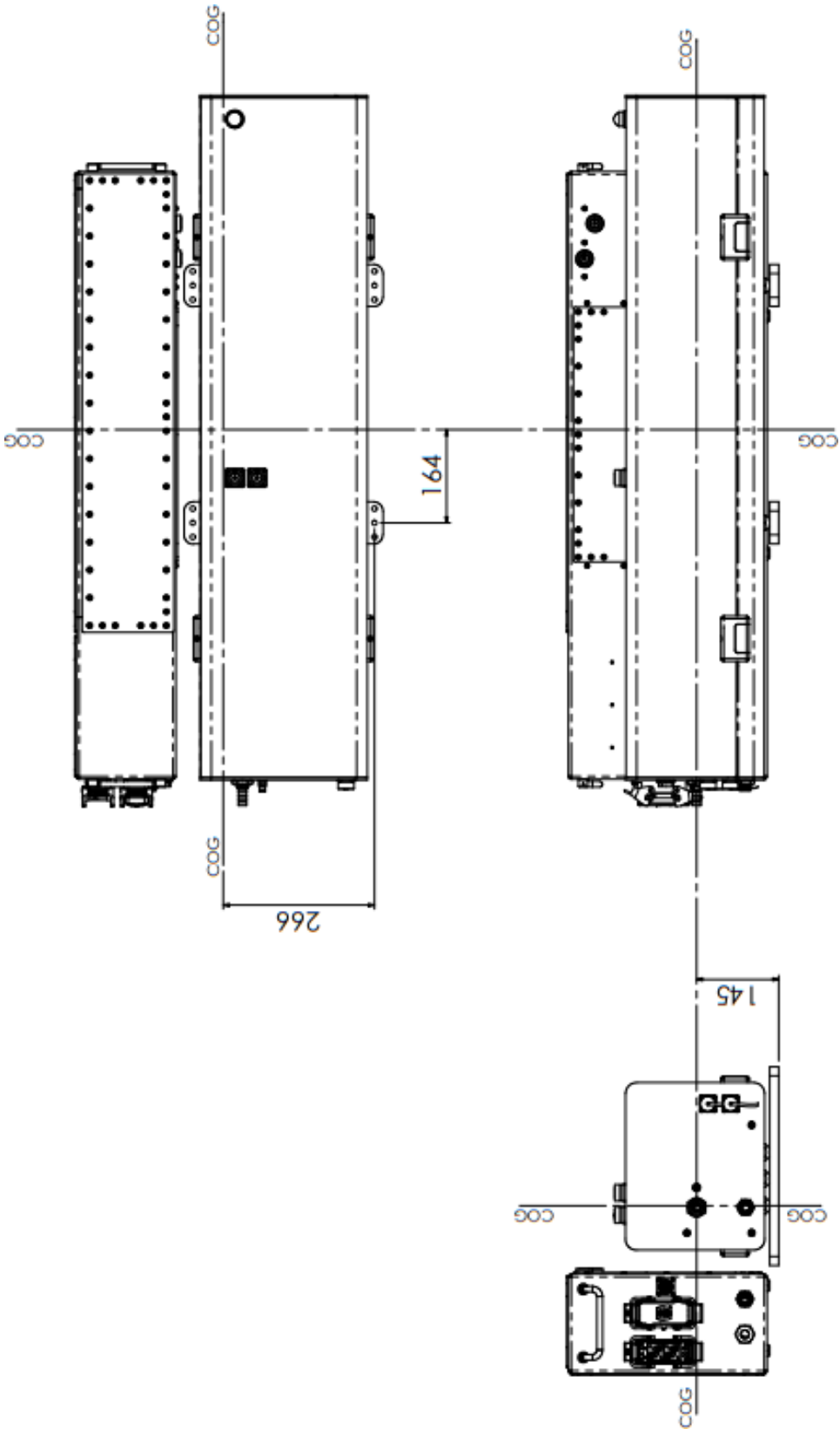
Complete system with minimum length RF cables



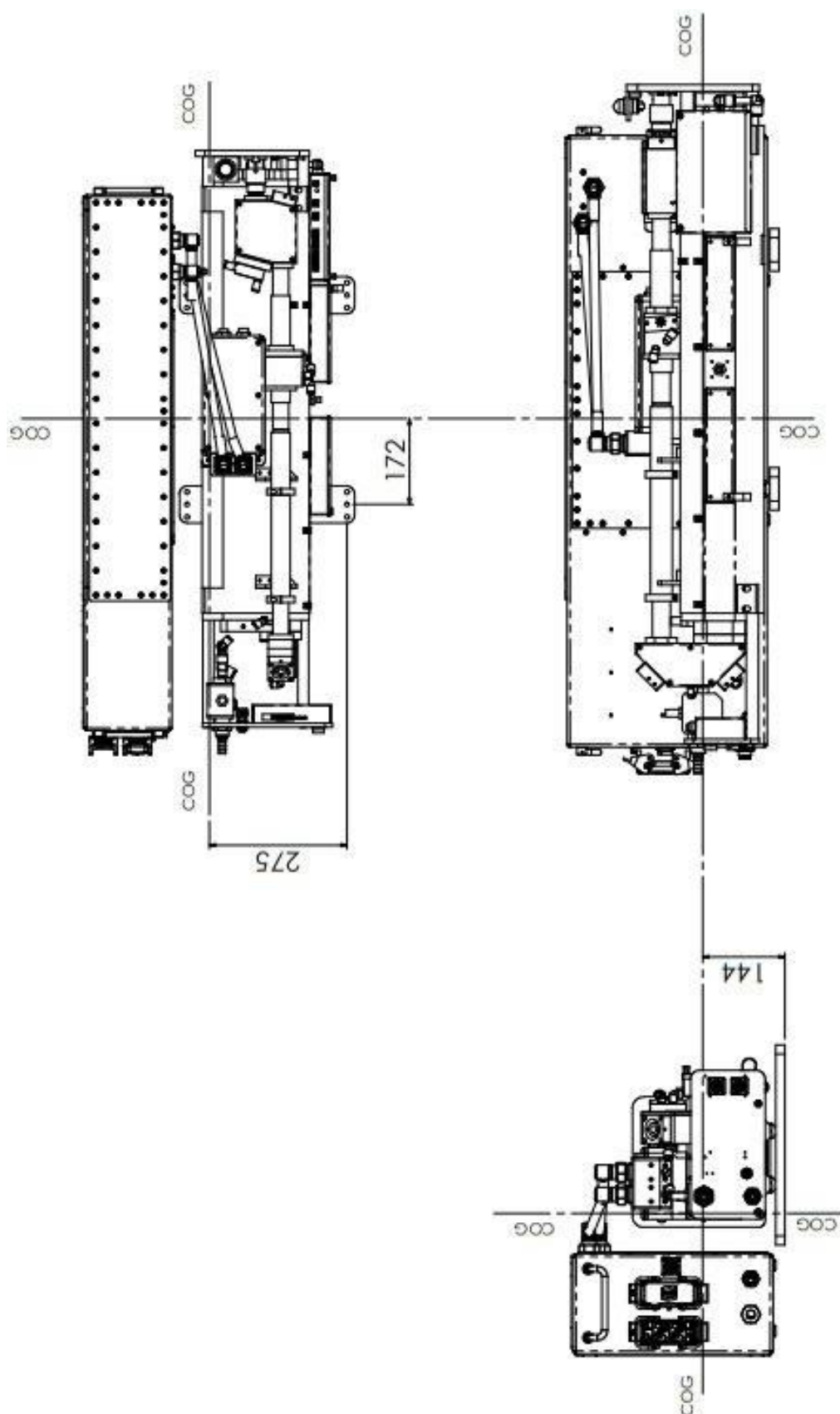
Complete system with mounting plates



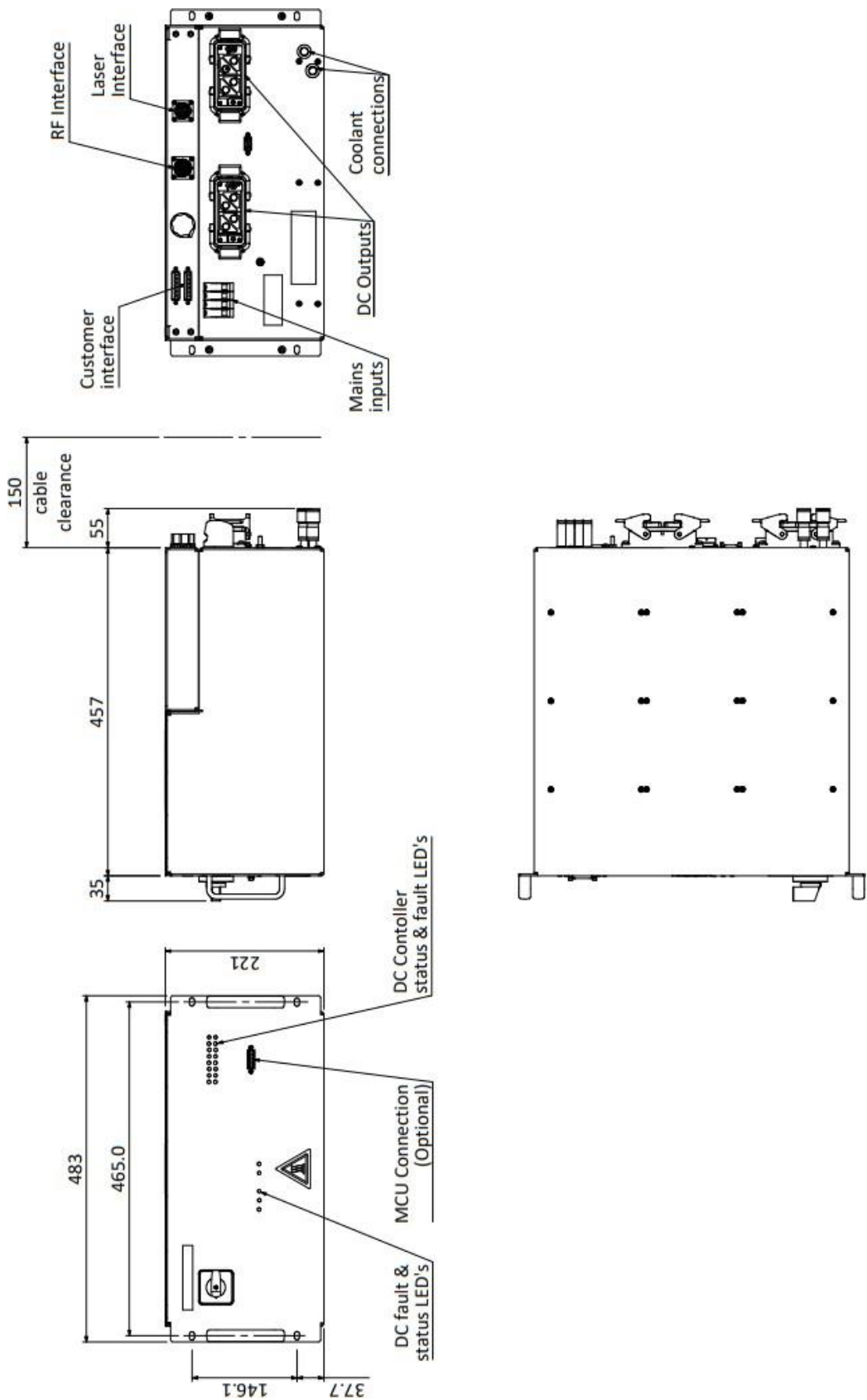
System centre of gravity — version with covers



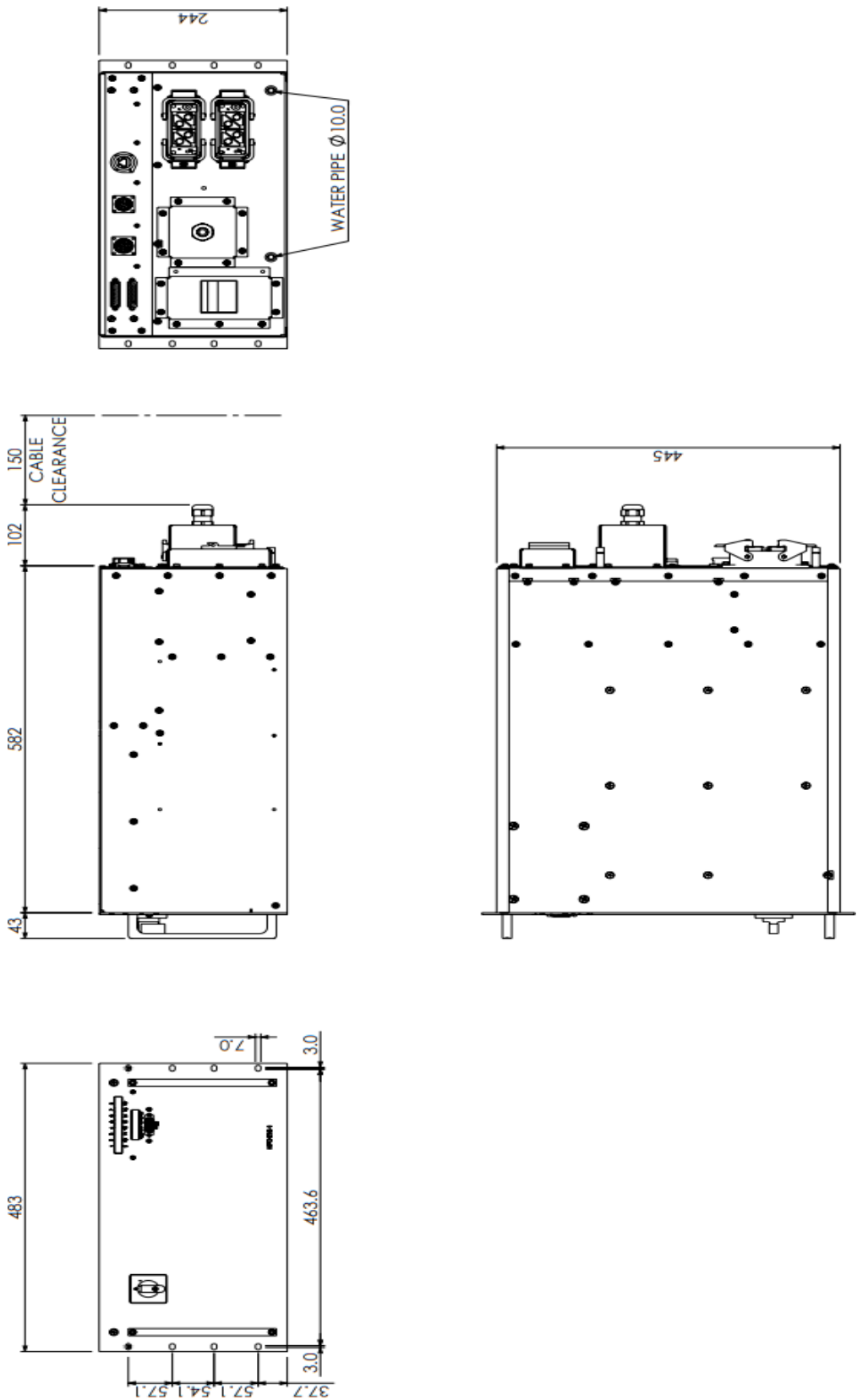
System centre of gravity — version without covers



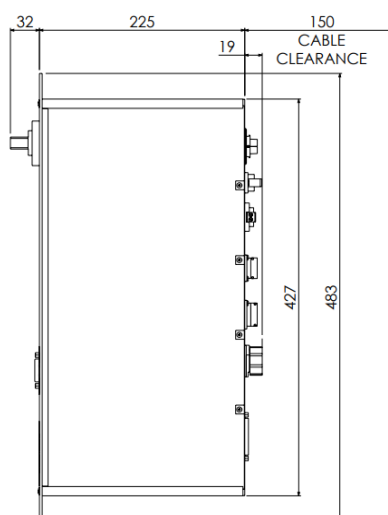
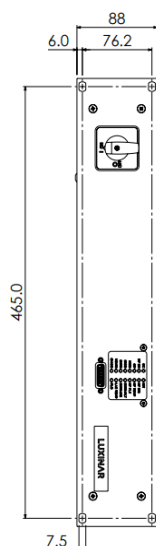
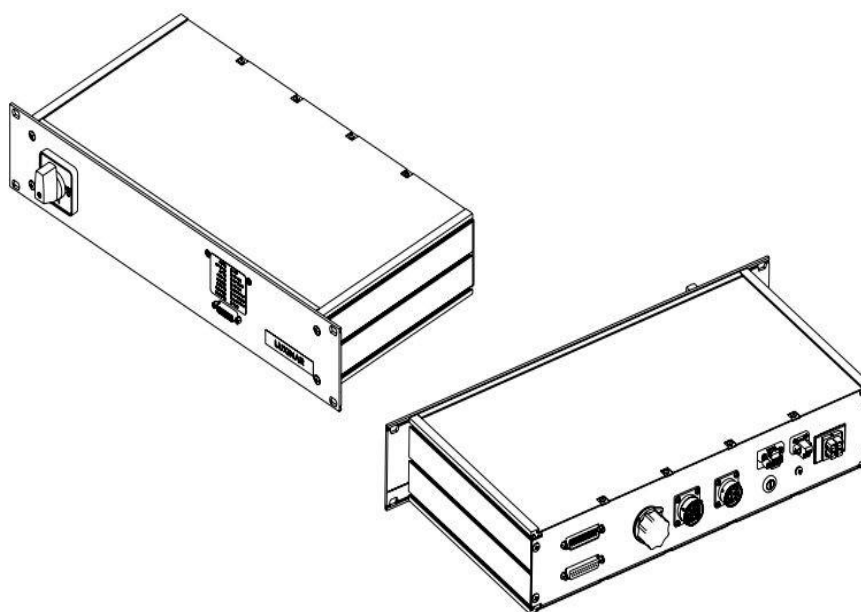
Three-phase DC power supply (016-0031-00)



Three-phase DC power supply (016-0033-00)



Controller for use with OEM DC power supply



APPENDIX 3

Coolant requirements and additives

The following requirements concerning water quality and permitted additives must be complied with.

Coolant quality

Table 30 - Coolant quality

Description	Value
Coolant type	De-mineralised, deionised or distilled water with corrosion inhibitor & anti-bacterial treatment
Conductivity	<1000µS/cm
Total hardness	<10ppm
pH value	7–8.5
Bacteria level	<1000cfu/ml

The pH value, conductivity and dissolved solids levels can be measured with a portable meter and the bacteria level can be checked with a test kit. For more information contact your local Luxinar Aftersales office.

Suspended particle removal

To remove particulate contamination, an in-line filter with a pore size of 100µm must be fitted as close as possible to the laser coolant inlet. The filter should be regularly checked for blockages and cleaned or replaced where necessary. This is particularly important after bacterial growth has been detected and anti-bacterial treatment applied.

Corrosion and anti-bacterial inhibitor

To prevent bacterial formation and corrosion of the cooling water circuit, Luxinar has tested and approved a specialist water treatment kit which is manufactured by NALCO.

Three water treatment kits are available, dependant on the total volume of the cooling water circuit to be used:

Circuit volume	Reference
50–199L	Order No.: 480-WTK-YM20.88
200–350L	Order No.: 480-WTK-YM60.88
351–500L	Order No.: 480-WTK-YM100.88

Order water treatment kits directly from NALCO at:

Nalco Deutschland GmbH,
Solmstraße 41
60486 Frankfurt am Main
Germany
Tel.: +49 69 7934-0
Customer service tel.: +49 7141 703 216
E-mail: custserv.germany@nalco.com

Nalco are equipped to ship kits worldwide.

- **Expiration period**
Two years
- **Storage temperature**
0-25°C
- **Disposal of used material**
Ensure that the disposal of all materials used in this product is conducted according to all local and national regulations.
- **Instructions for use**
Completely empty both inhibitor bottles which are included with the NALCO kit into the cooling water reservoir tank. After mixing the NALCO chemicals with the cooling water, the PH value should be between 6.5 and 9.0.



WARNING

Risk of injury to eyes

Use appropriate eye protection when handling chemicals used in the NALCO water treatment kit.

- NALCO 73199 is a multi-metal corrosion inhibitor to ensure effective protection against corrosion of stainless steel, copper and copper alloys and it also works as a bacteriostatic and hardness stabiliser.
- NALCO 7330 is a biocide which removes bacteria and organic contamination (algae and slime) from the water circuit.

NALCO 73199 and 7330 are completely compatible with glycol. The glycol should be without any inhibitor (concentration 30–35% glycol in demineralised water).

The use of inhibitors, biocides, other substances or hardness stabilisers other than the specialist NALCO kit may cause premature failure of the laser. It is the user's responsibility to ensure that the specification of any alternative additive is equivalent to that of the NALCO additive.

- **Cooling system maintenance**

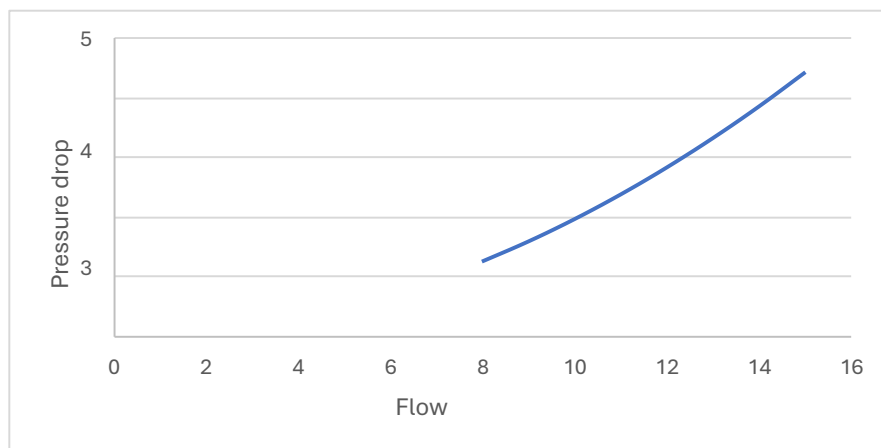
After six months of operation, drain off the coolant and refill with fresh water treated with the appropriate NALCO kit or equivalent anti-bacterial product, as specified in [Table 30](#).

Ensure that the disposal of all the materials used in this product is conducted according to all local and national regulations.

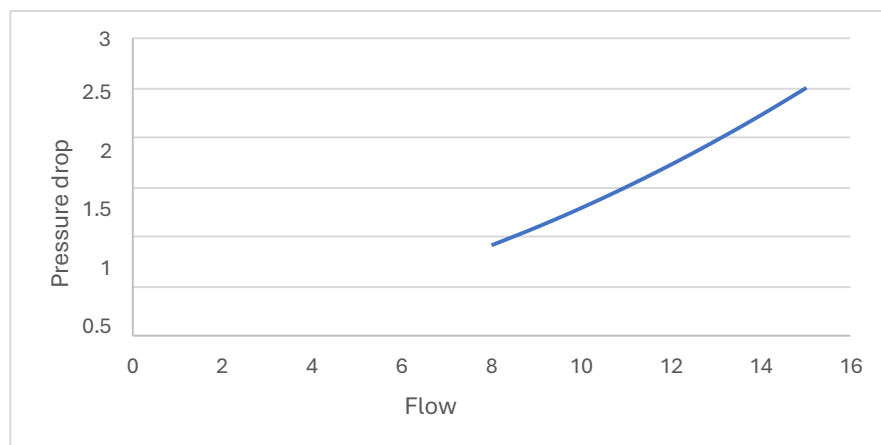
APPENDIX 4

Cooling system pressure drop curves

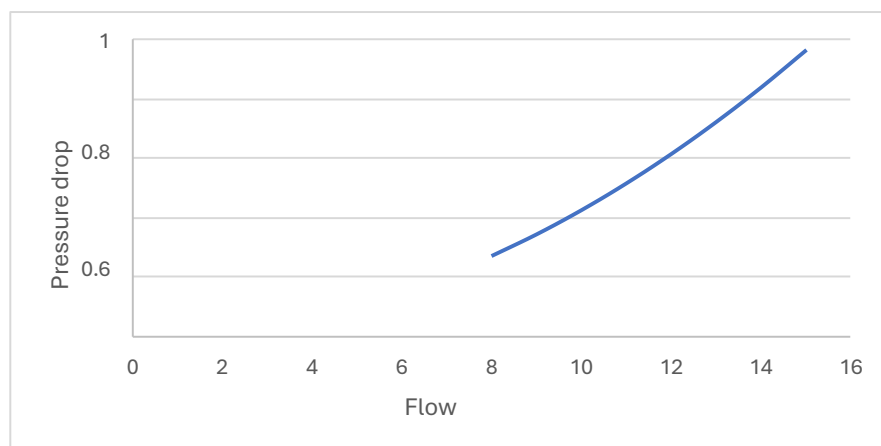
OEM 65iX — laser head and RF power supply in series



DC power supply (016-0031-00)



DC power supply (016-0033-00)



APPENDIX 5

Parts list

The following parts list details consumable parts that may be required during maintenance and troubleshooting procedures. To order parts, contact Luxinar Aftersales.

Table 31 - Parts list

Luxinar part number	Description
402-0006-00	Purge gas filter assembly
552-0019-00	Fuse, Plas 1A T TE5
552-0024-00	Fuse, 500mA T Cerm HRC
552-0035-00	Fuse, 500mA T Cerm 600V
569-0002-00	Mains circuit breaker, 32A
553-0015-00	Emission indicator, 12V 95mA LED
552-0007-00	Fuse 5x20mm Cerm T HRC, 1A

Note: These parts should only be fitted by trained Luxinar personnel.

APPENDIX 6

Applications troubleshooting

This appendix addresses common materials processing issues, their causes and corrective actions.

Common issues

Fluctuations in beam intensity at the workpiece

The intensity changes can cause variations in marking intensity on some materials.

Focus spot height changing relative to the workpiece

When beam delivery optics heat up and distort, the focus spot height can change relative to the workpiece. The machining result initially appears correct but degrades in a short time as if the laser power is reducing. The reverse effect is also possible where the initial result is poor but improves with time.

When cutting, the kerf width varies. When marking, the mark intensity reduces.

Directionality

When kerf width or marking intensity changes with machining direction, this directionality can be for a number of reasons. Most causes are due to beam distortion giving rise to an elliptic or distorted focus spot, or beam misalignment through a cutting head nozzle. If the beam is asymmetrical then the focus spot will also be asymmetrical.

Low machining speed

Line speeds at lower powers can be used to predict an expected line speed at a higher power. When predicted speeds cannot be achieved, common causes are optics distorting due to heating or back reflections causing mode size changes.

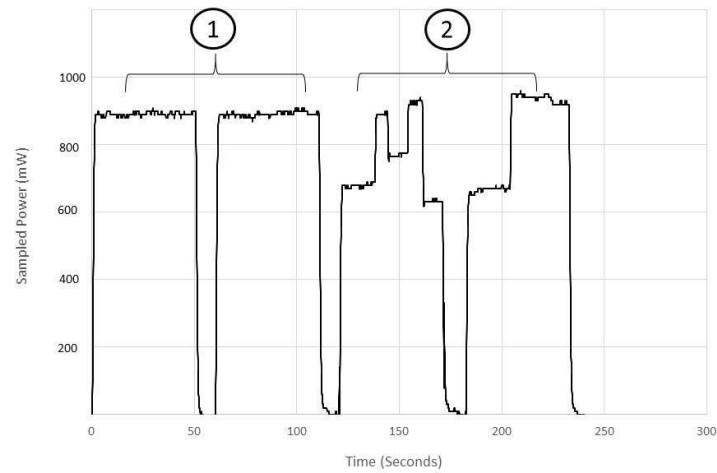
Beam distortion

There are many causes for beam distortion, including misalignment through the beam delivery system, contamination and clear apertures being too small. At higher powers, light absorbed by moisture in the air can lead to heating of the air which distorts the beam. To prevent this, purge the beam path with a flow of clean, dry air or dry nitrogen.

Unstable power

All lasers have a natural variation in power over time, commonly known as laser power signature. However, certain issues, for instance back reflections from the workpiece, can cause larger and erratic fluctuations in power than laser power signature alone.

The following graphs show sampled power (mW) versus time (s) measured by placing a beam splitter in the final beam delivery system to sample a small fraction of beam power while running repeated patterns lasting approximately 50s.



- 1 Sampled power with the beam blocked by a power meter placed after the beam splitter.
- 2 Sampled power from the beam splitter while running the machining process.

Figure 80 - Sampled power comparison

Important!

Small back reflections from the surface of an external power sensor can contribute to poor power stability. To prevent this, tilt the sensor around 5 degrees to the beam axis when taking measurements.

Causes and corrective actions

Table 32 - Corrective actions for common issues

Root cause	Observed effects	Corrective actions
Back reflections from transmissive optics, beam delivery components or the workpiece.	- Intensity fluctuation at the workpiece - Directionality - Lower than predicted machining speed - Unstable power	- Check for scratches, dirt or contaminant on the final beam delivery optics and the laser head output window. - Ensure the final beam delivery transmissive optics are tilted 2 to 5 degrees to the beam axis. - Check for small apertures that cause back reflections. - Observe in-line power sensor measurements while machining. Compare them to measurements made with the beam running directly into a power head at the laser beam exit. - Contact Luxinar Aftersales regarding optical isolation methods.
Contamination of beam delivery components or in the beam path.	- Fluctuations in intensity at the workpiece - Focus beam height changing - Directionality - Lower than predicted machining speed - Beam distortion - Unstable power	- Check for scratches, dirt or contaminant on the final beam delivery optics and the laser head output window. - Purge the final beam delivery system. - Purge the laser head.
Thermal lensing or distortion of optical components	- Focus spot height changing relative to the workpiece - Lower than predicted machining speed - Beam distortion - Unstable power	- Check for scratches, dirt or contaminant on the final beam delivery optics and the laser head output window. - Contact Luxinar Aftersales regarding suitability of beam delivery optics for OEM 65iX incident power. - Observe the effect of focussing in and out relative to the workpiece.
Acoustic beam steering	- Directionality - Lower than predicted machining speed - Beam distortion - Unstable power	- Refer to acoustic curves in section Appendix A. - Operate using a different pulse frequency range.
Final beam delivery system apertures too small for the beam diameter or poor beam delivery system alignment	- Directionality - Lower than predicted machining speed - Beam distortion	- Refer to beam propagation data and measure aperture sizes and mirror clear apertures to be sure that no clipping is taking place - Remove the final beam delivery system and check the mode from laser – ideally through focus

			• Check alignment onto beam delivery mirrors and that the beam is centred through all apertures • Check for distortion caused by stress in final beam delivery optic mounts • Contact Luxinar Aftersales regarding optical mounting methods
Intermittent RF power	• Fluctuations in intensity at the workpiece • Lower than predicted machining speed • Unstable power	Check the laser log history for errors	

Revision history

Revision	Date	Changes
1	18/01/2022	Reorder and modularise content, change to XML format. Update DC PSU and safety sections.
2	28/09/2022	Green diode pointer.
3	28/10/2022	UKCA marking and safety section updates
4	05/07/2026	Safety label updates
5	29/02/2026	Specification updates.
6	13/07/2026	Change part number of recommended coolant in all manuals

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