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SF550-Series **PRODUCT MANUAL**

CW / QCW Laser Diode Driver

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User Manual

SF550-Series

Laser Diode Driver

Before working with the laser diode driver, read this manual thoroughly. If you have questions or comments, please contact us immediately.

Introduction

The SF550-Series laser diode drivers are designed for driving high power laser diode stacks, bars, and arrays, and are ideal for use in industrial or laboratory environments. The drivers deliver precision adjustable drive current, and provide control of the frequency and duration of current pulses.

The SF550 is controlled from the front panel or with PC via RS-232 interface.

Safety Requirements

1. Before operating this laser diode driver, personnel should familiarize themselves with the safe operating principles of the laser diode driver and high power solid state lasers.
2. The laser diode driver is to be dismantled and repaired by the manufacturer only.
3. Operations requiring the movement of the laser diode driver and attached components, including the laser diode, must be conducted only after the power is switched off, the internal capacitor banks have discharged, and the power cable is disconnected. After switching off the power, wait three minutes for the capacitor bank to discharge before removing the mains power cable.
4. Before connecting the mains electrical supply, install the case-grounding strap. Disconnect the mains electrical supply before disconnecting the case-grounding strap.
5. Use only low-resistance grounding conductor to connect to the case-ground lug of the instrument. Connect the ground conductor only to approved facility electrical grounding points. **DO NOT CONNECT THE GROUNDING CONDUCTOR TO WATER PIPES, GAS PIPES, OR OTHER NON-APPROVED FACILITY FIXTURES.**
6. If any abnormal noises arise during supply operation, such as a crackling noise, buzz, squealing, or other unusual sounds, the laser diode driver is to be immediately disconnected from the mains power. Contact us for assistance rectifying the problem.

Specifications

	SF550-160/30	SF550-120/40	SF550-80/60	SF550-60/80	SF550-40/120
- Pulse (QCW) mode -					
Pulse rate* (F)	1-1000 Hz, single mode				
Output voltage* (V)	0-30V	0-40V	0-60V	0-80V	0-120V
Output current* (I)	1-320A	1-240A	1-160A	1-120A	1-80A
Pulse duration* (τ)	50-1000 μ s				
Rise time**	<60 μ s				
Fall time**	<60 μ s				
- CW mode -					
Output voltage* (V)	0-30V	0-40V	0-60V	0-80V	0-120V
Output current* (I)	1-160A	1-120A	1-80A	1-60A	1-40A
- General characteristics -					
Output current tolerance	0.3 %				
Average output power* (P)	4.8 kW				
Data display	LCD				
Communication interface	RS232, RS485 (optional)				
Trigger in	5 V, 10 μ s				
Trigger out	5 V, 10 μ s				
Interlock	switch contact closure				
Cooling	air cooled				
Power Input	three phase 220/380 VAC, 50Hz				
Dimensions	440*177*520 mm; 4U				
Weight	25 kg				

* Values are limited by average power: $F \cdot V \cdot I \cdot \tau \leq P$ (pulse mode); $V \cdot I \leq P$ (CW mode)

**With a length of laser diode power wire is not more than 2m

Delivery Set

- Power supply unit..... 1 pc.
- User manual 1 pc.
- Test report..... 1 pc.

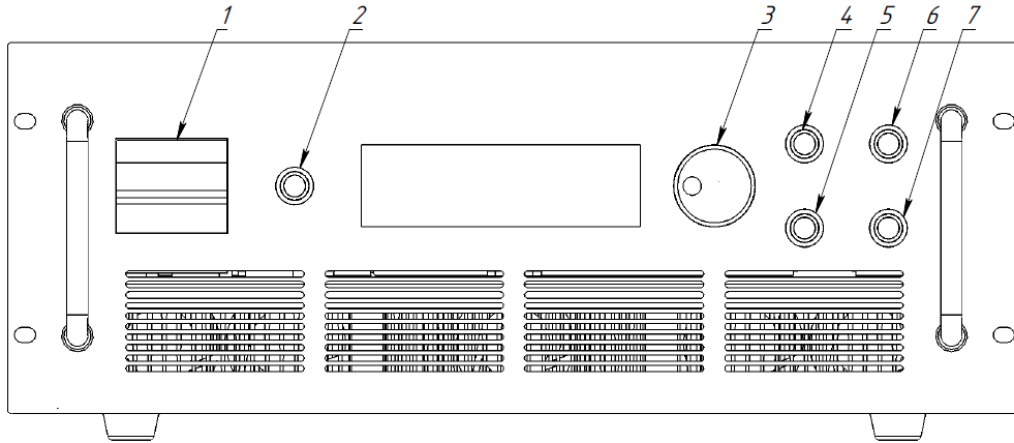
Operating Conditions

- Ambient temperature from +10°C to 35°C;
- Humidity 80% (at +25°C);
- Atmospheric pressure from 84 kPa to 106 kPa;
- Air free from corrosive vapours.



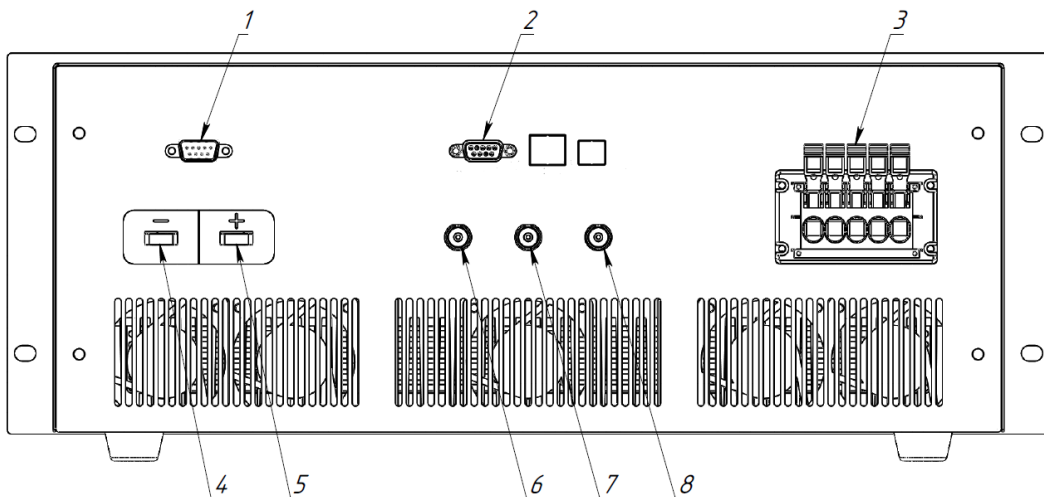
Views

SF550 laser driver is made in a standard 19" 4U case. The front and back panel of the unit are shown.



Front panel SF550

- | | |
|-------------------------|--------------------|
| 1 – circuit breaker | 5 – "START" button |
| 2 – on/off key switch | 6 – "MODE" button |
| 3 – encoder | 7 – "STOP" button |
| 4 – "EXT. TRIG." button | |

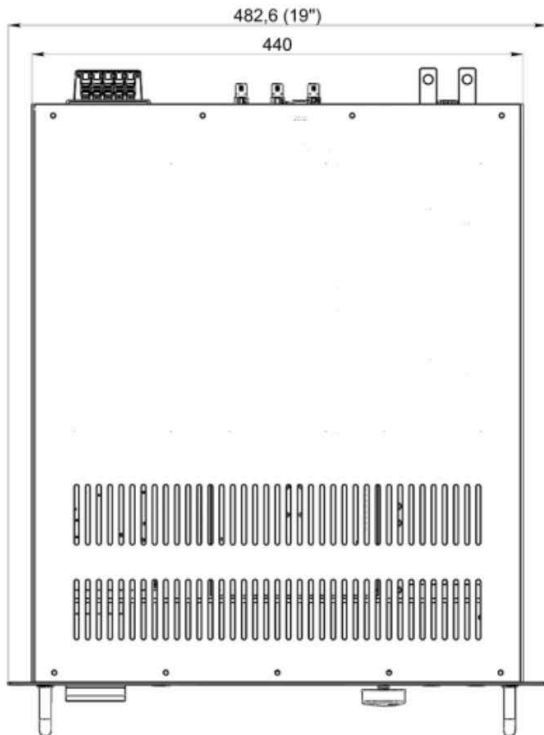
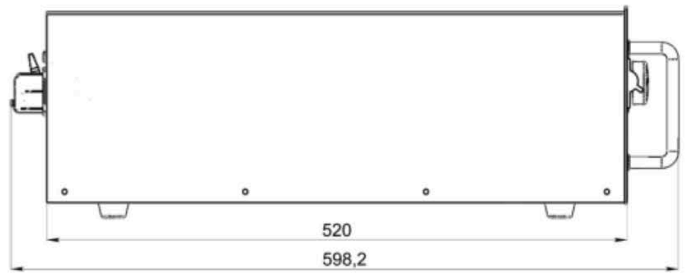
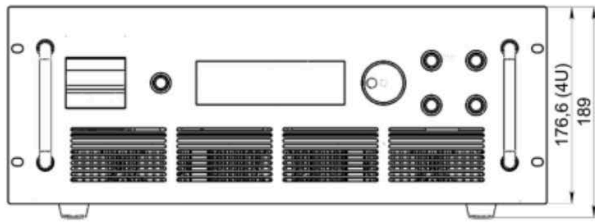


Back panel SF550

- | | |
|-------------------------------------|-------------------------------|
| 1 – interlock connector (DB-9-F) | 6 – current monitor connector |
| 2 – communication connector (RS232) | 7 – trigger output connector |
| 3 – input power | 8 – trigger input connector |
| 4 – LD – terminal | |
| 5 – LD + terminal | |




Dimensions



SF550

The table below illustrates the front-panel display icons and the meanings.

Table 1.

Indication element	Description
Hz	Frequency adjustment mode
ms	Pulse width adjustment mode
I	Pump current amplitude adjustment mode
V	Voltage adjustment mode
T_o	Output sync delay adjustment mode
Go	Front panel lock icon
RS₂₃₂	Link with PC using 232 interface
	Triggering of internal thermal protection
ILK	Triggering of external protection
24V	Error of internal power supply
Er00	Shut down due to external protection error
Er01	Shut down due to internal thermal protection error
Er02	Shut down due to internal power supply error
Er03	Shut down due to triggering protection of pulse width is more than setted, overcurrent or overvoltage on output switch

Setting Up the SF550 Laser Diode Driver

ATTENTION!

All operations related to SF550-Seroes laser diode driver installation and connection must only be carried out with power supply off and mains supply power plug removed from the socket. Any operations associated with connection and disconnection of the SF550 from the main electrical supply may be carried out three minutes after the SF550 has been switched off.

1. Unpack the SF550 laser diode driver from the shipping container. Retain the packaging for future use when storing or transporting the unit.
2. Locate the unit on a flat and stable surface, or mount the unit in a 19" rack enclosure using standard rack-mount hardware.
3. Connect the case ground conductor to the unit. Connect the other end of the case ground conductor to an approved electrical grounding point. Do not connect the grounding conductor to unapproved fixtures, such as water lines, gas lines, or other facility fixtures.
4. Connect the mains electrical cable. Use only the included mains power cable.

ATTENTION!

To ensure reliable and stable operation it is recommended to supply the SF550 from individual socket ~ three phase 220/380 VAC, 50Hz with feeder cable cross-section a minimum 1.5 mm² (AWG 15 minimum) The unit is to be earthed with individual wire to general earthing network, and the ground wire cross-section shall be 2.5mm² at least (AWG 13 minimum). It is strongly recommended to use only the original mains cable that was delivered with the unit.

5. Connect a laser diode stack or a dummy load (eg. a Schottky diode which is the electrical equivalent of your laser diode) to the laser diode power cable. Connect the laser diode power cable to the SF550 LD+ and LD- terminals. Note device and connection polarity.
6. Switch on the rear-panel circuit breaker.
7. Switch the ON/OFF key switch to position I. After that «STOP» button lights on.
8. Connect the Interconnect cable to the back panel.

ATTENTION!

During the first start-up avoid using large parameter values. For instance, do not set maximum current, pulse duration, and frequency at once. Ensure test run of the unit by gradually increasing pulse energy. Start by testing single pulses at the LD threshold current, and slowly increase the drive current, frequency, and pulse duration..

9. Select the operating mode. Hold the «MODE» «STOP» button to change CW/QCW mode.

10. Setting control values is performed as follows: Turn the encoder knob - clockwise increases the value, counterclockwise reduces the value. Selection of the control parameter is performed using the button «MODE» (of frequency, pulse duration, current, voltage).

When operating in QCW Mode, set required values of frequency, pulse duration, current, voltage in QCW mode. When operating in CW mode, set the required values of current and voltage in CW mode.

11. Set the operating voltage. Tuning of the operating voltage should be done once for each particular laser diode stack. Referencing the nominal voltage from the laser diode specifications, and increase it by 1 - 1.5 V. The added 1 - 1.5 V will be dissipated on the output transistor, connectors, and power wires. For example: for a single diode with nominal voltage about 10 V, set operation voltage of the supply unit equal to 11 - 11.5 V. It is preferable to start with such voltage and check the current shape with the oscilloscope. If the pulse shape isn't correct, increase voltage a little. Avoid setting the voltage too high (greater than 3 - 5 V over nominal voltage of the load) to avoid power supply overheat.

12. Switch the ON/OFF key to position II to start charging the output module. Note that the output current is not yet enabled.

13. Select the synchronization setting. The pulse output parameters of the SF550 can be set by external source, or by the internal pulse generator in manual mode. Select the synchronization mode by pressing the «EXT. TRIG.» button .


In manual mode, the frequency of the current pulse output is programmed from the front panel. When the SF550 is in external synchronization mode all the parameters except frequency are changed from the front panel or from a PC.



14. After the required parameters are set, press the «START» button. In QCW Mode, generation of current pulses in internal synchronization mode will begin after the «START» button is pressed.
15. To switch off the output current, first press the «STOP» button. Then switch the ON/OFF key switch to position I. To switch off power to the SD530, after 10-15 seconds, switch the ON/OFF key switch to position 0. The SF550 automatically stores all settings and recalls them during next start-up.
16. The front panel can be locked so that parameters can not be changed. To enable the locking function for control panel, press and hold the «STOP» button for about 5 seconds until blocking icon appears in the left corner of LCD display. When this function is active the SF550 does not respond to encoder rotation, or to the «EXT. TRIG.» and «MODE» buttons. This lock function does not lock out the key switch, or the «START» and «STOP» buttons. To disable the lock mode, press and hold the «STOP» button for about 5 seconds until the locking icon disappears.
17. The SF550 can be controlled by computer via RS-232 interface. Communication protocols and software description are provided in a separate document.
18. The power supply has a pulse counter for QCW mode, operating time measurement for CW mode.
19. To change the display mode for the pulse counter, press and hold the "MODE" button in QCW mode for 3 seconds. The top line of the counter is resettable, the lower line is not resettable (the number of pulses during the all operation time of the power supply). To reset the pulse counter press and hold the "STOP" button for about 3 seconds when in pulse counter display mode.
20. To change the display mode for the operating time measurement press and hold the "MODE" button in CW mode for 3 seconds. The top line of the operating time display is resettable, the bottom line is not resettable (total operation time of the power supply). To reset the operating time measurement press and hold the "STOP" button for 3 seconds.

Connector Interfaces

Input power connector

Sign	Description
A	L1
B	L2
C	L3
N	N
	PE

Interlock connector (DB-9-F)

Contact	Description
1	Interlock (Normally closed)
2	Interlock (Normally closed)
3-9	Not used

RS232 connector (DB-9-F)

Contact	Description
1	Not used
2	RxD
3	TxD
4	Not used
5	GND
6-9	Not used

Transportation and Storage

SF550 is to be transported in the factory packaging only. Transportation conditions:

- air temperature between +5 and +40°C;
- relative humidity maximum 80% at +25°C without moisture condensation;
- atmospheric pressure between 84 and 106 kPa.

SF550 shall be stored in original packaging, or without it in closed storehouses on shelves, at temperature between +5 and +40°C and relative humidity maximum 80% at +25°C without moisture condensation. In case SF550 is stored without the original packaging it is necessary to cover the unit with polyethylene film to protect it against dust.

Maintenance

The SF550 does not require periodic maintenance. It is recommended to keep the unit clean, using a slightly damp cloth to remove dust from case. With the grounding strap connecting the unit to the facility earth ground, use a soft brush and vacuum cleaner to clean air holes.

After completion of the guaranteed life, expert diagnostics may be required to identify any parts to be replaced. In case of long-term outages it is recommended to cover the unit with polyethylene film to protect it against dust.

Manufacturer warranty

Manufacturer guarantees that this power supply meets specified technical characteristics provided operation modes and conditions, storage and transportation rules are observed by the user.

Guarantee period is 12 months as of shipment with warranty time between failure of 2000 hours. During warranty period the manufacturer shall be entitled to rectify revealed defects free of charge or replace device parts being out of service, if the manufacturer is responsible for these defects.

Certificate of acceptance

Laser Diode Driver SF550 corresponds to the set of design documentation.

Product: Power Supply	Model: SF550-
Serial number	Manufacture date