BROADBAND PLASMA LIGHT SOURCE XWS-65

Operation and safety manual

Contents

1. Content of the system

ISTEQ broadband plasma light source XWS-65 system includes:

Controller unit (PSU) – 1
Light source head – 1
Electrical cable – 1
Control cable – 1
Ethernet cable – 1
Interlock connector – 1
Gas purging connectors - 2

After unpacking the system please check that there is no damage. If there is contact the supplier.

2. Safety precautions

The XWS-65 laser plasma source uses a high-power laser light which is delivered by fiber and focused on plasma inside the light source head unit.

The plasma light source is very bright and can potentially cause damage to the eyes and skin if there is direct contact.

CAUTION
LASER RADIATION WHEN OPEN
DO NOT STARE INTO BEAM OR
VIEW WITH OPTICAL INSTRUMENTS
CLASS I LASER PRODUCT

Laser delivery fiber and optics:

- Do not strongly bend the laser fiber cable (usual fiber usage precautions), no mechanical stress is allowed
- Do not disconnect the SMA fiber connector from the collimator unit, to prevent any damage and contamination
- Do not operate the source with the collimator unit disconnected from the optical head
- Do not touch the output window and the lamp bulb inside the light source head unit
- Do not open the light source head

Exploitations restrictions:

- Operate the source in faculties with ambient temperature below 30°C
- Do not restrict air convection of the controller as well as the light source head unit. Minimum distant to the nearest obstacles:
  - From source head back: 20cm

- From PSU side walls: 20cm
- From PSU top: 20cm

- Light source head module gets HOT (~60C under normal conditions during the first 15 minutes of continuous operation)

Important for operating UV model:

- Wear UV-protection glasses
- Take necessary precautions to avoid UV exposure
- Limit exposure to UV-generated ozone

3. Operation

|	
1. Carefully unpack the delivered system and prepare for the operation	
2. Remove the transparent/metal protection panel from the side of the Optical head:	
3. Remove the transparent protection cup from a **collimator unit,** attached to the laser fiber in a metal/PVC protection tube: **Attention: DO NOT disconnect the SMA connector from the Collimator unit, to prevent any damage or contamination.**	
4. Carefully plug in the collimator into the optical head and tight four screws:	

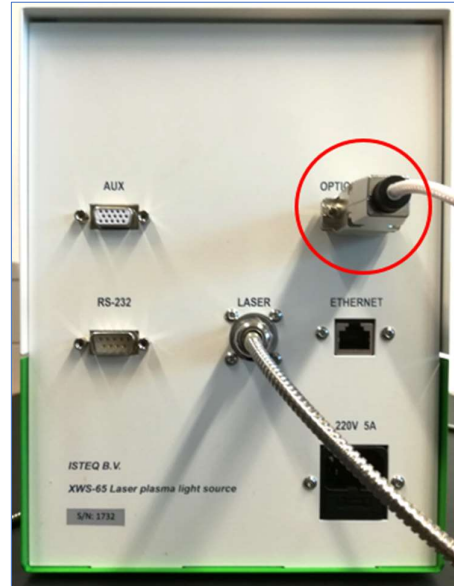|	
5. Attach the control cable to the light optical head:	
6. Remove the plastic/metal cap from the optical head output window:	
7. Plug the electrical socket to the mains available in the facility and plug in the other end of the electrical cable to the control unit (PSU):	
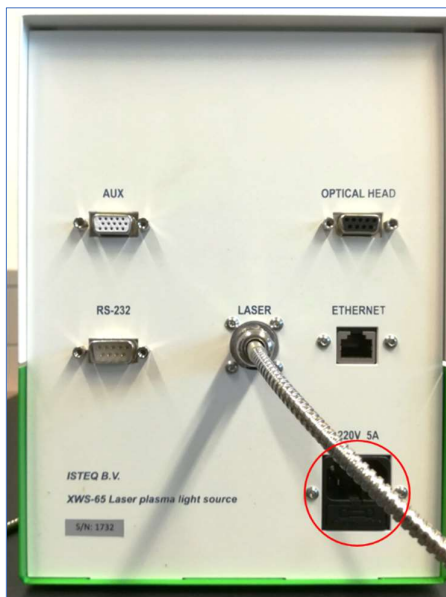
8. Attach the other end of the control cable to the controller unit – "Optical Head" socket:	
9. If you have a system with **Interlock** function, attach an **Interlock unit** to the controller unit (AUX socket):	
10. If that is the very first lunch of the XWS system – do Autocalibration procedure For more details – see Autocalibration	

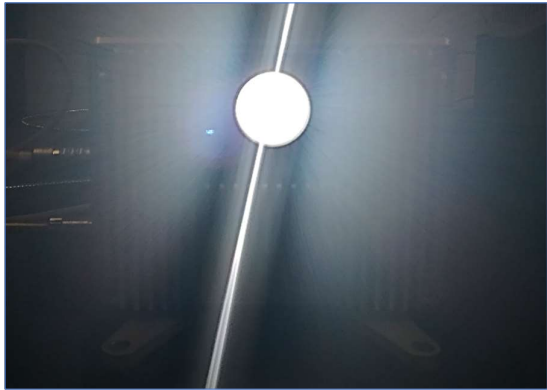|	
11. Switch on the **"Power"** button and wait until **"Ready"** LED is ON:	
12. Press **"Start"** button to switch ON the plasma and **"Stop"** to switch it OFF:	

4. Normal operational check-list

When the system is running and the plasma is started, please, check:

1. Light is produced:	
Two minutes after the plasma was started Check **DISPLAY** of the PSU front panel: 2. Source status is «PLASMA ON» 3. «Temp OK» green LED is on 4. Temperature of the laser (Tl) is 20.0±0.1° C (or 25±0.1°C depending on the source configuration) 5. Temperature of the head (Th) is slowly increasing	

5. Source parameters: Display button

«Display» button on the front panel of the control unit can be used for the XWS source parameters monitoring:

1. DISPLAY 0 Default display screen shows: • **Tl**: Laser Temperature, °C • **Th**: Head Temperature, °C • **IDLE**: Source current status	 T1=19.8 Th=22.0 IDLE READY LASER TEMP OK FAULT
2. DISAPLAY 1 One time pressed **«Display»** button. Shows: • Laser Status (On/Off) • **U**: Laser Voltage, V • **I**: Laser Current, A	 LASER IS OFF U=0.01 I=0.02 READY LASER TEMP OK FAULT
3. DISPLAY 2 Two times pressed **«Display»** button. Shows cooling system parameters: • Percentage of the cooling system load, % • **PWR**: Cooling system electrical power consumption, W	 ■——————— 010% PWR=0.9 WATTS READY LASER TEMP OK FAULT
4. DISPLAY 3 Three times pressed **«Display»** button. Shows: • **Uptime**: Total uptime of the system, hours • **SN**: Serial number of the system • **FW**: Firmware version	 UPTIME=0349:50 SN:1718 FW:2.95 READY LASER TEMP OK FAULT

5. DISPLAY 4

Four times pressed **«Display»** button.

Shows:
- **FP (ETH)**: IP address of the system (if Ethernet cables is connected)

6. Ethernet connection

XWS-65 can be connected to a Network via Ethernet cable. It can be done, using an external Network as well, as a direct Ethernet connection with your PC/Laptop.

Please, contact your supplier if you need any assistance.

1. Connect Ethernet cable to XWS-65 Ethernet connector on the back side of the PSU:	
2. Press «Display» button four times (DISPLAY 4) to see the source IP address:	
3. Using your PC/Laptop connected to the same Network, open browser and type the address: *http://system_IP_address*	
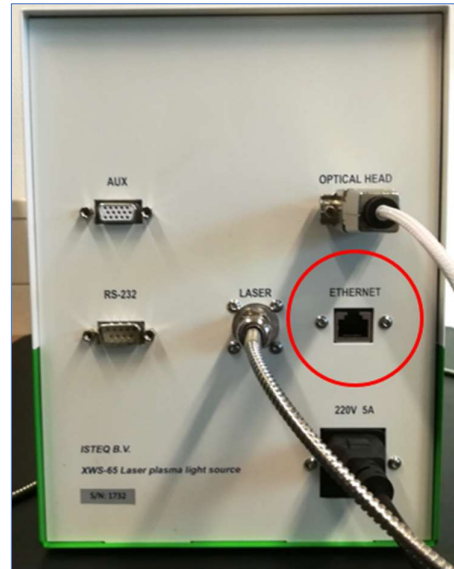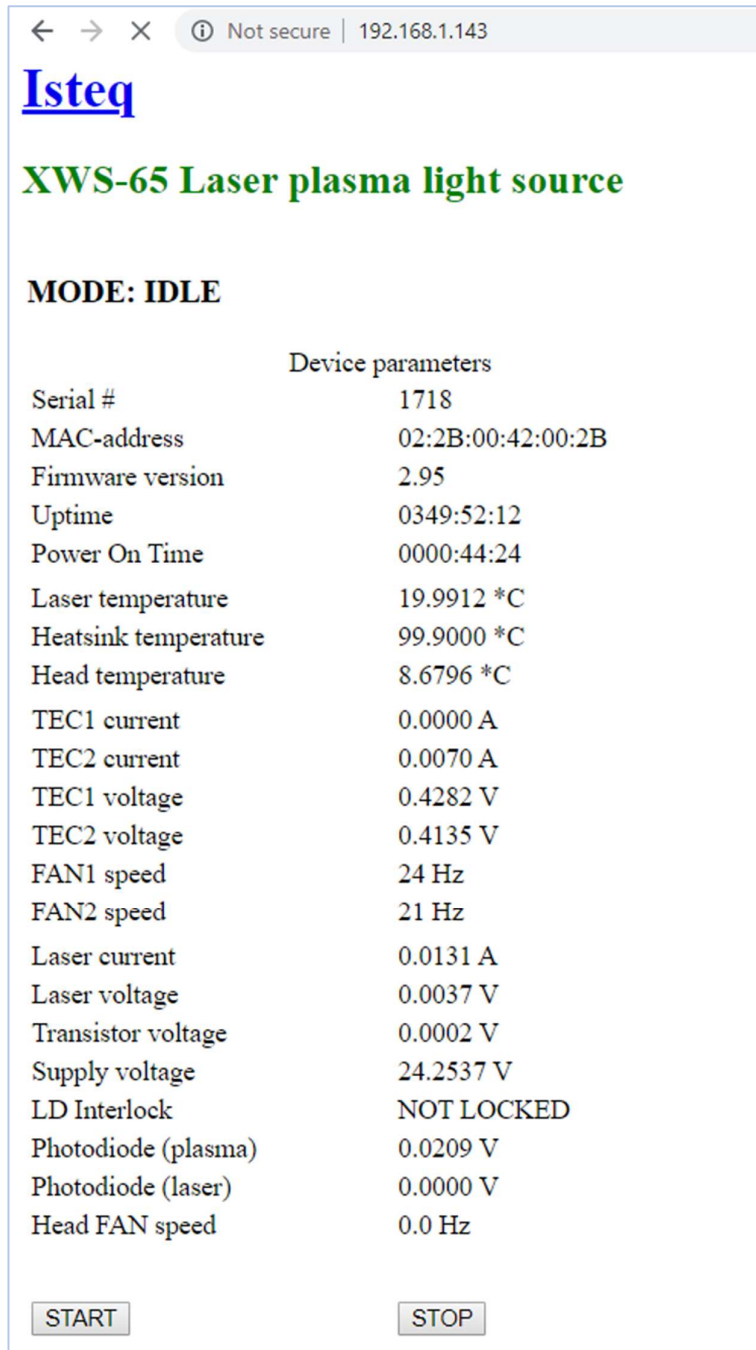
After you will see an XWS-65 Web Interface, which allows to monitor the source parameters updated every second:

← → X ⓘ Not secure | 192.168.1.143

Isteq

XWS-65 Laser plasma light source

MODE: IDLE

Device parameters

Serial #	1718
MAC-address	02:2B:00:42:00:2B
Firmware version	2.95
Uptime	0349:52:12
Power On Time	0000:44:24
Laser temperature	19.9912 *C
Heatsink temperature	99.9000 *C
Head temperature	8.6796 *C
TEC1 current	0.0000 A
TEC2 current	0.0070 A
TEC1 voltage	0.4282 V
TEC2 voltage	0.4135 V
FAN1 speed	24 Hz
FAN2 speed	21 Hz
Laser current	0.0131 A
Laser voltage	0.0037 V
Transistor voltage	0.0002 V
Supply voltage	24.2537 V
LD Interlock	NOT LOCKED
Photodiode (plasma)	0.0209 V
Photodiode (laser)	0.0000 V
Head FAN speed	0.0 Hz

[START]   [STOP]

This Web Interface allows to the customer to:

- Get information about the system
- Monitor system parameters
- Remotely Start and Stop the plasma

Parameter description and normal meaning range are shown in the table below:

Parameter	Meaning	Normal value
Serial #	Serial number of the system	NA
MAC-Address	MAC-address of the system	NA
Firmware version	Firmware version of the PSU control PCB	2.95 or higher
Uptime	Total Uptime of the system, hh:mm:ss	NA
Power On Time	Time of the current system session, hh:mm:ss	NA
Laser temperature	Temperature of the laser, *C	20±0.1°C or 25±0.1°C (depending on the system configuration)
Heatsink Temperature	NA	NA
Head temperature	Temperature of the Optical Head	20°C < Th < 60°C
TEC1 current	Laser Cooling system: TEC 1 element current	<8A
TEC2 current	Laser Cooling system: TEC 2 element current	<8A
TEC1 voltage	Laser Cooling system: TEC 1 element voltage	<10V
TEC2 voltage	Laser Cooling system: TEC 2 element voltage	<10V
FAN1 Speed	Laser Cooing system: FAN 1 rotation speed	<100Hz
FAN2 Speed	Laser Cooing system: FAN 2 rotation speed	<100Hz
Laser current	Current of the drive laser	10±0.1A or 13±0.1A (depending on the system configuration)
Laser voltage	Voltage of the drive laser	<15V
Transistor voltage	NA	NA
Supply voltage	Onboard system voltage	24±1V
LD Interlock	Status of the interlock system	NOT LOCKED for normal operation
Photodiode (plasma)	Safety system/Feedback loop: signal of the safety photodiode for plasma light monitoring	<1.6V

Photodiode (laser)	Safety system/Feedback loop: signal of the safety photodiode which registers the laser light	NA
Head FAN speed	Speed of the Optical Head cooling fan	NA
[START]	Button for plasma start	
[STOP]	Button for plasma stop	

7. RS-232 communication

That is possible to control the XWS light source, Start and Stop the plasma and monitor the system internal parameters using RS-232 protocol.

Next steps to be taken:

1. Connect your PC/Laptop to the RS-232 socket using UCB/COM adapter:	
2. It is up to the customer – to decide which software to be used for the RS-232 communication As an option – Free Software "Terminal"	
3. Serial port settings: 115200 8-N-1	
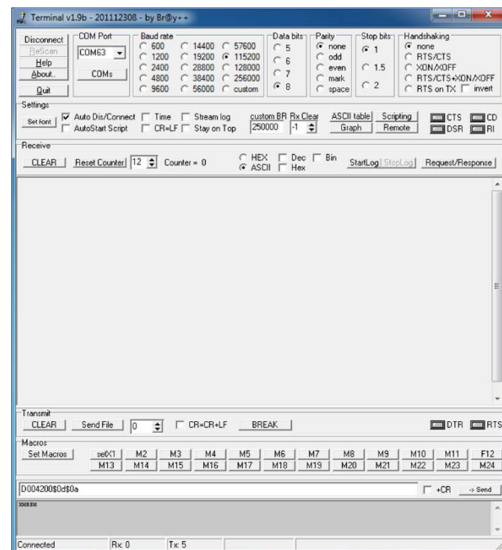
4. Send commands from the list below to receive the information about the system.
    That is also possible to START and PLASMA remotely using RS-232 protocol. See the commands description below

Command list and comments are shown in the table below:

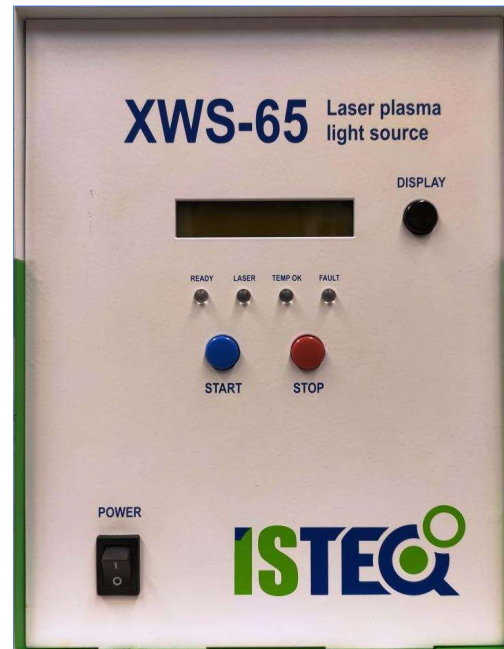| Command	Response
STATUS	STATUS=x where 'x' is: x = 0 – IDLE (ready for operations) x = 1 – STARTING x = 2 – IGNITION x = 3 – PLASMA ON x = 4 – ERROR
ERROR	ERROR=xxxxx Allows to know error flags if STATUS == 4 Flags' packed in 20-bit wide status word Bit 00 – TEC overcurrent channel #1 Bit 01 – TEC overcurrent channel #2 Bit 02 – Abnormal system voltage Bit 03 – TEC temperature sensor shorted Bit 04 – TEC temperature sensor open Bit 05 – TEC FAN1 fail Bit 06 – TEC FAN2 fail Bit 07 – LASER fail (setpoint not reached) Bit 08 – HDC fail (maybe head interface cable's not attached) Bit 09 – TEC link fail Bit 10 – LASER link fail Bit 11 – HDC link fail Bit 12 – Plasma start fail (photodiode feedback) Bit 13 – Plasma down (while in active mode) Bit 14 – LASER overheat (> 35 *C) Bit 15 – Optical head overheat (> 80 *C) Bit 16 – LASER start fail (photodiode feedback) Bit 17 – firmware error Bit 18 – hardware error Bit 19 – unknown error 00000 means NO ERROR
SERIAL	SERIAL=xxxx where 'xxxx' is decimal 4-digit number
FIRMWARE	FIRMWARE=x.xx where 'x.xx' is main controller firmware version

UPTIME	UPTIME=xxxx.x where 'xxxx.x' is laser active time in hours
PWRONTIME	PWRONTIME=xxxxxx where 'xxxxxx' is six digit number – time in seconds since device switched on
LASER_TEMP	LASER_TEMP=xx.xxxx where 'xx.xxxx' is laser module temperature in Celsius
HEAD_TEMP	HEAD_TEMP=xx.xxxx where 'xx.xxxx' is optical head temperature in Celsius
TEC_CUR1	TEC_CUR1=xx.xxxx where 'xx.xxxx' is TEC channel #1 current in Amps
TEC_CUR2	TEC_CUR2=xx.xxxx where 'xx.xxxx' is TEC channel #2 current in Amps
TEC_VOL1	TEC_VOL1=xx.xxxx where 'xx.xxxx' is TEC channel #1 voltage
TEC_VOL2	TEC_VOL2=xx.xxxx where 'xx.xxxx' is TEC channel #2 voltage
TEC_FAN1	TEC_FAN1=xxxx where 'xxxx' is FAN's speed in rpm
TEC_FAN2	TEC_FAN2=xxxx where 'xxxx' is FAN's speed in rpm
LASER_CUR	LASER_CUR=xx.xxxx where 'xx.xxxx' is laser current is Amps
LASER_VOL	LASER_VOL=xx.xxxx where 'xx.xxxx' is laser voltage in Volts
LASER_FET_VOL	LASER_FET_VOL=xx.xxxx where 'xx.xxxx' is laser FET voltage drop in Volts
SUPPLY_VOL	SUPPLY_VOL=xx.xxxx where 'xx.xxxx' is system supply voltage in Volts
PHOTODIODE	PHOTODIODE=xx.xxxx where 'xx.xxxx' is plasma photodiode voltage in Volts
REPORT	REPORT#LEN=x, where 'x' is length of report string Report string value
UNKNOWN	UNKNOWN=xx:xx:xx where 'xx:xx:xx' is power on time in 'hours:minutes:seconds' format
TURN_ON	TURN_ON=[WAIT|OK|ERROR] Turns plasma on & returns result of operation
TURN_OFF	TURN_OFF=[OK|ERROR] Turns plasma off & returns result of operation
LASER_STAT	LASER=[ON|OFF|ERROR]
PLASMA_STAT	PLASMA=[ON|OFF|ERROR]

8. Autocalibration

When the XWS system is just received and prepared to start for the very first time it is needed to calibrate the system. During the calibration the XWS system scans and adjusts internal parameters. This procedure is called Autocalbration.

To start the Autocalbration – the next steps to be taken:

1. Switch OFF the system	
2. Pressing and holding buttons "Display" and "Stop" switch ON the system ("Power" button)	

3. Check the PSU Display. It will be shown: - STARTING - SERVICE MODE: ON - AUTO CALIBRATION	
4. Wait till "PRESS START" is shown on the display. Press "SART": Note: it is not possible to start the autocalbration, if the Optical head temperature (Th) exceed 30*C. If so – it is needed to wait, till Th drops below 30*C.	
5. Wait till the calibration is done. After the system will be restarted automatically.	
6. When system restarted – Autocalbration is done and the source is ready for an operation.	

9. Troubleshooting

| Issue	Recommendation
Control unit (PSU) is not powering up	1. Check that electrical cable is plugged into the control unit (PSU) 2. Check the electrical socket in your facility is working 3. Check and if necessary replace the fuse (5A) on the rear side of the PSU
Light is not generated after pressing the "Start" button	1. Check what is the message and ERROR number shown on the PSU front panel display 2. Contact your supplier
"Fault" LED is blinking	1. Check ERROR number and description on the PSU display 2. Switch off the light source ("Stop" and "Power" buttons) 3. Contact your supplier
Contact the supplier for any other issues. Please provide a serial number, which can be found on the PSU back side (S/N: 1XXX)	

10. Specifications and facility requirements

XWS-65 performance	
Spectral range	190 to 2500 nm (UV configuration), 250 to 2500 nm (Ozone-free configuration)
Spectral brightness (450-500 nm)	Up to 45mW/(mm^2×sr×nm)
Laser power input	65W
Emitting body source dimensions	250×400µm
Lifetime	10,000 hours
Temporal and spatial stability	STD < 0.15%
Main parameters	
Lamp medium	Xenon
Light source head dimensions	130×106×74mm
Control unit dimensions	351×175×232mm
Output aperture (by default)	24mm
Output NA (by default)	0.4
Optical design	
External optic interface	C-mount
Pumping laser wavelength	NIR
Power input	Via fiber
Optional configurations:	
Source spectrum	UV or Ozone free
Light output	Free space or fiber coupled
Additional	
External control	Ethernet (Web Interface), COM-port (RS232)
Interlock	Db-15 connector

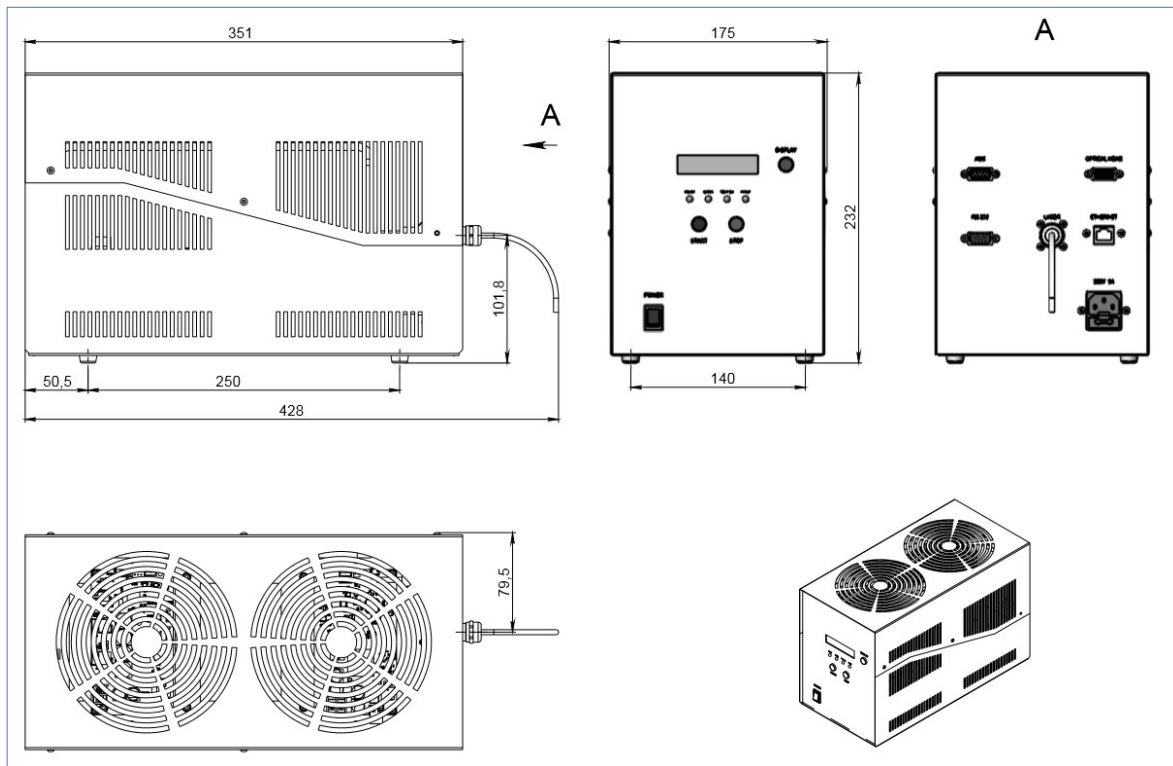|	
Distant plasma start and stop	Db-15 connector
Electricity requirements	
Voltage	110-220V±10%
Frequency	50Hz
Power consumption	Up to 350W

11. XWS-65 light source head dimension

Linear dimensions: 130x106x74mm
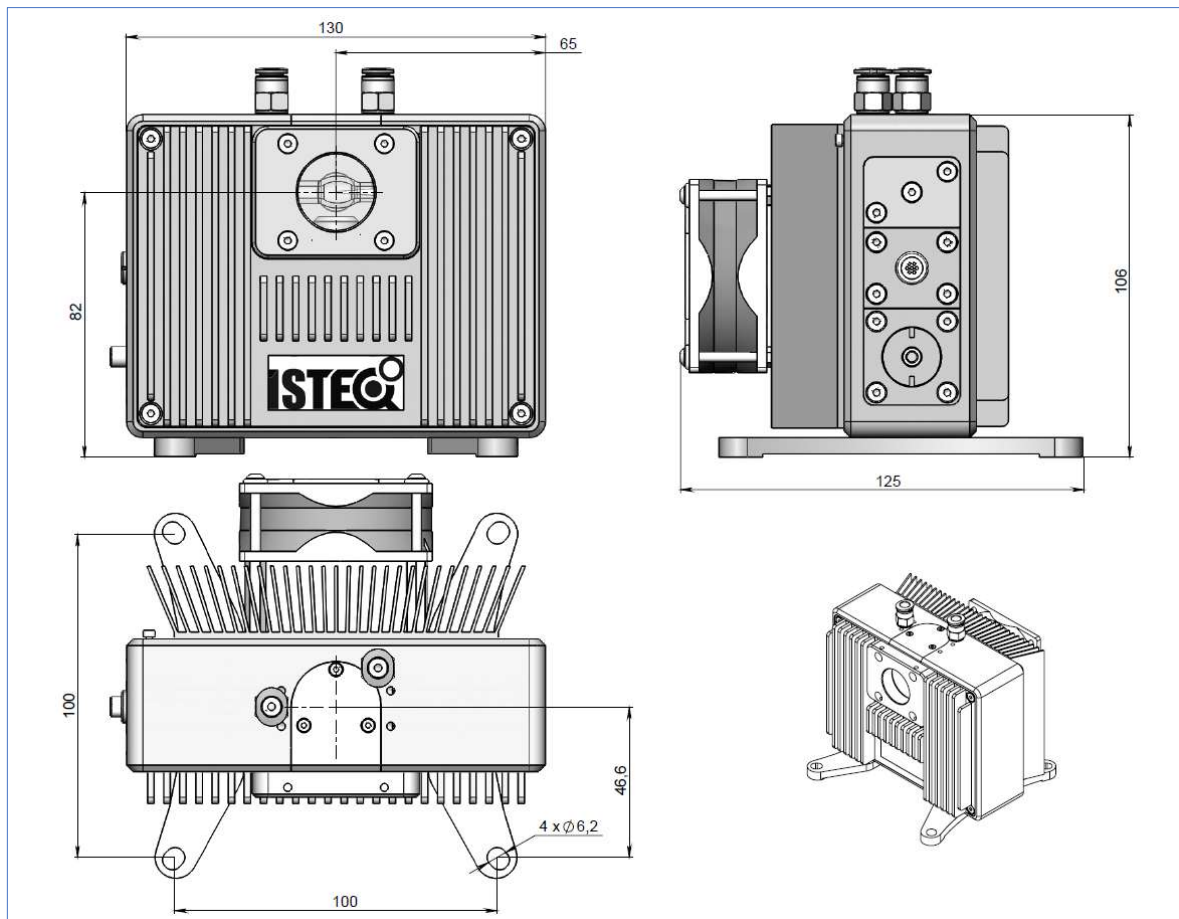
12. Controller unit (PSU) dimension

Linear dimensions: 351x175x232mm

13. ISTEQ contacts

If you have any questions regarding the XWS source – feel free to contact your supplier or ISTEQ directly:

Address: The Netherlands, Eindhoven, High Tech Campus 9, 5656AE

Website: www.isteq.nl

Phones: +31(0)40-230-42-42, +31(0)62-525-7382 (mob)

E-mail: info@isteq.nl

14. Photonics4Work contacts

For any commercial information or if you have any questions regarding the XWS source contact:

Address: The Netherlands, Zevenaar, 6903 PZ, Mercurion 26

Website: www.photonics4work.eu

Phones: +31 31 – 316 340804 (Office), +31 6 – 22 40 60 27 (mobile)

E-mail: contact@photonics4work.eu