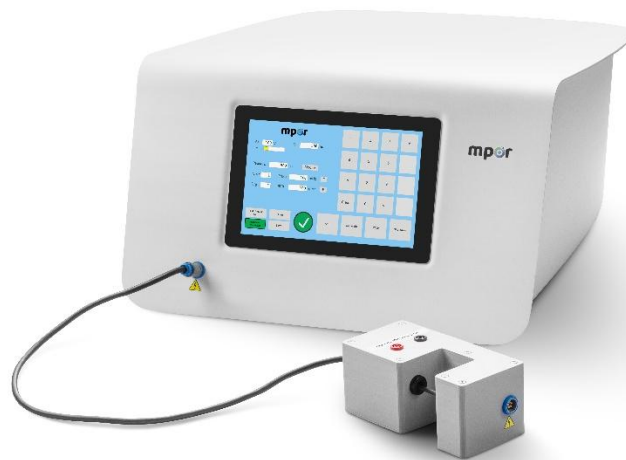




LABORATORY HIGH-FREQUENCY ELECTROPORATOR

L-POR 3 kV Version 1.1 Datasheet

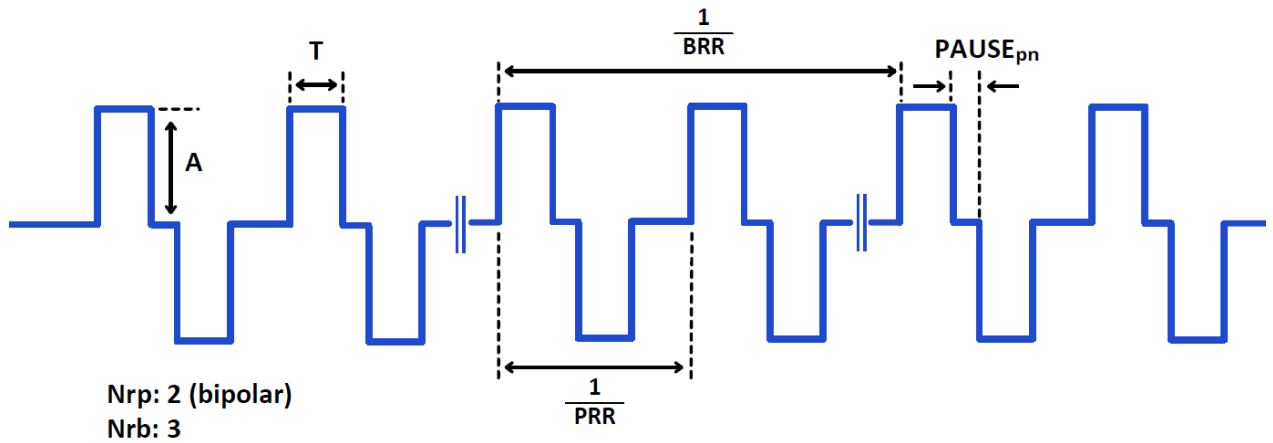


L-POR 3 KV HIGH-FREQUENCY ELECTROPORATOR PULSE SPECIFICATIONS

L- POR 3 kV electroporation device 1.1 is a device with 7 adjustable pulse parameters (voltage range, pulse duration, pause between positive and negative pulse, number of pulses in a burst, number of bursts and pulse/burst repetition rate) and 2 pulse modes (monopolar and bipolar). It is perfectly suited for laboratory research as it enables completely new experiments in the electroporation field. The user interface is graphical in design to allow input of complex electroporation pulse parameters and control of measured signals. The control unit is built on an FPGA circuit. Device has integrated external trigger and HDMI port . In addition, current protection is integrated, allowing currents up to 70 A without interrupting pulse delivery.

FOR RESEARCH USE ONLY, **NOT FOR HUMAN USE!**





PARAMETER		min	max
Voltage range	A	100 V	3000 V
Amplitude duration	T	500 ns	10 ms
Pause between positive and negative pulse	PAUSE_{PN}	500 ns	10 ms
Number of pulses in a burst	Nr_P	1	1000
Number of bursts	Nr_B	1	1000
Pulse repetition rate	PRR	100 mHz	1 MHz
Burst repetition rate	BRR	100 mHz	100 Hz
Pause between pulses	PBP	500 ns	10 s
Pause between bursts	PBB	10 ms	10 s
Total treatment time duration		500 ns	40 ms
Total treatment burst duration		500 ns	80 ms

Voltages can be set in 1 V increments. Durations can be set in 10 ns increments.





TECHNICAL DATA	
Model	L-POR 3kV v1.1 (and defined with serial number: EU or USA)
Manufacturer	mPOR d.o.o.
Manufacturer e-mail	info@mpor.eu
Weight	15 kg
Dimensions (H x W x D) mm	310 x 510 x 610
Housing colour	White; other colours also available per request
Warranty	1 year
Installation category	CAT II
Voltage drop	Defined in Figure 1
Load resistance	$\geq 20 \Omega$
Pulse rise time	$< 100 \text{ ns}$
Display	10.1 inch colour display
Controls	touch screen
Operative system	Linux
Electrical supply	230 Vac, 50 Hz or 120 Vac, 60 Hz (defined with serial number)
Power Ratings	35 W idle and 135 VA pulsing
External trigger	+5 V, $\geq 2\mu\text{s}$ positive front on BNC connector
Trigger delay	$> 2\mu\text{s}$, has to be defined for specific trigger
Pollution	Degree 1
Storage Temperature	-10°C to 70°C
Operating Temperature	5°C to 40°C

L- POR 3 kV must NOT be exposed to EM radiation exceeding the levels specified in the standard EN55011. L- POR 3kV must NOT be exposed to ionizing radiation exceeding the levels specified in the EU Radiation Protection Regulation, i.e. above 1 $\mu\text{Sv/h}$!





RECOMMENDED OPERATING RANGE

The pulse parameters for electroporation must be set within the range of load according to Figure 1. For quality assurance of electroporation experiments, the voltage drop should not be higher than 10%. This means that the user must calculate the maximum treatment time, which depends on the load. The load resistance can be roughly estimated from the current and voltage measurements (the resistance is equal to the voltage divided by the current). The treatment time is equal to the product of the number of pulses in a burst and the pulse duration (amplitude).

$$\text{Treatment time} = N_r * T$$

The combination of N_r and amplitude duration T should be chosen to be in the green area of the graph in Figure 1. **The load resistance should never be less than 20 Ω .**

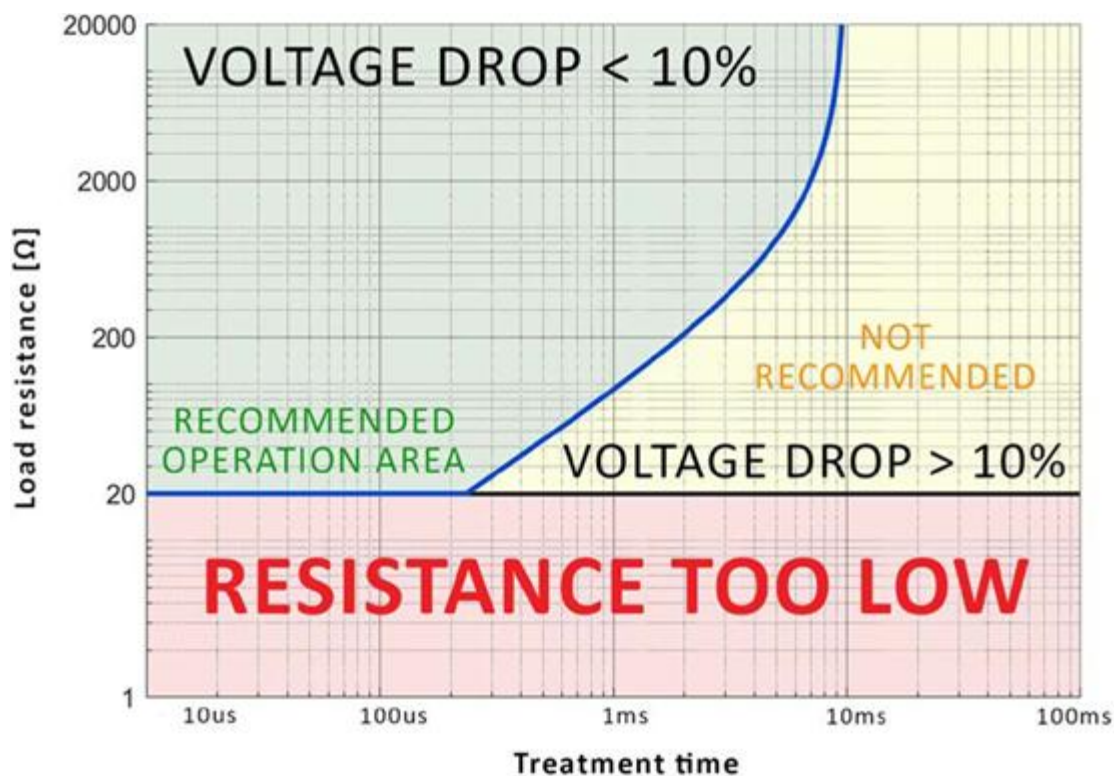


Figure 1: operating range of L-POR 3 kV electroporator.





SAFE OPERATING RANGE

To avoid sparks and stay within the safe working range, the pulse parameters for electroporation must be set according to Figure 2. The maximum voltage is limited by the distance between the electrodes and the treatment time.

$$\text{Treatment time} = N_r * T$$

If the electrodes are closer together, a lower voltage must be used in order to avoid sparks.

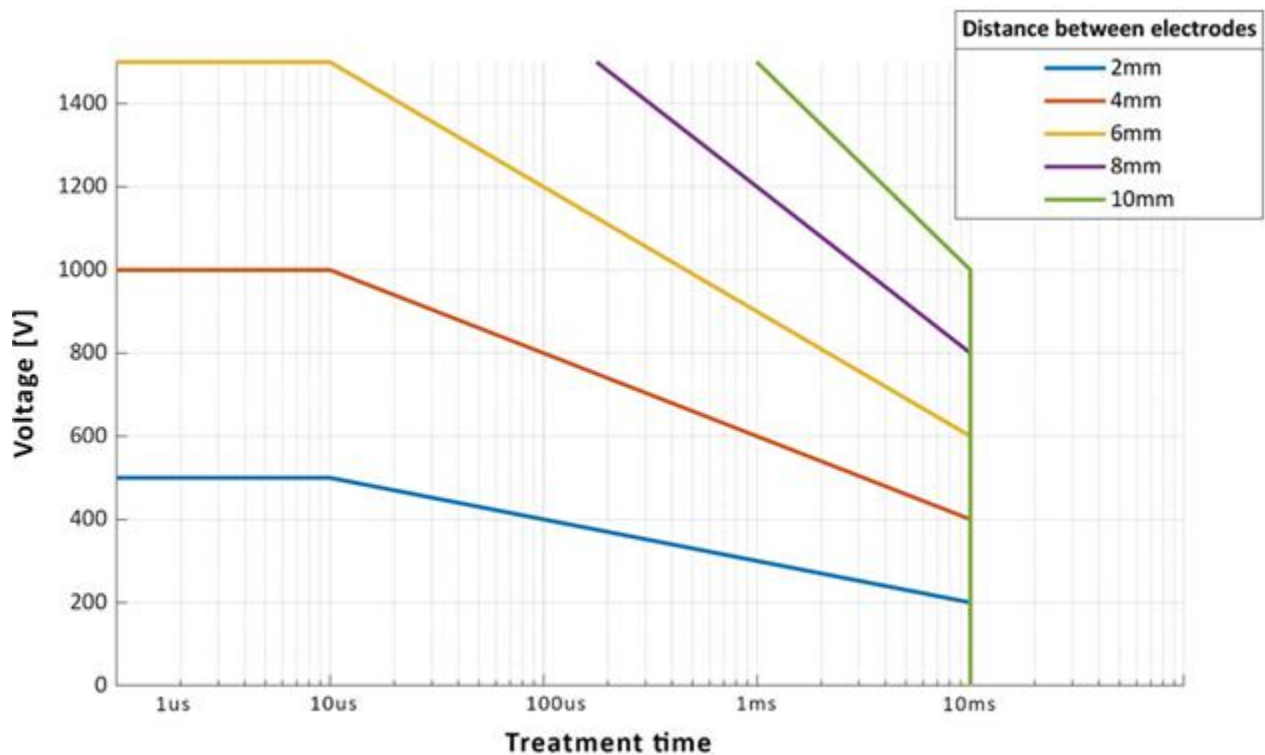


Figure 2: to avoid sparks, the treatment time and voltage have to be set in accordance with this figure.

QUALITY CONTROL

The current should be monitored during all experiments made with L-POR 3 kV. This is the only way to ensure that you have successfully delivered the pulses to the load. Therefore, an oscilloscope and a current probe are necessary to ensure the quality of your experiments. The current probe should have a bandwidth of at least 50 MHz. However, a higher bandwidth is required for quality measurements (bandwidth = 3.4/rise time). If you have problems with the measurements or need help in choosing the right equipment, you can contact mPOR.

