



The universal driver for LEDs **D-31M**

Operations manual

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1. Application.

The driver D-31M is designed for power supply of Mid-IR LEDs manufactured by IBSG.

2. Features.

- The driver D-31M provides two modes of operation: Quasi Continuous Wave mode (the mode of *maximum average optical power* from the LED) and pulse mode (the mode of *maximum peak optical power* from the LED).
- The possibility to tune the LED current amplitude, repetition rate and pulse duration, to select the optimal mode of the LED.
- The synchronization capability with a selective amplifier or with some other device.
- Easy and durable in use.

3. Service conditions.

Temperature tolerance	-15 °C..+50 °C
Relative air humidity (at temperature + 35°C)	less then 80 %
Atmospheric pressure	86..107 kPa

4. Appearance of the driver and its interface.

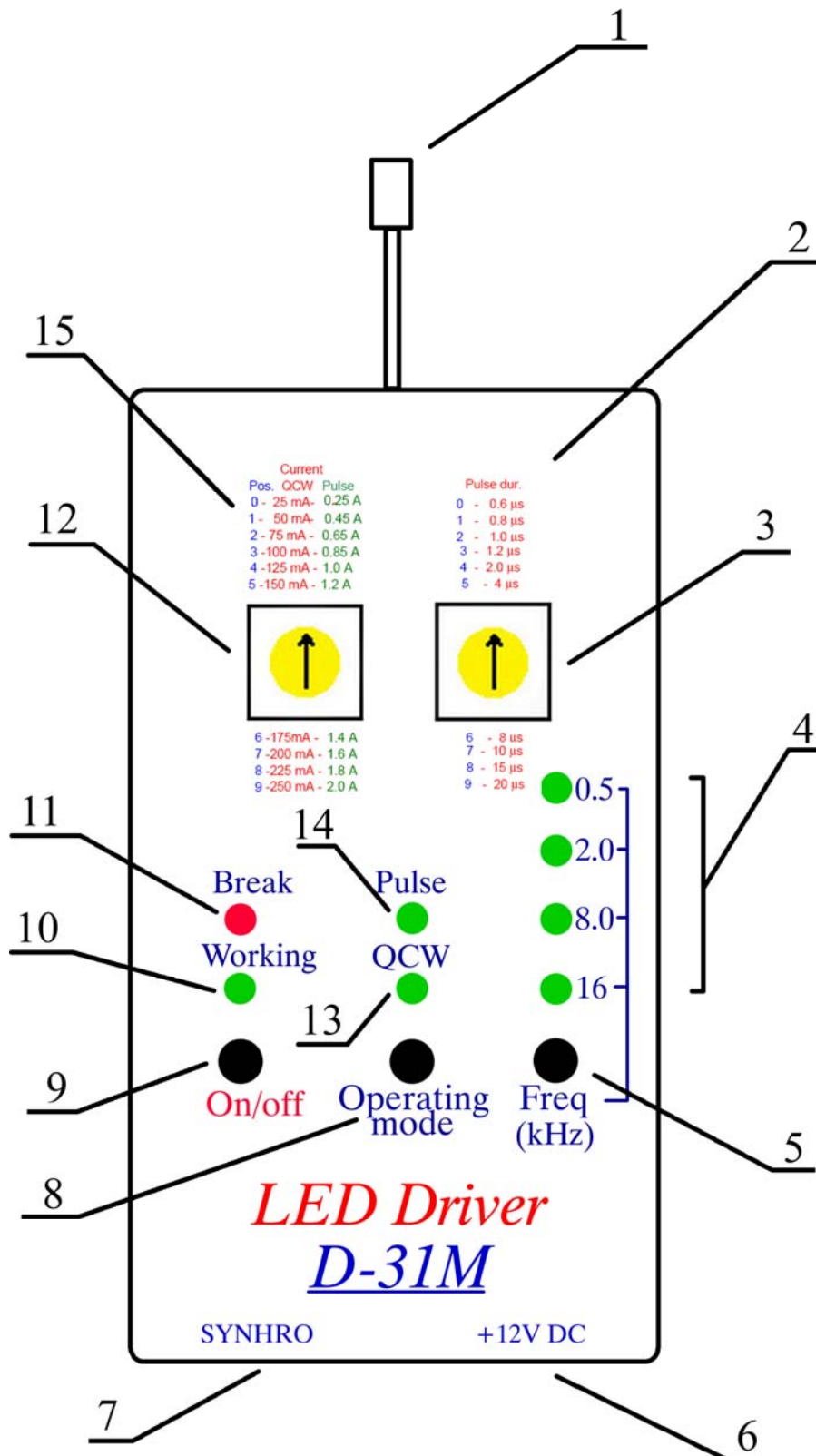


Fig.1. Appearance of the driver and its interface.

1. The jack for the LED connection.
2. Lookup table of switch position and pulse duration. (The table for switch position correlation with pulse duration)
3. The multiposition switch for adjusting the pulse duration.
4. The indicators of selected frequency.
5. The button of frequency selection.
6. The jack for the cable of AC/DC adapter.
7. The jack for synchronization cable.
8. The button of mode selection.
9. The start/stop button of LED power supply.
10. The LED current indicator.
11. The red LED indicator of failure of LED current.
12. The multiposition switch for adjusting the LED current.
13. The green LED indicator of quasi continuous wave mode.
14. The green LED indicator of pulse mode.
15. Lookup table of switch position and LED current amplitude. (The table for switch position correlation with LED current amplitude)

5. Mode description.

Driver provides two modes of operation: Quasi Continuous Wave (quasi steady-state) mode and Pulse mode.

5.1. Quasi continuous wave mode – the oscillating mode of symmetrical unipolar meander (fig.2.). Such mode provides maximum average optical power from the LED. The Led current in this mode can be changed in the range from 20 to 250 mA by using the multiposition switch for adjusting the LED current (12). Using the button 5 one of four frequencies (512 Hz, 2 kHz, 8 kHz and 16 kHz) can be selected. The pulse duration will be respectively equal 250 μ s, 100 μ s, 62 μ s and 31 μ s.

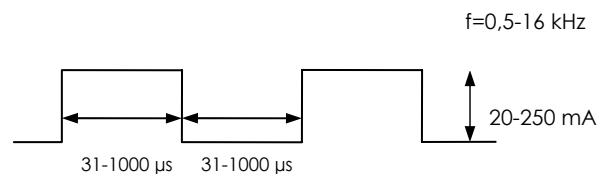


Fig.2. Current-time relation in case of continuous wave mode.

5.2. Pulse mode – the oscillating mode of pulse sequence (fig.3). Such mode provides maximum peak optical power from the LED. Similarly to the quasi continuous wave mode, by adjusting the switch 12 the LED current can be changed, but in the wider range: from 0,1 to 2,0 A. Using the button 5 one of four frequencies (512 Hz, 2 kHz, 8 kHz and 16 kHz) can be selected. Pulse duration can be also selected in the range from 0.6 to 20 μ s with the help of switch 3.

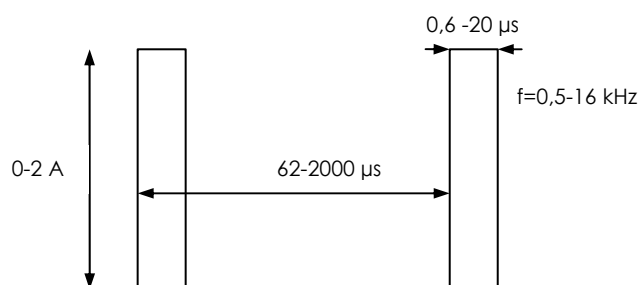


Fig.2. Current-time relation in case of pulse mode.

Note! Please, don't use the combination of frequency and pulse duration that gives a duty cycle more than 10 percents (table 1).

Note! We recommend to use the pulse current amount to 2 A only at pulse duration less than 1 μ s. Otherwise used LED can be broken.

		Frequency			
		512 Hz	2 kHz	8 kHz	16 kHz
Pulse duration, μ s	0,6	Permissible	Permissible	Permissible	Permissible
	0,8	Permissible	Permissible	Permissible	Permissible
	1	Permissible	Permissible	Permissible	Permissible
	1,2	Permissible	Permissible	Permissible	Permissible
	2	Permissible	Permissible	Permissible	Permissible
	4	Permissible	Permissible	Permissible	Permissible
	8	Permissible	Permissible	Permissible	Impermissible
	10	Permissible	Permissible	Impermissible	Impermissible
	15	Permissible	Impermissible	Impermissible	Impermissible
	20	Permissible	Impermissible	Impermissible	Impermissible

Table 1. **Permissible** and **impermissible** combinations of frequency and pulse duration in pulse mode.

6. Operating instruction.

1. Carefully combine the wires of the LED with pins of connector “LED” (1) tightly till fixation.

Note! Marked with the red point pin of connector “LED” must be connected with the appropriate wire of the LED (It’s marked with the red point too). In the case of wrong junction the LED can be damaged.

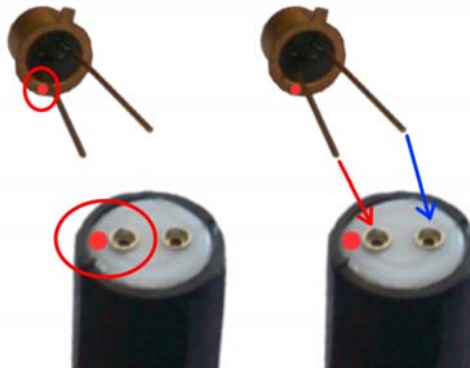


Fig.4. Observance of polarity during the connection between the LED and the LED connector (1).

Note! LED case must be electrically isolated from the ground.

2. If necessary with the help of cable for synchronization connect the signal detector with the driver D-31M (jack “SYNCR0” (7)).

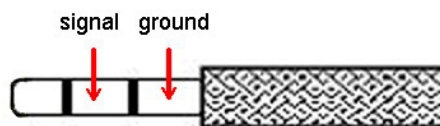


Fig.5. The polarity of jackplug of cable for synchronization.

3. Insert the jackplug of cable of AC/DC adapter into connector "+12V DC" (6).

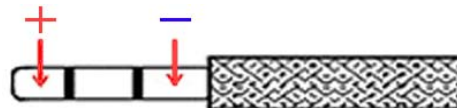


Fig.6. The polarity of jackplug of power cable.

4. Using the button “Operation mode” (8) select the operating mode of the driver: QCW or pulse. The appropriate green LED indicator “Pulse” (14) or “QCW” (13) will be turned on.

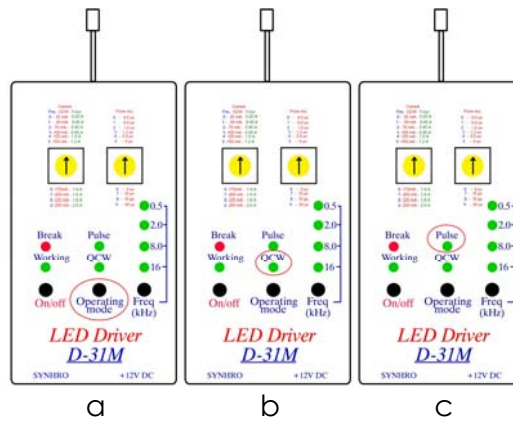


Fig.7. a – the button of mode selection, b – QCW mode, c – pulse mode.

5. Set the switch “ I_{adjust} ” (12) to the position “0”, corresponding the minimum value of LED current.
6. Using the button “Freq” (5) select one of four values of frequency. In the case of working in the pulse mode select the requisite value of pulse duration by adjusting the switch “ τ_{pulse} ” (3) and using the table 2 on the driver case.

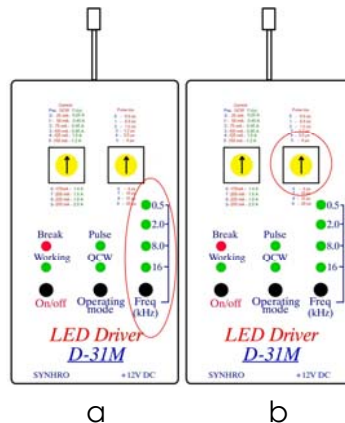


Fig.8. a – the button of frequency selection and the indicators of selected frequency, b – multiposition switch for adjusting the pulse duration.

7. Switch on the LED current by depress the button “Current ON/OFF” (9). The green LED indicator “Work” (10) will be turned on. In the event that the red LED indicator “Break” (11) go on working that will be mean the failure of LED current (That is the LED is damaged). After that, set the LED current using the switch 12 and table 15.

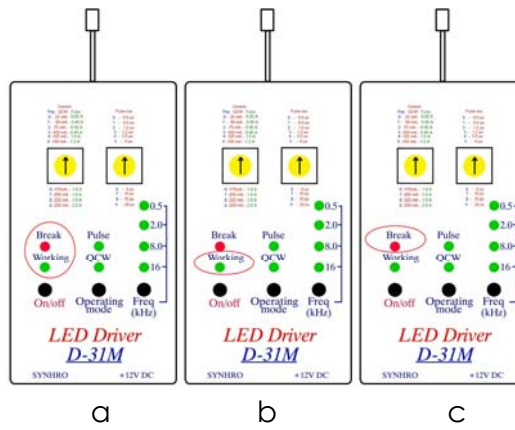


Fig.9. a – the LED current is off, b – the Led current is on, c – the LED current is on, but the LED circuit is broken .

8. Please, ascertain that the running LED current complies with the LED specification.

7. Technical characteristics.

Input voltage	+12 V, stabilized
Voltage tolerance	-5..+5 %
Power consumption	Less then 4 W
Adjustment temperature range	-10 °C..+25 °C
Board dimensions	90×50×25 mm
Weight	90 g

	QCW mode	Pulsed mode
Pulse duration	31 – 1000 μ s	0,6 – 20 μ s
Repetition rate (Frequency)	0,5 – 16 kHz	0,5 – 16 kHz
Output current amplitude	20 – 250 mA	0,1- 2,0 A

8. Block diagram

The driver block diagramme (pulse power supply) D-31M is presented in fig.10.

The pulse power supply of light-emitting diodes functionally consists of generator G, single-shot multivibrator M, multiplexer MX1, voltage-to-current converter U/I, the pulse power supply converter DC/DCLED.

The generator G forms the pulse sequence with variable repetition rate. The repetition rate can be changed with the help of the button "Frequency". It's indicated by light-emitting diodes "2 kHz", "4 kHz", "8 kHz", "16kHz". The waiting multivibrator M and the multiplexer MX1 receive the voltage impulses in the form of a meander from generator G .

The single-shot multivibrator M generates voltage impulses with the adjustable fixed duration synchronously with rise-up portion of input voltage impulses. Switching of duration of impulses is carried out by means of switch SW1 in the range from 0,6 to 20 μs .

The multiplexer MX1 by means of the button "Operating mode" switch the clock pulses on the input of voltage-to-current converter U/I. In addition clock pulses come to the jack "Synchro" for synchronisation with the external photoreception amplifier.

The IR-light-emitting diode LED receive a pulse current from U/I converter. Start-up of circuit U/I is carried out by means of the button "Current ON/OFF". The green light-emitting diode "Work" lights up in that case . If the circuit of the LED is broken the light-emitting diode "Break" lights up. Adjustment of the amplitude of the LED pulse current is implemented by means of a multiposition switch SW2.

The DC / DC circuit is a pulse voltage converter from + 12 V in + 5 V, -5 V for power supply of all the elements of the D-31M. The input voltage of DC / DC converter supplies from "+12 VDC" jack.

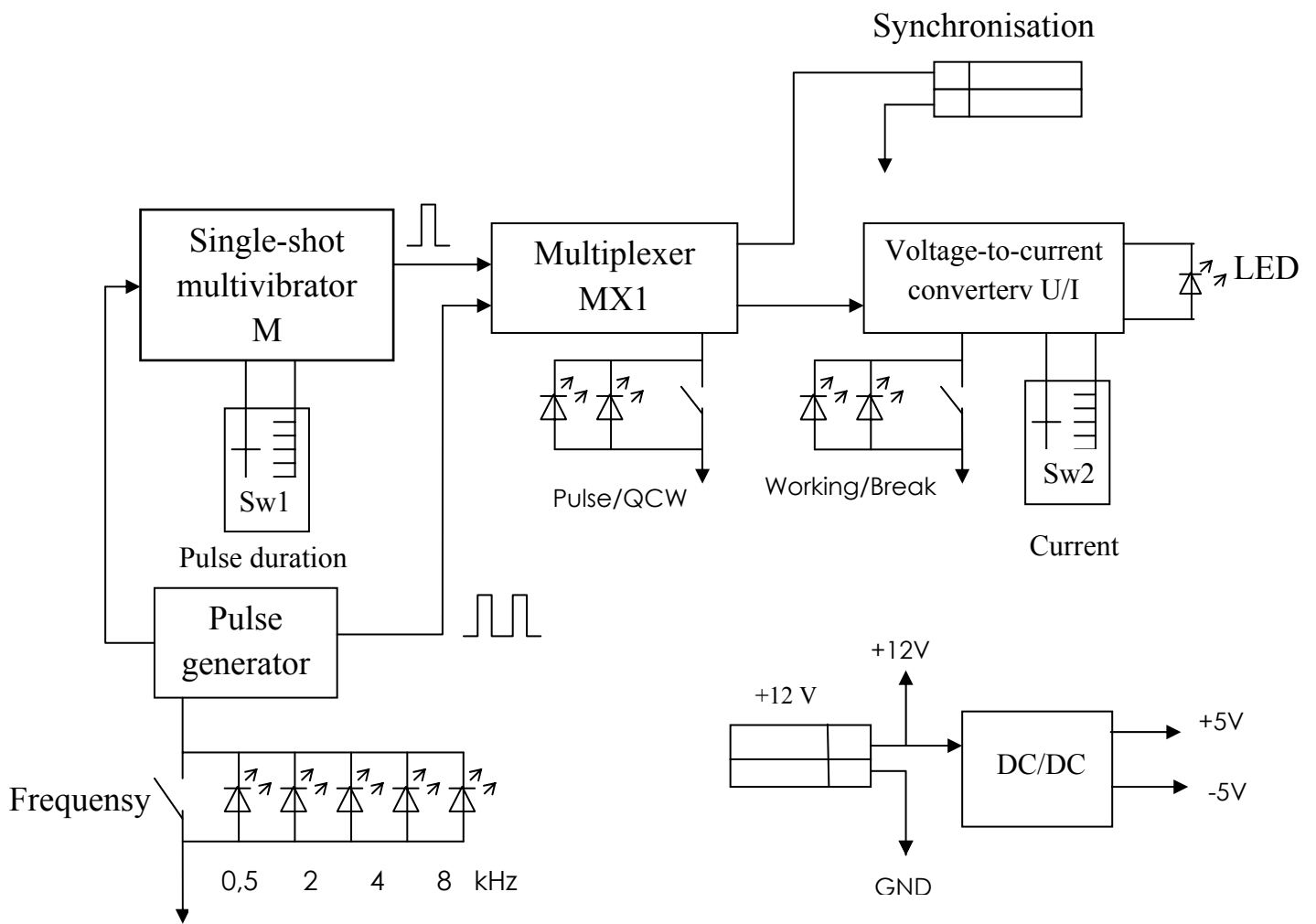


Fig.10. The Block diagram of D-31M.