



DQ-100-4

High Voltage Driver

Technical Description

2021
Lithuania

CONTENTS

CHAPTER 1 WARRANTY	1
1.1. WARRANTY STATEMENT	1
1.2. SERVICE CONTACT INFORMATION	1
CHAPTER 2 SPECIFICATIONS	2
2.1. GENERAL INFORMATION	2
2.1.1. <i>Model</i>	2
2.1.2. <i>Main Components</i>	2
2.2. TECHNICAL SPECIFICATIONS	2
CHAPTER 3 DEVICE LAYOUT	3
CHAPTER 4 SAFETY	5
CHAPTER 5 QUICK START GUIDE	6
CHAPTER 6 IMPORTANT NOTES	8

LIST OF FIGURES

FIGURE 1. OUTLINE DRAWING AND DIMENSIONS OF THE DRIVER	3
FIGURE 2. TOP VIEW OF THE DRIVER.....	4
FIGURE 3. INPUT CIRCUIT OF DRIVER	7
FIGURE 4. CONTROL TIMING CHARTS	7

LIST OF TABLES

TABLE 1. MAIN COMPONENTS	2
TABLE 2. TECHNICAL SPECIFICATIONS.....	2
TABLE 3. PORTS SEEN IN TOP VIEW OF THE DRIVER.....	4

1.1. Warranty Statement

This Pockels cell driver DQ-100-4 is protected by one-year warranty covering labor and parts. The warranty enters into validity since the shipment date. Any evidence of improper use or unauthorized attempts at repair leads to warranty cancellation.

1.2. Service Contact Information

In case of service required or any questions on warranty, please notify:

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2.1. General Information

2.1.1. Model

DQ-100-4

2.1.2. Main Components

Table 1. Main components

Component	Quantity
High voltage (HV) driver DQ-100-4	1
Set of DC power and sync. Cable (l=1.5m)	1
HV cable (l=1.5m; soldered to DQ-100-4)	1
Technical description	1

2.2. Technical Specifications

Table 2. Technical specifications

Parameter	Specifications
Maximum working voltage (HV), <i>kV</i>	4
Maximum HV consumption (HV load = 6 pF), <i>W</i>	36
Polarity	Positive
HV pulse rise time, <i>ns</i>	< 7
HV pulse fall time, <i>us</i>	~2
HV pulse duration, <i>ns</i>	180
Maximum HV repetition rate, <i>kHz</i>	100
HV pulse delay, <i>ns</i>	35
External triggering pulse amplitude @50Ω load, <i>V</i>	3.5...5
External triggering pulse rise time, <i>ns</i>	< 20
External triggering pulse duration, <i>ns</i>	100...1000
Low voltage DC requirements	9...25 V; 150mA
Connector for DC power suppling and HV driving	KK 2.54mm 5k
Dimensions, mm	104 x 52 x 23
Maximal operating temperature of base plate, °C	35
Weight, g	160

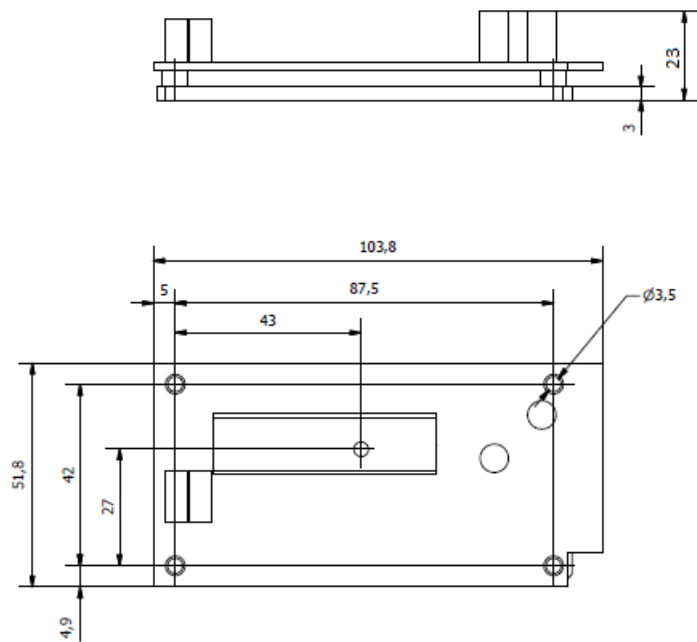


Figure 1. Outline drawing and dimensions of the driver

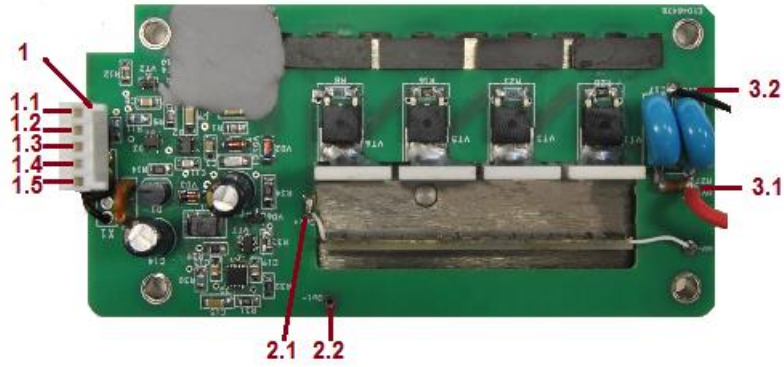


Figure 2. Top view of the driver

Table 3. Ports seen in top view of the driver

#	Port
1	Connector for DC power supplying and HV driving
1.1	Pin1 SYNC IN input
1.2	Pin2 GND
1.3	Pin3 +DC power input
1.4	Pin4 N.C.
1.5	Pin5 GND
2.1	HV pulse output pin +OUT
2.2	GND output pin
3.1	+HV Power input pin
3.2	GND input pin from HV supply

Equipment is designed to be safe under normal environmental conditions according to 1.4.1. 61010-1@IEC:2010 (Safety requirements for electrical equipment, control and laboratory use):

- a) indoor use;
- b) altitude up to 2000 m;
- c) temperature 5°C to 35°C;
- d) maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 35°C;
- e) POLLUTION degree 1: no POLLUTION or only dry, non-conductive POLLUTION occurs.

Warning:

The safety of the system incorporating driver and HV power supply is the responsibility of the assembler of the system.

Operating the driver is allowed to persons acquainted with the operation manual and having permission to deal with voltages over 1000 V.

Do not remove unit covers while power cable is connected to the mains (if applicable).

Do not touch any parts of the system when high voltage is applied, as it may cause human injuries or death.

Do not operate the unit until it is **grounded** and the load is connected.

Do not use the unit if any defects have been detected.

1. Set-up cooling

This driver is cooled by attaching the base plate to a large enough heat sink. The cooling should ensure the base plate temperature does not exceed 35°C during operation. The power to be removed by cooling is equal to HV power supply power consumption.

The driver is attached to a heat sink via the copper base plate. When using an external heat sink to cool the driver, apply thermal paste between the driver base plate and heat sink.

2. Connect wires to the Pockels cell

There are several requirements for the wires leading from outputs OUT and GND to the Pockels cell.

The wires must be about 0.24 mm² CSA. Both wires must be as short as possible and of equal length. Their length must not exceed 100 mm. The hot wire must be at least 5 mm away from any conductive materials (including the operator's fingers and instruments) – this is done to avoid any additional capacitive load. Otherwise, the driver's characteristics may degrade and/or the driver may get damaged.

3. Ground the Pockels cell driver together with the generator and HV supply

The driver output of several kilovolts (kV) with very fast edges is a powerful source of electromagnetic interference (EMI). Please ensure proper wiring and grounding to avoid problems caused by interference.

The best solution to minimize EMI is to mount the driver and the HV power supply on the metal body of the laser. The driver base plate must have very good contact with the ground wire of the HV power supply, such as the four mounting holes on the edges of the board.

If the EMI level is still very high, attempt mounting ferrites on all power and control wires leading to the driver and power supply (except wires to the Pockels cell).

Please note that the aluminum case of the driver is not designed to provide effective EMI shielding. Essentially, correct wiring provides best results.

4. Supply voltage to the driver from the DC power supply

For a safe start of the driver, the DC power supply must provide at least 0.6 A peak current when turning on. Although most DC power supplies are capable of providing this, it is recommended to double-check your supply as an insufficient peak current may damage the driver.

5. Supply voltage from the HV supply

If the HV power supply is manufactured by another manufacturer, ensure that there is no overvoltage while turning it on before supplying voltage.

6. Provide synchronization pulses from the generator

It is necessary to measure the generator output voltage with a 50 Ω load before applying synchronization signals to the DQ-100-4 driver. The signal voltage must be in the range of 3.5...5 V.

After the generator output voltage is measured, remove the 50 Ω load and provide synchronization pulses to the driver.

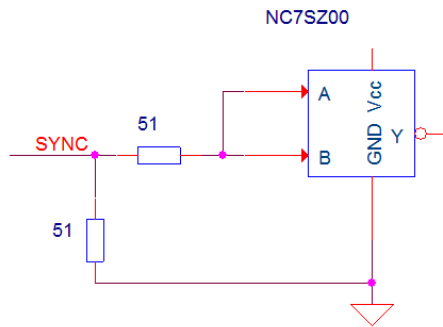


Figure 3. Input circuit of driver

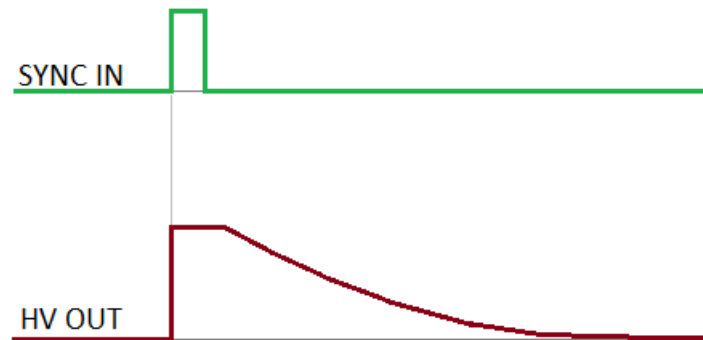


Figure 4. Control timing charts

Please read these important notes before using the product!

- 1.** The output pulse is provided between OUT and GND connectors. Do not connect an oscilloscope or any other device to the OUT connector. The wire contact with the Pockels cell must be proper in order to avoid a discharge, which may damage the driver.
- 2.** The pulse shape (including fronts) can be measured indirectly. On your oscilloscope, select 1 V sensitivity and the 1 M Ω input. Then the isolated 1:10 divider should be *slowly* and *carefully* moved towards the hot output wire. When the probe is ~10 mm away from the hot output wire, the pulse shape should appear in the oscilloscope (amplitude should be several volts). Do not place the probe too close to the hot output wire – a discharge may start and damage the driver. This measurement method is not suitable for measuring >500 ns pulses.
- 3.** Do not attempt to measure the parameters of any parts of the driver's electronics using an oscilloscope, especially when the driver is running in pulsed mode. Attempts to measure parameters of certain parts of the driver's circuitry may lead to damage.